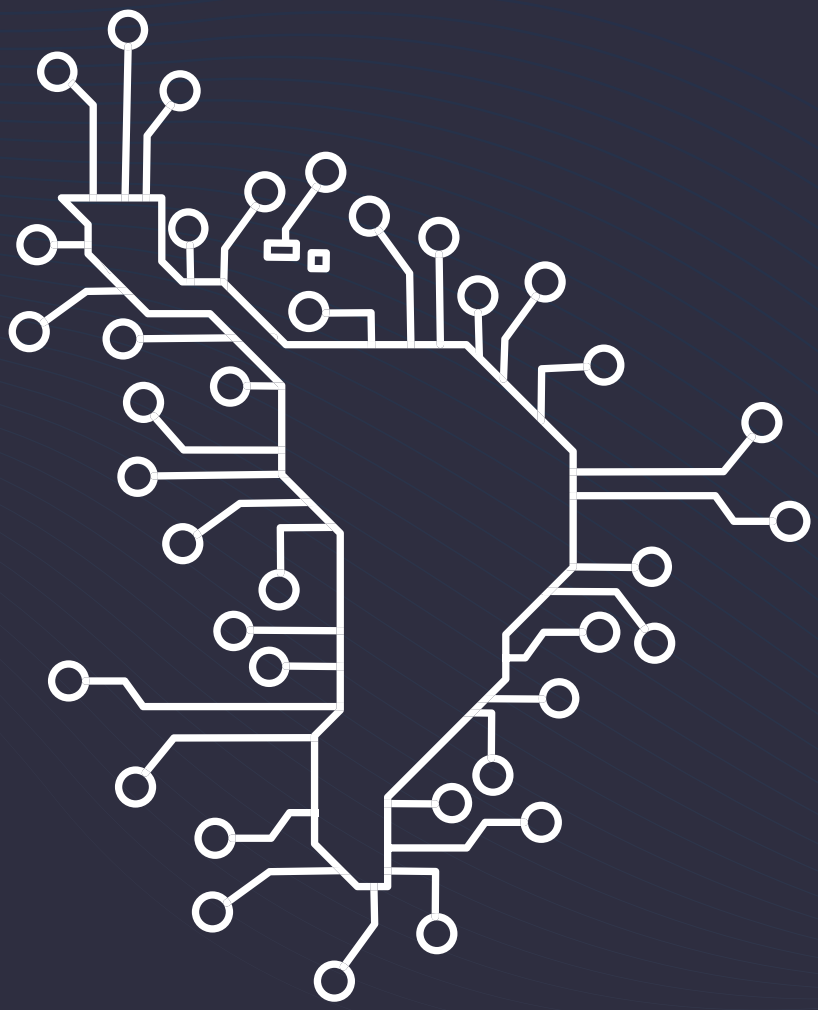


INTELLIGENCE ARTIFICIAL AT THE SERVICE OF SOCIAL GOOD IN LATIN AMERICA

AND THE CARIBBEAN:

regional overview and
Snapshots of twelve countries

A publication of the fAIr LAC initiative

INTELLIGENCE ARTIFICIAL AT THE SERVICE OF SOCIAL GOOD IN LATIN AMERICA

AND THE CARIBBEAN:

regional overview and
Snapshots of twelve countries

*Authors:*Constanza Gomez Mont; Claudia May Del Pozo; Cristina Martinez Pinto; Ana Victoria Martin del Campo Alcocer (C Minds)

*Contributors:*Natalia González Alarcón, Roberto Sánchez and Cristina Pombo (Social Sector); Arturo Muente and Florencia Seale (Citizen Innovation Services Division); and Tetsuro Narita, Carolina Carrasco and César Buenadicha from IDB Lab (IDB Group)

May 2020

https://www.iadb.org/

INDEX

PRESENTATION

The Inter-American Development Bank (IDB Group) advocates for a widespread understanding of artificial intelligence (AI), its opportunities and applications, but also its risks and possible measures to mitigate them.

To this end, the IDB Group, in collaboration with C Minds and the input of a group of regional experts[1], designed the fAIr LAC initiative, which aims to promote the responsible adoption of AI to improve the delivery of social services and create development opportunities in order to reduce gaps and mitigate growing inequality in Latin America and the Caribbean (LAC). In collaboration with partners and allies from the public and private sectors, civil society and academia, the fAIr LAC initiative leads the execution of pilot projects for social good in response to identified public problems. Likewise, under its auspices, tools are created to guarantee minimum standards, as well as to strengthen the quality of data and models in order to mitigate the potential risks associated with AI systems, while promoting an informed public debate on their opportunities.

One of the first steps of this initiative is to document and disseminate more information on advances in the field of AI for the common good and on relevant use cases in the region. This report contributes to this goal.

In light of the latent need to accelerate responses to the social and environmental challenges of LAC, this effort seeks to contribute to the discussion and generation of knowledge on the adoption of said technology in an ethical and responsible manner, so that it can be used as a tool to contribute to the fulfillment of the Sustainable Development Goals (SDG) and promote action.

1 For stylistic reasons, this report uses the inclusive generic masculine to refer to both sexes, unless otherwise indicated.

PROLOGUE

TO Latin America and the Caribbean need innovative solutions to improve the quality of their social services. Technology can help to make them more efficient and sustainable. Among the available tools, artificial intelligence (AI) can play a key role, but only if it meets certain requirements.

For example, artificial intelligence can become an ally for doctors when it comes to detecting diseases. It can help teachers design personalized education for their students. It can even help workers improve their training and connect them with real job opportunities in companies.

People can be much more productive when supported by technology. And this is one of the basic principles for the implementation of artificial intelligence in our region: it must be designed to complement humans and to improve their capabilities, but never to completely replace them.

Despite the availability of multiple technologies, none can replace the work of professionals in the social sector. In education, for example, although AI allows for personalized curricula for each student, the results will be insufficient if there is no guidance and pedagogy from a good teacher in the process. Doctors and teachers, among many others, are the most important factor for health and education to work. The problem then is not necessarily technology; the problem has been a flawed design that starts from the false premise that these professionals could be replaced.

For this reason, we believe that the IDB is called upon to play a key role in the implementation of artificial intelligence in Latin America and the Caribbean. Our in-depth knowledge of the public and social sectors—their processes, possibilities, challenges, and risks—acquired over 60 years of working on projects with governments and ministries, places us in a privileged position to contribute significantly to the implementation of AI for the provision of social services for the population.

This report is part of a broad and, above all, ongoing effort in the field of artificial intelligence, given its changing nature and the accelerated pace of its development. Our goal is to promote the adoption of ethical and responsible technology that generates better social services in our region. To do so, we collaborate with and disseminate the most relevant use cases in Latin America and the Caribbean.

Marcelo Cabrol
Manager, Social Sector
Inter-American Development Bank

New digital technologies represent a great opportunity to significantly expand the impact of our interventions. In this context, we must promote their use, without overlooking their potential risks and negative effects. In this way, we can ensure that these innovative tools effectively contribute to inclusion.

Among the new technologies, artificial intelligence stands out for its potential, as it is central to the digital platforms and social networks that we use every day, and to the business model of many entrepreneurs and innovators in the region. AI, as observed in various studies, requires active and coordinated efforts to avoid biases and adverse effects on disadvantaged groups. This is because, in the development and deployment of AI systems—particularly during the training of algorithms—challenges arise related to consent, bias, explainability, and other factors that can call into question the ethics and transparency of these systems and prevent them from having the necessary legitimacy to expand their use. All these challenges demonstrate the important role that the IDB Group can play in the region in promoting an ethical and responsible use of AI, focused on generating social impact.

It is also essential to promote the responsible use of AI not only in large technology companies but also in emerging and innovative companies in sectors such as health, education and social security so that they design solutions aimed at both the private and public sectors. This connection between innovative solutions and social problems represents a great opportunity in LAC, but requires that its innovation ecosystem develop reliable standards and tools based on AI. This will only be possible by promoting the development of good practices, algorithmic audits and specific guides that promote its responsible adoption and enable the development challenges of the region to be met.

Specifically in the case of the IDB Lab (the IDB Group's innovation laboratory), a priority would be to be able to work by connecting and training the different actors in the innovation ecosystems of LAC (entrepreneurs, investors, accelerators, among others) with the purpose of promoting AI as a facilitator of innovation for inclusion. This joint work between governments, companies and entrepreneurs will accelerate and consolidate the ethical and responsible use of AI as a tool that contributes to the fulfillment of the Sustainable Development Goals (SDG) in the region.

To advance this agenda, as the IDB Group we are launching fAIr LAC, an initiative that promotes the responsible use of AI for social impact. In particular, the IDB Lab and its network of allies seek to ensure that entrepreneurs and innovators in the region incorporate tools in their work that guarantee both digital security (availability, integrity and confidentiality of data and systems) and algorithmic transparency and accountability. The idea is that the AI models that are developed include, from their first design, a vision of technical robustness and respect for the rights of citizens. In this sense, we are promoting activities to raise awareness, train talent, facilitate market and investment opportunities and create networks, methodologies and tools for entrepreneurs and SMEs to incorporate the concept of responsible AI in the development of their solutions.

We therefore invite entrepreneurs, innovators and civil society organizations to join fAIr LAC and work with us so that together we can fulfill the dream of putting technology at the service of people, inclusion and equal opportunities in Latin America and the Caribbean.

Irene Arias
Manager, IDB LAB
Inter-American Development Bank

AND

The C Minds team firmly believes that technology can be used as a tool to build social value. Under this conviction, our mission is to collaborate with governments, academia, industry, multilateral organizations and other change actors in the design of strategies aimed at strengthening the capacities of institutions in Latin America and the Caribbean. We work under a collaborative framework with the purpose of creating alliances that provide a holistic perspective that enhances the benefits of new technologies. In particular, we aim to understand how artificial intelligence (AI) translates into profound structural changes for the benefit of the region, as well as design measures to prevent and mitigate the social and environmental risks that come with its accelerated development and adoption.

In Latin America and the Caribbean, realizing the promise of AI as a tool to drive more inclusive and fair economic and social development is not a luxury but a latent necessity. In this sense, we are proud to be partners of the IDB Group in this crucial task of strengthening the region in the use of AI for social good.

We hope that this report will help to clearly visualize the progress made in Latin America and the Caribbean in this field and in turn will contribute to promoting the conversations and actions necessary for the ethical use of this technology. Ultimately, this will be what defines its role in making Latin America and the Caribbean a more prosperous, fair and inclusive region. This will depend largely on our ability to delve deeper into the questions and find answers collectively.

Constanza Gomez Mont
Founder and director
C Minds

Inter-American Development Bank (IDB) - Social Sector

The Social Sector (SCL) is made up of a multidisciplinary team that acts under the conviction that investing in people can improve their lives and overcome development challenges in Latin America and the Caribbean. Together with the countries of the region, the Social Sector formulates public policy solutions to reduce poverty and improve the provision of education, work, social protection and health services. The objective is to build a more productive region where equal opportunities for men and women prevail, as well as greater inclusion of the most vulnerable groups.www.iadb.org/en/about-us/departments/scl

Inter-American Development Bank (IDB) - IDB Lab

IDB Lab is the IDB Group's innovation laboratory. It mobilizes financing, knowledge and connections to catalyze innovation aimed at inclusion in Latin America and the Caribbean. For IDB Lab, innovation is a powerful tool that can transform the region by creating unprecedented opportunities for populations in vulnerable situations due to the economic, social and environmental conditions in which they find themselves.https://bidlab.org/

C Minds

C Minds is a Mexican organization led by women that seeks to promote equal opportunities to achieve a fuller life through the use of new technologies such as artificial intelligence (AI). The organization specializes in designing and implementing strategies for social change in emerging countries in response to new paradigms triggered by massive technological transformation. C Minds works with governments, multilateral organizations and local institutions implementing projects that seek to increase the resilience of communities, prepare different industries for the future and promote the development of new technologies centered on human rights. www.cminds.co

This report is part of the fAIr LAC initiative

fAIr LAC

fAIr LAC responds to the IDB's efforts to build a common understanding of what AI is, its opportunities and applications, but also its risks and possible measures to mitigate them. In collaboration with strategic partners and allies, this initiative seeks to promote the responsible adoption of AI to improve the provision of State services (mainly in the sectors of education, health, social protection, labor markets and issues associated with gender and diversity) and create development opportunities in order to reduce gaps and mitigate growing social inequality. Working together with the public and private sectors, civil society and academia, the fAIr LAC initiative will lead the execution of experiments and pilot projects of AI systems. It will also create ethical evaluation models and other tools so that governments, entrepreneurs and civil society can deepen their knowledge on the subject, have guides and frameworks for the responsible adoption of AI and influence both public policy and the entrepreneurial ecosystem.https://www.iadb.org/en/

ACKNOWLEDGEMENTS

For his contributions throughout the research to strengthen this report, we would especially like to thank Professor Ulises Cortés, Coordinator of the High Performance Artificial Intelligence Group at the National Supercomputing Center in Barcelona and member of the fAIr LAC Expert Group.

For the identification of various use cases and inputs, we express our gratitude to the following people from the fAIr LAC Expert Group:

- Carolina Aguerre, Co-director of the Center for Technology and Civil Society (CETyS) of the University of San Andrés in Argentina
- Daniel Korn, Director of Corporate Affairs at Microsoft Latin America
- Javier Barreiro, Director of Technology at the Agency for Electronic Government and Information and Knowledge Society (AGESIC) of the Government of Uruguay
- Prof. Ricardo Baeza-Yates, Chief Technology Officer of NTENT USA, Managing Director of NTENT Hispania and Director of the University Data Science Program at Northeastern University

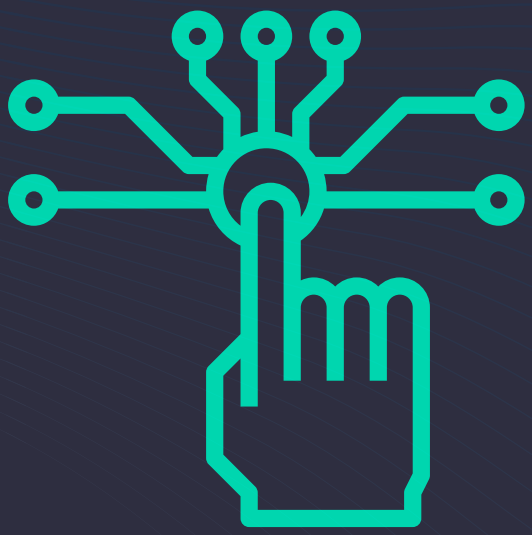
For their contributions to identifying key information and initiatives, we would like to thank the following individuals:

- Alain-Paul Michaud, Managing Partner at Los Ynnovadores, keynote speaker and promoter of AI (Peru)
- Alexander Ditzend, President of the Argentine Foundation for Artificial Intelligence (Argentina)
- Andrés Bustamante Valenzuela, Digital Transformation Consultant, Co-founder of authomata.io and former Director of Digital Government (Chile)
- Camille Elizabeth Jackman, Masters student at the University of the West Indies (Trinidad and Tobago)
- Carlos Alberto Martínez Cortés, CEO of TechBA and Coordinator of Tec_Salud at the Mexico-United States Foundation for Science (Colombia)
- César A. Beltrán Castañón, Associate Professor and Leader of the AI Group at the Pontifical Catholic University of Peru (Peru)
- Chelcee Brathwaite, graduate of the University of the West Indies (Trinidad and Tobago)
- Francisco Alomía, Co-founder of Saturdays.AI in Quito (Ecuador)
- Gilles Maury, Technology, Media and Telecommunications Industry Leader for Costa Rica, Nicaragua, Honduras and the Dominican Republic at Deloitte (regional)
- Glenda Michel, Deputy Director General of Innovation and Digital Transformation at the Ministry of Finance and Public Credit (SHCP) (Mexico)
- Javier Richard Cuicapuza Antonio, Founder/President of Data Science Research (Peru)
- Jonathan Barcant, Director of Vetiver TT EES Ltd and founder of the IA Movement (Trinidad and Tobago)
- José Antonio Guridi, AI Policy Coordinator, Government of Chile (Chile)
- Julio Paciello, Professor of AI at the National University of Asuncion (Paraguay)

- Leonardo Loureiro, Computer Engineer and President of the Uruguayan Chamber of Information Technology (Uruguay)
- Miguel Paredes, Vice President of AI, Data & Pricing at Rimac Seguros y Reaseguros (Peru)
- Nubia Santofimio, advisor in the formulation and development of the Digital Government policy (Colombia)
- Philippe Surman, co-founder of Intelligence Mexico Conference (Mexico)
- Ramiro Albrieu, Senior Researcher in Economic Development at the Center for the Implementation of Public Policies for Equity and Growth (CIPPEC) (Argentina)
- Raúl Rojas, Professor of AI at the Free University of Berlin (Mexico)
- Rodrigo Arrúa Minucovich, Director of AI Brazil (Brazil)
- Rodrigo Félix Montalvo, Embassy of the United Kingdom in Mexico (Mexico)
- Santiago Ortega González, Directorate of Digital Government of the Ministry of Information and Communication Technologies (MinTIC), Government of Colombia (Colombia)
- Tamar Colodenco, Google's Head of Public Policy and Government Relations for the Southern Cone (regional)
- Valeria Tafoya, Member of Global Shapers León (Mexico)
- Yolanda Martínez, Representative of the Inter-American Development Bank (IDB) in Chile (Chile)

For their contributions, we would also like to express our appreciation to Alexandre Bagolle, Claudia Piras, David Rosas, Elena Arias, Jennifer Nelson, Luis Tejerina, Manuel Urquidi, Marcelo Pérez-Alfaro, Mario Casco and Verónica Tejerina of the IDB Social Sector digital team, as well as to Adrian Kopps, Clara Martínez, Lucía Trochez and Lucía Vázquez Bon of the C Minds team.

Finally, we thank the developers and implementers of the use cases for sharing their work: 1DOC3; Peace Agreements; ALeRCE; Amanda Care; AYNI Lab; Help for workers and migrants; CEDO; DART; Bot Detection; Violence Reduction; Doc.com; Dymaxion Labs; IRBin; Kilimo; Laura (Argentina); Laura (Brazil); Layers - Smart Land; Livox; NotCo; PAM; ParaEmpleo; PARMA; Telemedicine Portal; Crime Scene Prediction; Prometea; R1T1; SISBEN; SpeakLiz; Traive; U-Planner, and Unima.



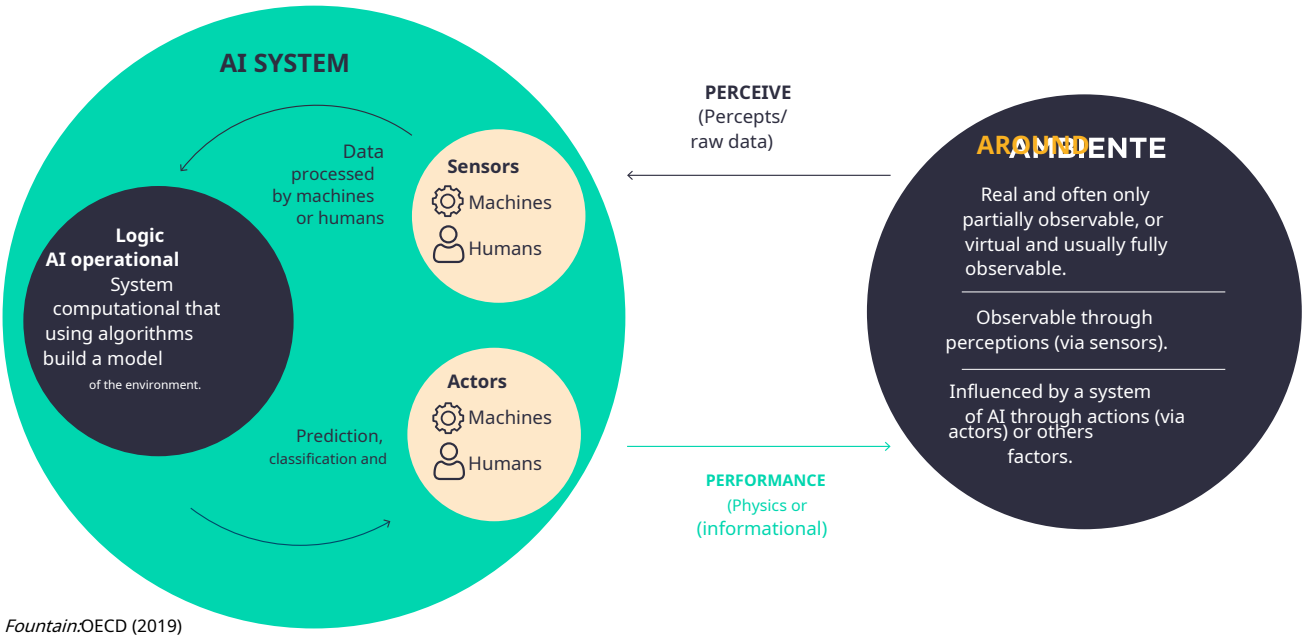
1. INTRODUCTION

1. INTRODUCTION

Among the many challenges that Latin American and Caribbean (LAC) countries share in a time of economic and political uncertainty, improving the delivery of state services—especially in education and health—ranks high (IMF, 2019). Developing regional strategies to successfully address these challenges is becoming increasingly complex, not only because of the political, cultural and economic differences that exist, but also because of growing social inequality. While this panorama may seem daunting, many regional change agents are seeking new alternatives, relying on technological tools that promise to create a more prosperous and fair region.

Among these tools is artificial intelligence (AI). In its dual role as a general-purpose technology[2] and a tool for innovation, AI has gained prominence in debates in multiple spheres under the promise of changing the way we live and our perception of the world. Since it is a concept in constant evolution, it is difficult to offer a definition that contemplates its multiple facets (Figure 1). It can be said that AI is a field of study focused on the development of capabilities in computer systems that are used to perform tasks previously considered exclusive to human intelligence, including reasoning, learning and problem solving, to name just a few. The Organization for Economic Cooperation and Development (OECD) defines AI as "a computational system that can, for a given set of objectives defined by humans, make predictions and recommendations or take decisions that influence real or virtual environments. AI systems are designed to operate with different levels of autonomy" (Cabrol et al., 2010:10).

Figure 1.High-level conceptual view of artificial intelligence



*Fountain:*OECD (2019)

AI promises to improve the design of digital services focused on people's needs and the efficiency of vitally important processes - such as the delivery of social services.[3] and transparency in the

2 A general-purpose technology is one that has applications in various tasks (not just one specific one), exhibits technological dynamism, logical (continuous updating) and has innovative complementarity (capacity to enhance other innovations) (Hurtado, Lugones and Surtayeva, 2014).

3 In this document, social services are understood as the set of services and actions aimed at improving the social well-being of the population. citizenship by providing information, care and support, particularly for the sectors of education, health, social protection, labour markets, social security and issues associated with gender and diversity.

public decision-making—and stimulate the economy through increases in productivity. It can also contribute to each of the 17 Sustainable Development Goals (SDGs) of the United Nations (UN) through use cases that respond to specific objectives, as long as the challenges related to its scaling are overcome (AI Index Stanford, 2019). An example of the relevance of AI is the impact it can have on the economy of a developing country; it is estimated that AI could contribute up to 14% of additional wealth to the emerging economies of Latin America (Estevadeordal et al., 2018).

The potential of AI is so broad that it is expected to be a core tool for facing current and future challenges. For its part, the concept of**AI for social good**[4]AI for social good aims to empower people: it is used to address the most important challenges of our time, those that directly impact humans and the environment in the most diverse fields such as health, education, employment, justice, resource availability, climate change, gender equality and the reduction of inequalities. The concept of AI for social good includes different actors, including all those organizations or initiatives that address these challenges by relying on this technology.

The world is at the dawn of a new era in which the impact of digitalization is growing and spreading in ever more surprising ways. This is happening through technologies and techniques such as gene editing, cryptographic methods, and nanomaterials, among others (Davis, 2016). Given the promise of AI in terms of improving people's quality of life, a considerable number of institutions in LAC have devoted themselves to learning about, exploring, and testing the new possibilities it offers, particularly in the economic, health, and education fields. It is expected that it will benefit millions of people in the next decade (Anderson and Rainie, 2019).

In light of the above, it is essential to carry out an analysis of the progress made in the development and adoption of AI in LAC in general, and also to document the progress made in leveraging AI-driven models for the social good. This includes mitigating its potential intrinsic risks, which in the fAIr LAC initiative have been divided into eight categories.[5]: (i) interoperability and digital transformation; (ii) conceptualization and design; (iii) governance and security; (iv) data source; (v) model development; (vi) use and decision-making; (vii) accountability; and (vii) systemic impact.

While there are efforts in LAC aimed at increasing interest in promoting innovation and technological development, specifically in AI issues, there is no consolidated information on the status of its use as a tool to address social challenges from a country or regional perspective. Considering that LAC is in an early stage of AI adoption, it is a good time to consider the different uses that can be given to it, and in particular the role that governments can play in its development and responsible adoption.

This is how the Inter-American Development Bank (IDB) and C Minds, within the framework of the fAIr LAC initiative, have produced this report, which seeks to offer an initial diagnosis of the progress made by LAC countries in the use of AI for the social good. The effort included input from more than 65 experts from all sectors of the region and incorporated information from relevant existing documents, which allowed for expanding knowledge of the AI ecosystem in each of the countries studied.

This report is expected to contribute to the recognition and visibility of AI best practices in the region, enlighten decision-makers on these issues, contribute to promoting evidence-based dialogues and debates, and encourage the formulation of comprehensive strategies to advance the responsible use of AI to solve social and environmental challenges in LAC, among other things. At the same time, it is intended to foster a critical space to reflect on the meaning and implications of AI.

4 Social good is understood as any action that benefits people's quality of life and has a positive impact associated with society in general.

5 For further information on the identified risk categories, please review the fAIr LAC technical note here.

accelerated development of AI in the regional context, and on appropriate mechanisms to ensure that this technology is used for the benefit of all people.

Readers are invited to learn about the progress made in each country, to transform the knowledge presented into an open dialogue about the direction of this technology in the local context, and to participate in the co-creation of a regional agenda that guarantees that AI as a technological tool protects human rights and contributes to the inclusive development of LAC.

The AI ecosystem is evolving rapidly and therefore the regular updating of this information is considered essential. The authors welcome anyone who would like to recommend relevant or new initiatives that have not been included in this report, by sending the relevant information to fairlac@iadb.org andinfo@cminds.co , or by visiting the fAIr LAC observatory page directlyhere .

2. METHODOLOGY

2. METHODOLOGY

Selected countries

This report includes a diagnosis of the state of AI in twelve LAC countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Paraguay, Peru, Dominican Republic, Trinidad and Tobago, and Uruguay (Map 1). This selection was based on a subregional assessment and 21 criteria (Annex A), including the level of digital maturity, international rankings such as the open data index, and progress made in AI.

Map 1.Overview of AI in 12 selected countries in Latin America and the Caribbean

Country analysis

To provide a comprehensive and current overview by country, the researchers relied on documentary analysis and information shared by local and regional experts exclusively for this report. The full list of experts, selected based on a mapping of the region and through recommendations, can be found in the acknowledgements at the beginning of this document. For each country, the information collected is organized into the following subsections: (i) a summary of the country profile as a general context; (ii) documentation of the different efforts of the government and academia, as well as an overview of the actions of the entrepreneurial sector and civil society to build and develop an AI ecosystem for the social good; (iii) use cases in the implementation phase that leverage AI-driven models to meet the SDGs in the region.[6], and (iv) a general conclusion. The details of each of these subsections, as well as the relevance of each actor studied, can be found in Annex B.

6 The list of use cases broken down by country, topic and implementers can be found in Annex C.

AI Ethics

As is well noted in *Automate with caution: data and artificial intelligence in Latin America* (Scrollini, 2018), the opportunities that AI offers for LAC also entail potential risks that have not yet fully materialized, given its current state of development. The topic of AI ethics is relatively new in the world and incipient in the region. Although there is still no significant progress in the countries studied, within the framework of this report an open regional survey was conducted—the first of its kind—to understand the perceptions of different people.

225 individuals from LAC participated in this open survey. Although its results cannot be generalized to the entire region, since they do not arise from a representative sample, they do provide a thermometer of the diverse perspectives of the participants on the topics discussed.[7] The results of this survey are included in this publication.

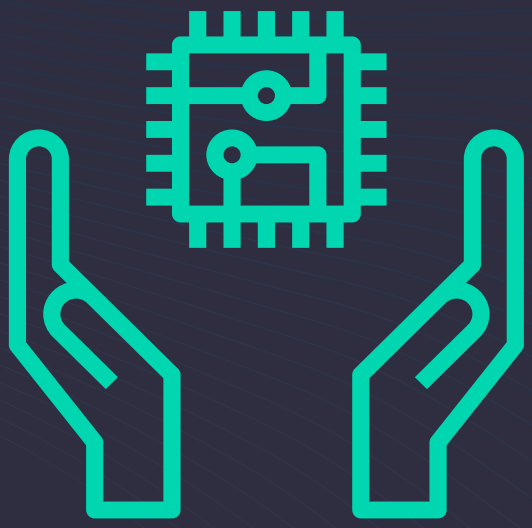
Scope of the report

This report does not rank or rate the countries in the sample. Nor does it seek to delve into the initiatives that have incorporated the use of AI in each country or that are promoting its development. The aim is to provide readers with an overview of the current foundations of AI and the progress made in each of the selected countries in terms of its use for the social good. In other words, it aims to provide information on initiatives in this field that have been carried out to date in 12 LAC countries by four interest groups: government (with an emphasis on national efforts), academia, entrepreneurial ecosystem, and civil society organizations (CSOs).

It should be noted here that while the efforts of the industry in general, together with those of the so-called *Big Tech*, constitute one of the core foundations for the advancement of AI in the service of social good in countries, this publication does not go into depth about their activities, thus avoiding repeating existing efforts such as those of Endeavor, an ally of fAIr LAC. In short, this report includes a sample of examples of initiatives and ventures that take advantage of AI to have a greater impact on issues of social development and environmental care in LAC.

As the AI ecosystem is rapidly evolving, readers are encouraged to stay up to date through the sources compiled in this report, which covers the main efforts identified in those 12 countries as of early 2020.

7 The following are the thematic axes of ethics and inclusive policies around AI that were considered: inclusive growth; sustainable development and well-being; human-centred values and equity; transparency and explainability; robustness, safety and security; and accountability (OECD, 2019).



3. MAIN FINDINGS

3. MAIN FINDINGS

The following is a summary of the findings recorded in this report. It should be noted that there is no intention to generalize these salient aspects to the entire region, since the 12 countries analyzed here are among the most advanced in both Latin America and the Caribbean when it comes to laying the foundations for the adoption of AI as a tool to serve the social good. Therefore, from now on the authors will refer to this group of countries as LAC12.

- Most of the countries that make up LAC12 have established solid foundations from a government perspective, as they are developing their AI systems aligned with state efforts aimed at increasing connectivity, infrastructure development, national digitalization strategies, open data, and national AI agendas in the process of being developed.
- All countries studied have a digital strategy and, with the exception of Trinidad and Tobago, also have an open data agenda. Uruguay and Colombia have already formulated their national AI strategies, while Brazil and Chile are doing so. Mexico and Argentina have undertaken a significant effort by including the ecosystem in the formulation of a national strategy proposal that still requires consolidation.
- The lack of digital infrastructure in the region is emerging as a key challenge in terms of democratising the benefits of AI. The Economic Commission for Latin America and the Caribbean (ECLAC) estimates that access to technology can be up to ten times higher in urban areas compared to rural areas.
- Regardless of the differences between urban and rural areas, the lack of connectivity prevails in the 12 countries studied, given that less than 70% of the average population in LAC12 has access to the Internet.
- The existence of 5G networks is a competitive element for the local AI ecosystem – it accelerates and strengthens connectivity services – which means that an AI system can analyse data and learn more quickly than it does today. In this regard, Argentina, Colombia and Uruguay are carrying out tests, while Mexico, Brazil and Peru are already bidding for spectrum.
- Cybersecurity is a key element for progress in the digital economy. This topic represents a very important area of opportunity in the sample of selected countries, since, according to the Global Cybersecurity Index, the 12 are ranked from 51 to 123 out of a total of 175 worldwide.
- In terms of gender, schooling and English proficiency, at the regional level there is one woman for every two men studying STEM (science, technology, engineering and mathematics) degrees. The average student is three years behind the average of schoolchildren in OECD countries in reading, mathematics and science. As for the average level of English – the language in which most AI programs and documentation are written – it is only 56%, which indicates the existence of an area of opportunity and priority in which it will be necessary to develop skills.
- Nearly 75% of the main universities in LAC12 are promoting research and development of autonomous systems. Meanwhile, public and private research centers generate 50% of this type of research.
- More than 96% of the main universities in LAC12 offer AI-related courses and 50% have a specialized laboratory or center. These are promising figures in terms of developing local talent, one of the main challenges for AI startups in the region. However, only half of these universities have offices outside the country's capital, which constitutes a considerable challenge in terms of disseminating knowledge and distributing opportunities.
- There is a gender diversity gap in AI research, although this is not a specific challenge in LAC. In a 2019 study of 11,000 publications presented at 21 international conferences,

In another study, which analyzed arXiv (the most important open access repository of publications), it was determined that, on average, in 34 countries only 25.4% of publications dealing with AI have co-authorship by at least one woman. In the region, only Argentina (with around 34%), Mexico (with around 27%) and Brazil (with around 26%) are among the first 34 countries where gender differences in participation in publications on AI are less marked. Argentina ranks first in terms of the proportion of AI publications where a woman appears as the sole author (15%).

- In terms of AI patents, LAC is at the lowest levels compared to other regions (less than 1%).

- The 12 countries in the sample face systemic challenges such as inequality gaps. The average GINI coefficient in these countries is 46%, making the region one of the most unequal in the world, along with sub-Saharan Africa. This opens an opportunity to explore how AI could become a powerful tool to reduce this gap.
- In 2018, venture capital in LAC doubled (a total of USD 1.98 billion across all subsectors). Although still in its early stages, impact entrepreneurship and its promotion through venture capital is growing in the region. However, there are still quite marked differences between countries in terms of the level of evolution and adoption of AI by this sector.

- 82% of venture capital investments in 2017 were in the IT sector. While the largest subsector in terms of AI use in the region is software and business services,[8], with 43% (Endeavor, 2018), there are four subsectors that are directly related to improving the quality of life and that stand out for their growth rate: health, EdTech, FinTech and AgTech. Although AI is not the only technology used by social and impact entrepreneurs, it plays a fundamental role in their innovation and growth strategies.
- The entrepreneurship ecosystem is driving numerous AI use cases for social good in LAC12. These uses seek to expand and distribute existing opportunities, for example by creating possibilities for farmers to access credit; promoting personalized and quality education through monitoring and support solutions for students; democratizing access to health services through remote automated diagnostic systems; enabling more fluid communication from and between the hearing impaired community; reducing malnutrition by providing sustainable and accessible plant-based foods; and mitigating the effects of climate change from different sectors.

- The sample of 29 use cases shows that their main challenges in adopting AI are: quality (58%), labeling (58%) and data availability (47%), followed by availability of qualified talent (47%) and cultural resistance (42%).
- 37% of participants in the survey "Perception of the importance given to AI ethics in Latin America and the Caribbean" (225 people) perceive that it is being given very little importance on the public agenda. Likewise, 58% perceive that civil society organizations and others dedicated to generating social impact are giving very little or no consideration to the use of AI to accelerate their impact.
- According to the aforementioned survey, the AI ethics issues that are of greatest concern in the region are: privacy and security of personal data (56%), reliability and security of systems (37%) and transparency (33%). Likewise, it is perceived that the private sector is the one that is having the greatest influence on issues related to AI ethics (40%), followed by the academic sector (29%).
- More than 70% of respondents do not know of an example of an implemented use case of AI in the service of social good (Table 1).

8 Made up of those companies dedicated to creating tools aimed at meeting the operational needs of businesses. example, cloud services such as Amazon Web Services (Aws), FutureFuel and Squibler, among others.

Table 1.Overview of AI advances in 12 selected LAC countries* (%)

	Government	Academy	Ecosystem entrepreneurship	Civil society
Argentina	77.5	52	52.4	75
Brazil	77.4	88	41.8	50
Chili	79.1	76	50.9	75
Colombia	89.1	68	47.3	25
Costa Rica	65.1	75	n/d	100
Ecuador	61.4	60	n/d	75
Mexico	76.4	64	52.1	25
Paraguay	61.8	46.4	n/d	50
Peru	62.6	46.4	45.4	50
Republic Dominican	61.6	46.4	45.7	75
Trinidad and Tobago	38.5	60.3	n/d	75
Uruguay	91.5	60	47.2	100

*Fountain:*Own elaboration.

* For "Government", the average of the World Bank Digital Adoption Index, the World Economic Forum (WEF) Network Readiness Index, and the digital, data, and AI strategy formulation index was calculated (100% if the country already has them, 50% if they are in progress or pending, and 0% if it does not have them).
For "Academy", the category was obtained by calculating the percentage of public, non-centralized universities with AI-related courses, AI-related research, and AI laboratories, out of the total number of universities studied (3, 4, or 5).
For the "Entrepreneurship Ecosystem" the National Entrepreneurship Context Indicator (NECI) was used, which measures how conducive the environment is for entrepreneurs.
For "Civil Society" the Civicus Monitor indicator was used, which measures the state of civil society freedoms.

Source: Own elaboration.
* For “Government”, the average of the World Bank’s Digital Adoption Index, the World Economic Forum (WEF) Network Readiness Index, and the digital, data, and AI strategy formulation index was calculated (100% if the country already has them, 50% if they are in progress or pending, and 0% if they do not have them). For “Academia”, the category was obtained by calculating the percentage of public, non-centralized universities with AI-related courses, AI-related research, and an AI laboratory, out of the total number of universities studied (3, 4, or 5).
For the “Entrepreneurship Ecosystem” the National Entrepreneurship Context Indicator (NECI) was used, which measures how conducive the environment is for entrepreneurs.
For “Civil Society” the Civicus Monitor indicator was used, which measures the state of civil society freedoms.

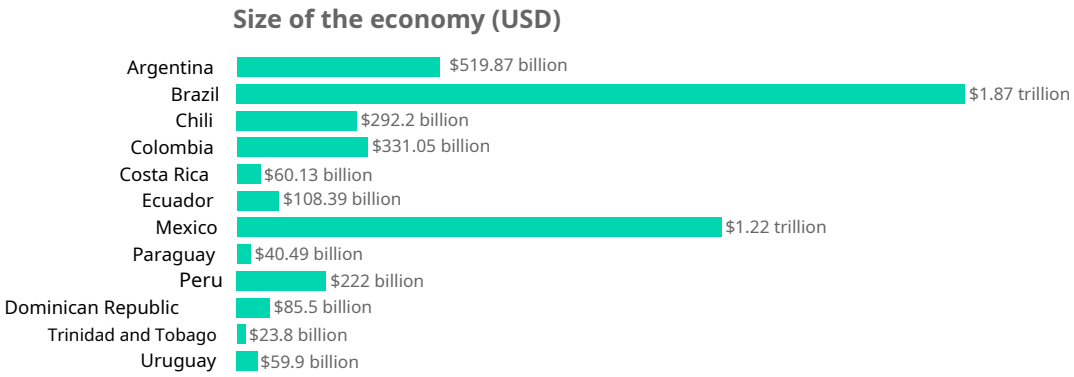
4. OVERVIEW REGIONAL

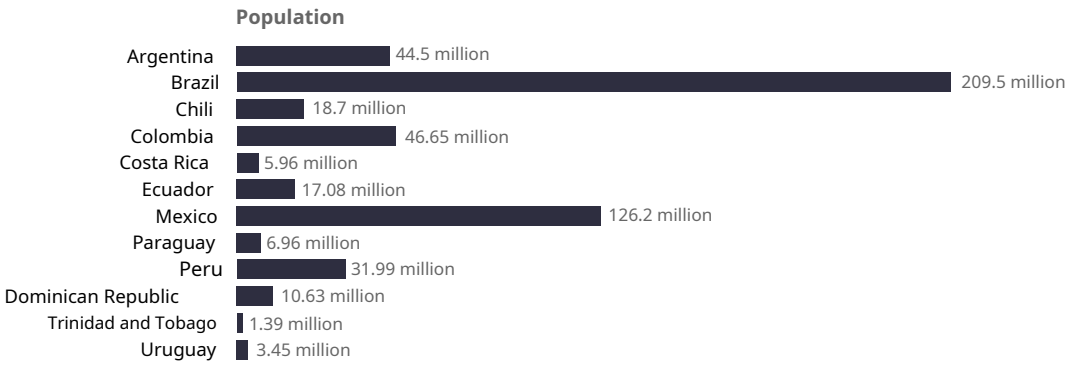
4. REGIONAL OVERVIEW

Profiles of selected countries

In order to provide a general context, Figure 2 offers a comparison of some economic, demographic, education, human development and equality indicators for the twelve countries selected for this report.

Figure 2. Basic indicators for the 12 selected countries





Human Development Indicators

	PISA*	Fitness in English	Labour qualified	Index of development human	Coefficient of GINI
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chili	1 I was	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3 I was	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Dominican Republic	N/A	52.3%	50.2%	0.736	45.7
Trinidad and Tobago	N/A	N/d	71.8%	0.784	40.3
Uruguay	2 do	54.1%	25.5%	0.804	30.5

* Position among the countries evaluated

Sources: Top panels: World Bank (2019).
Human Development Indicators (from left to right): OECD (2019); English Skills (nd); UN (2019); UNDP (2018); World Bank (2018).

Government progress

Table 2 summarizes the progress made by the governments of the 12 selected countries in laying the foundations for advancing AI for the social good.

Table 2.Advances in strategy formulation and infrastructure and connectivity*

	Strategy digital	Strategy of data	Strategy of AI	Infrastructure and connectivity
Argentina	Yeah	Yeah	to explore continuity	very advanced
Brazil	Yeah	Yeah	in progress	very advanced
Chili	Yeah	Yeah	in progress	leader
Colombia	Yeah	Yeah	Yeah	very advanced
Costa Rica	Yeah	Yeah	No	very advanced
Ecuador	Yeah	Yeah	No	semi-advanced
Mexico	Yeah	Yeah	to explore continuity	advanced
Paraguay	Yeah	Yeah	No	semi-advanced
Peru	Yeah	Yeah	No	advanced
Republic Dominican	Yeah	Yeah	No	semi-advanced
Trinidad and Tobago	Yeah	No	No	advanced
Uruguay	Yeah	Yeah	Yeah	leader

*Fountain:*Own elaboration.

* For the connectivity and infrastructure items, an average of the percentages obtained in the World Bank's Digital Adoption Index and in the*Network Availability Index*of the FEM. For this last category, a "leader" level corresponds to a score above 90%, "very advanced" to between 80 and 89%; "advanced" to between 70 and 79%, and "semi-advanced" to between 60 and 69%.

In addition to the progress made in each of the countries, there are spaces dedicated to AI at the international level where LAC governments participate individually or as a block. There, the aim is to align government actions on AI issues in general. Some of them are mentioned below:

- **United Nations:**The Group of Friends on Digital Technologies[9], aligned with the SDGs, seeks to maximize the positive impact of new technologies and mitigate potential negative risks. It is co-chaired by Mexico, Finland and Singapore.
- **Digital 9[10]:**International forum that brings together nine pioneering countries in the advancement of digital practices for the benefit of their citizens. Mexico and Uruguay are the only Latin American countries that are part of this group; in 2019 Uruguay assumed the Presidency of the forum. It has a thematic group on AI.
- **Pacific Alliance:**In 2017, the Digital Agenda was launched, as well as the Roadmap that outlines the path to improve the competitiveness of the four countries of the Pacific Alliance (Mexico, Peru, Colombia and Chile) through information and communications technologies (ICT). The alliance seeks to set the standard in AI, among other topics, to give a signal of social commitment.
- **GEALC Network:**The Network for the Development of Electronic Government for Latin America and the Caribbean (GEALC)[11] In 2018, the Emerging Technologies Working Group was created, led by Mexico. This group carried out an initial mapping of the different regional initiatives.

Academy Advances

The CSRankings[12]is a ranking of the best data science institutions in the world. It is based on the number of institutions and researchers that have published papers related to the topics covered therein.[13]and that have appeared in events of the highest levels in their category. Between 2015-2020, 12 Latin American universities stand out, which are listed below followed by their respective position (there are numerous ties in the ranking):

- Federal University of Rio Grande do Sul (UFRGS), Brazil: 215
- Universidade Federal de Mina +Dos Gerais (UFMG), Brazil: 221
- Federal University of Viçosa, Brazil: 235
- Pontifícia Universidade Católica do Rio Grande do Sul (PUC-RS), Brazil: 253
- Institute of Mathematical and Computing Sciences (USP-ICMC), Brazil: 253
- Universidade de São Paulo (USP), Brazil: 272
- University of Chile, Chile: 297
- Pontifical Catholic University of Rio de Janeiro (PUC-RIO), Brazil: 316
- Universidade Federal de Pernambuco (UFPE), Brazil: 351
- Universidade Federal do Rio de Janeiro (UFRJ), Brazil: 351
- University of Buenos Aires, Argentina: 351
- University of the Andes, Colombia: 386

On the other hand, according to Stanford University (Figure 3), AI references in journal publications

9 For more information seehttps://repositorio.cepal.org/bitstream/handle/11362/5014/1/S0700876_es.pdf

10 For more information, seehttps://leadingdigitalgovs.org/about/leading-digital-governments

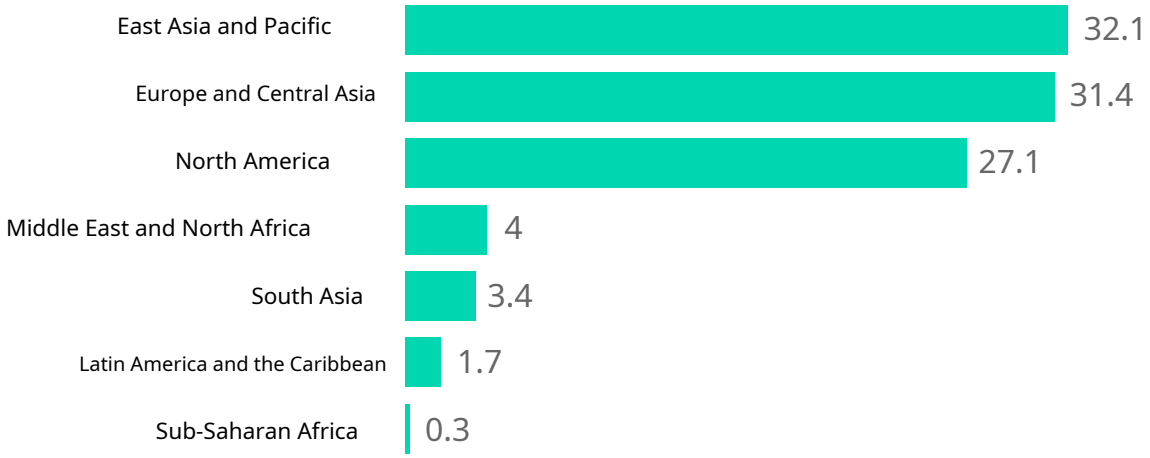
11 For more information, seehttp://www2.redgealc.org/sobre-red-gealc/que-es-la-red-gealc/

12 CS=Computer Science.

13 The following areas are included: AI, computer vision; machine learning and data mining; and natural language processing.

of a scientific nature are a sign of the impact of their research and development. In 2019, only 2% of all publications on these topics originated in LAC, making it one of the least prolific regions in the world in this regard (Stanford University, 2019).

Figure 3.Share of AI publications worldwide, by region

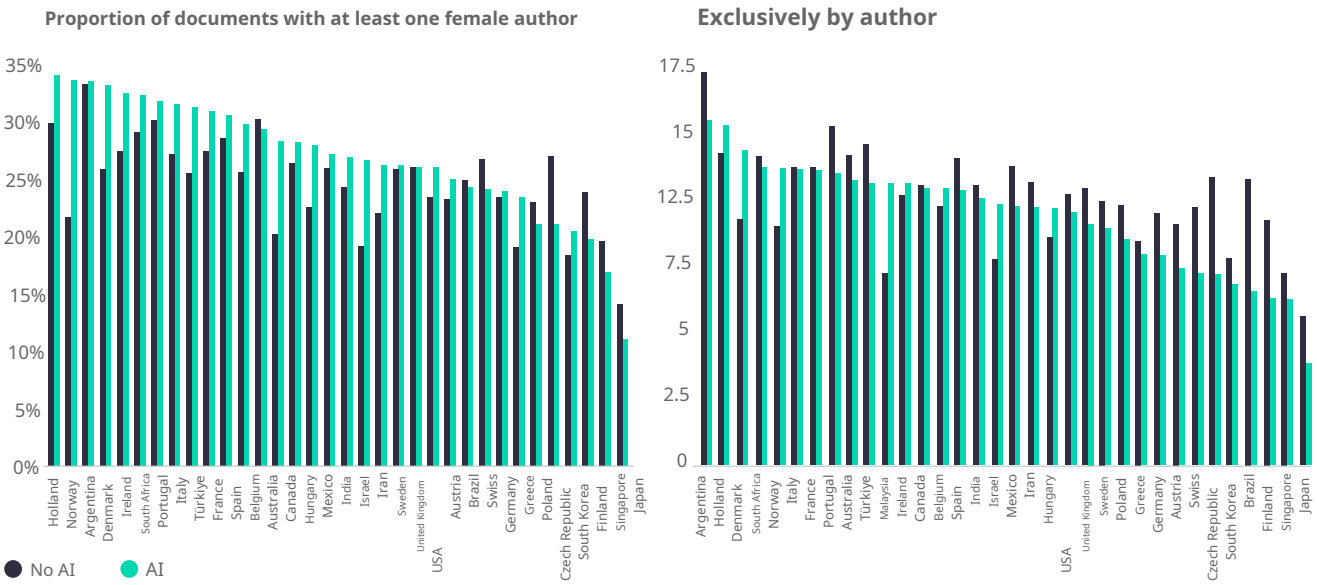


Source: Stanford University (2019).

It is important to highlight that there is a gender diversity gap in AI research, although this is not a specific challenge in LAC. A 2019 study of 11,000 publications presented at 21 international conferences found that only 18% of lead authors are women. Another study that analyzed arXiv (the most important open access repository of publications) found that, on average, in 34 countries only 25.4% of those dealing with AI have co-authorship by at least one woman (Figure 4). Among 34 countries considered in the region, only Argentina (with around 34%), Mexico (with around 27%) and Brazil (with around 26%) are classified among those where gender differences in participation in AI publications are less marked. Argentina ranks first in terms of the proportion of AI publications with a woman as sole author (15%).[14].

14 For more information, see https://media.nesta.org.uk/documents/Gender_Diversity_in_AI_Research.pdf

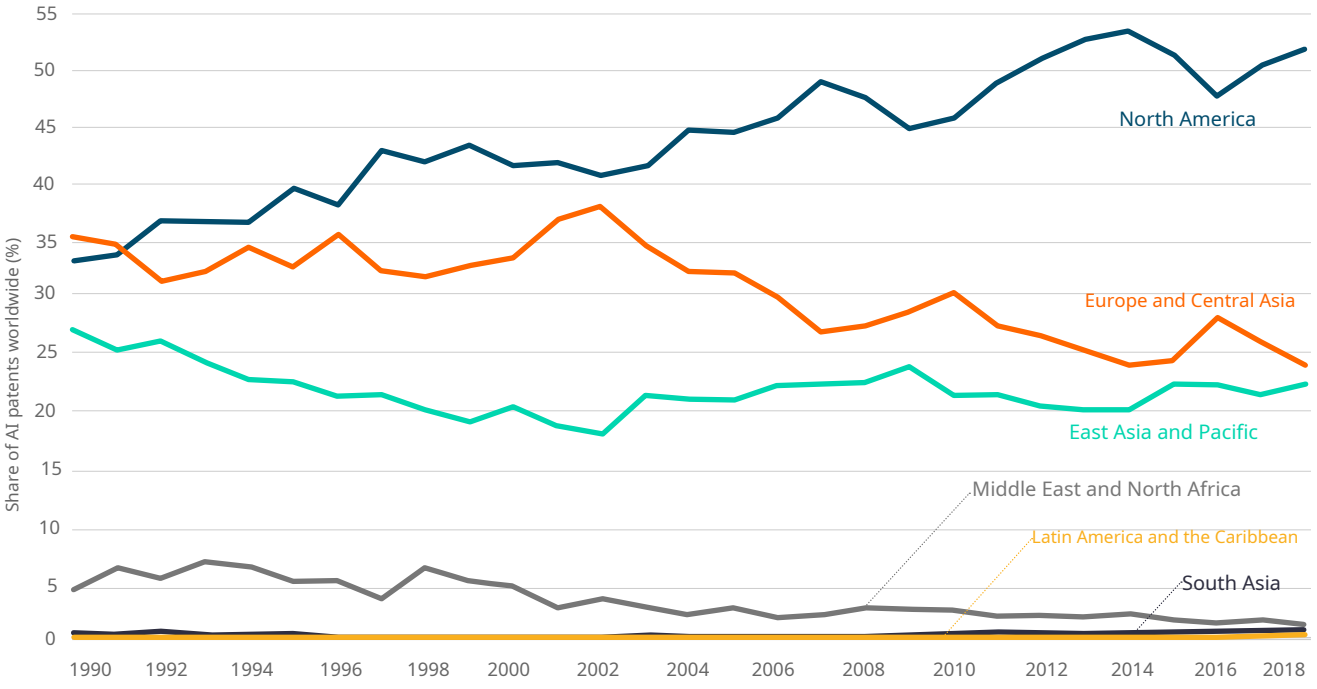
Figure 4. **Participation of women in authorship of AI studies**



Fountain: Nesta (2019).

In terms of AI patents, the LAC region is at the lowest levels compared to its peers: less than 1% (Figure 5):

Figure 5. **Global distribution of AI-related patents by region**



Fountain: AI Index Report (2019).

The above data reflect that LAC has a long way to go in terms of achieving greater development and impact of academia on AI issues. However, valuable efforts led by various institutions are being recorded to consolidate and increase the offer of academic programs specialized in these topics, hand in hand with other research and development initiatives that are positively impacting the AI ecosystem in their respective countries.

Table 3 summarises the information consulted on the best universities* at the bachelor's level by country, according to the QS World University Rankings (see Annex B) and, in some cases, according to alternative local sources. This table also considers the existence of programmes related to or specialising in artificial intelligence.[15], as well as AI research and laboratories. The Times of Higher Education (THE) ranking was also consulted, another of the most relevant university rankings in the international arena, whose analysis metrics are explained in Annex B. In those cases where there is no total or partial coincidence between the two rankings, the indications will be made in the section corresponding to "Academy" in the profile of each country.

Table 3.Advances in AI in academia

	Universities public	No centralized	Career AI related	Investigation about AI	Laboratory of AI
Argentina	1/5	0/5	5/5	5/5	2/5
Brazil	4/5	3/ 5	5/5	5/5	5/5
Chili	2/5	3/ 5	5/5	5/5	4/5
Colombia	2/5	4/5	4/5	4/5	3/ 5
Costa Rica	3/4	2/4	4/4	3/4	3/4
Ecuador	1/3	1/3	3/3	23	23
Mexico	2/5	2/5	5/5	4/5	3/5
Paraguay	1/3	1/3	3/3	1/3	1/3
Peru	1/3	0/3	23	23	1/3
Republic Dominican	1/3	1/3	3/3	1/3	1/3
Trinidad and Tobago	23	23	3/3	23	0/3
Uruguay	1/4	2/4	4/4	4/4	1/4

*Fountain:*Own elaboration.

* The top universities indicated by the QS Ranking (undergrad) were selected, which includes between 5 and 3 of the best universities for each country. The total number of universities included in the analysis is the sum of the total number of universities indicated by country.

15 STEM careers such as Data Engineering, Systems Engineering, Computer Science, Data Science and Data Analytics, to name a few.

It is worth mentioning that there are complementary academic efforts in each country that are strengthening AI research and development in general. These are documented throughout this publication.

Advances in the entrepreneurial ecosystem and the social sector

New players in the entrepreneurial ecosystem and the social sector have gradually joined the ranks, taking advantage of AI tools to achieve efficiencies and strengthen their impact on people's quality of life. A general look at the fastest-growing subsectors directly related to social impact, as well as trends in the type of AI applications used and examples of multi-country initiatives, provides an overview of regional progress.

Outstanding sectors in the use of AI for social good

The incorporation of autonomous systems in startups is becoming more and more feasible. Large technology companies such as Amazon, Apple, Google, IBM and Microsoft market their AI development platforms and tools; some of them are free or low-cost, and they join the growing list of open source tools and codes. Their availability, together with other factors such as access to capital, are driving the growth of the entrepreneurial ecosystem that benefits from technology. According to the Association for Private Capital Investment in Latin America (LAVCA), venture capital in LAC doubled in 2018, reaching USD 1.98 billion compared to USD 1.14 billion in 2017 (Crunchbase, 2019). This capital is mainly divided between Brazil (55.9%), Mexico (20.5%), Chile (10.6%), Argentina (4.1%) and Colombia (4.1%) (LAVCA, 2019).

In turn, 82% of venture investments made in 2017 were directed to the IT area. In 2019, the SoftBank Global Investment Group (SBG) created a USD 5 billion fund for technological innovation in the region.[16].

While the largest subsector in the use of AI in LAC is Services and *Software* Business[17], with 43% (Endeavor, 2018), there are four subsectors directly related to improving the quality of life that stand out for their growth rate: health, EdTech, Fintech and AgTech. Although AI is not the only technology that social and impact entrepreneurs leverage, it plays a central role in their innovation and growth strategies.

Health. Surpassed only by the Services and *Software* In the business sector, the health sector ranks second among those with the highest concentration of activity from companies with a high level of specialization in AI in Latin America (17%) (Endeavor, 2018).[18].

The amount of healthcare data is estimated to double every three years (Densen, 2011). This availability of information makes this sector fertile ground for the use of AI, with impacts on efficiency and healthcare, research and development, and also on related fields such as health insurance, which is growing at the fastest pace in the world: 30% each year projected until 2025 (FIME, 2019).[19].

EdTech. One of the three key trends at an international level is adaptive learning. This is based on the use of AI, cognitive science and predictive analysis, among other tools, to personalize educational content to suit students. In the case of LAC, Mexico is a country in which companies that take advantage of AI to offer these personalized learning services are consolidating.

17 See note 8.

18 The study "The Impact of AI on Entrepreneurship" was based on the analysis of 70 companies based in Argentina, Brazil, Chile, Colombia, Mexico and Peru that use AI in various economic sectors. For more information, see www.contenido.endeavor.org.mx/inteligenciaartificial

19 For more information, see www.elhospital.com/eventos/FIME-2019+128796

Of the 190 EdTech startups identified by Endeavor, 57% are located in Latin America and the Caribbean. Mexico is the country with the most EdTech entrepreneurs, with 13 cases, followed by Brazil with six and Colombia with five.[20](Endeavor Intelligence, 2018).

New formats of education and virtual education in AI topics are promoting social mobility. Platzi, a Colombian company, is a digital platform for technology courses in the Hispanic world and one of the main ones globally. On average, the income of its students once they finish one of its courses increases by 54%, while the best students increase their income by 260%. In 2018, the number of students registered in Platzi reached 700,000 (Platzi, 2019).

AgTech. In recent years, the region has seen notable growth in AgTech technological innovation in the agricultural and food sectors, a phenomenon that continues and expands in the region and in the different productive sectors (IDB, 2019).

In 2018, there were more than 450 startups in Latin America and the Caribbean focused on technological innovation in AgTech; more than half of these were created in the last four years (IDB, 2019).

There is a significant concentration in Brazil, which represents 51% of all identified ventures. It is followed by Argentina with 23%; the Andean region with 18%; Uruguay and Paraguay with 5%, and Central America and the Caribbean with 0.03% (IDB, 2019). Currently, 55% of those 450 ventures evaluated in the IDB study (2019) offer technological innovation solutions to the agricultural and food sectors, including the use of AI to achieve efficiencies.

FinTech. The Global FinTech Index City 2020[21]It establishes that Brazil (ranked 19 out of 65 countries), Mexico (ranked 30 out of 65 countries) and Chile (ranked 35 out of 65 countries) are the three regional leaders with the highest number of consolidated FinTechs, in the maturation phase or ready to scale their operations (Findexable, 2019).

FinTech is the second subsector, followed by logistics and distribution, that receives the most venture investment in LAC (LAVCA, 2019).

41% of startups in the FinTech sector believe that AI is the tool of the moment to help boost business and establish a fluid service-benefit relationship with the customer. This coincides with the significant importance that is being assigned to it in banking for financial inclusion (IA LATAM, 2019).

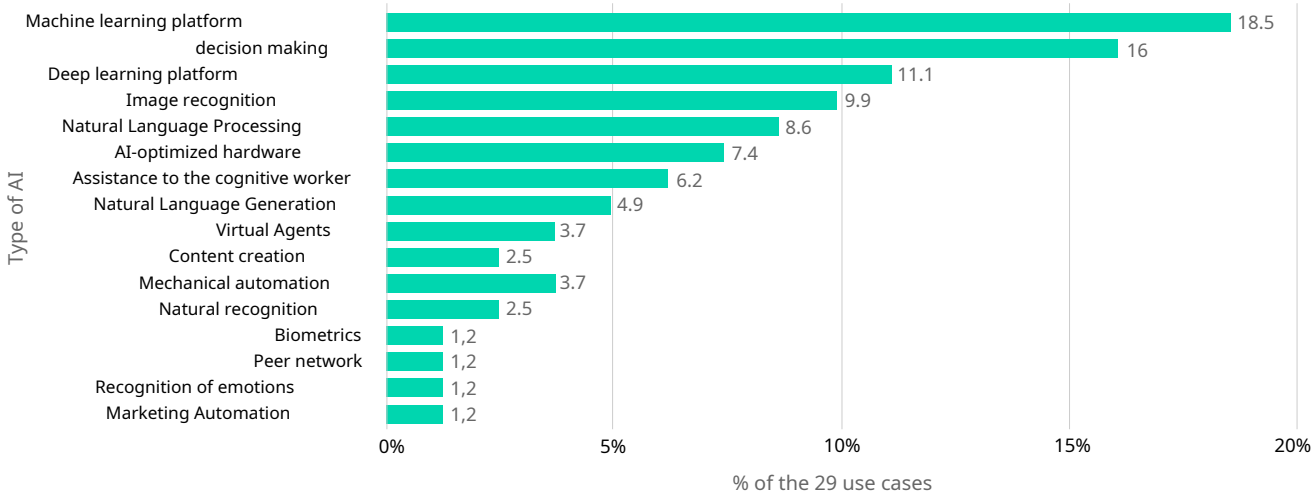
20 For more information, seehttps://contenido.endeavor.org.mx/download-edtech-eng

21 For more information, seehttps://findexable.com/gfi-download/

AI use cases for social good

Figure 6 shows the type of AI applications for social good used in the sample of 31 use cases (Appendix C).[22].

Figure 6.Type of AI applications used in the 31 use cases (%)



*Fountain:*Forms filled out by contacts for each use case. Indicators are based on Endeavor's regional survey (2020).

Relevant multi-country initiatives in LAC

Although efforts and spaces focused on AI for social good are still incipient in the region, there are some relevant multi-country initiatives that are summarized below.

Initiatives and other regional efforts

fAIr LAC. Led by the IDB Group[23], this initiative promotes the widespread use of responsible AI and in the service of social good by the public and private sectors in the region[24]It has headquarters in Costa Rica, Mexico and Uruguay.

IDRC(International Development Research Centre (IDRC). This Canadian institution has an initiative in development: AI for the Global South.[25]This focuses on issues of public interest, as well as infrastructure and skills to take advantage of this technology.

Networks and communities of professionals in the region. These include IA-Latam[26]and the Latam Circle of the AI Global Partnership for an Ethical Design of the IEEE (Institute of Electrical and Electronics Engineers)[27]Directed by C Minds[28].

Innovators Under 35 (MIT)[29]. This is a recognition program for outstanding entrepreneurs who are developing new technologies to address pressing problems. Winners include cases where AI is being leveraged as part of an operations model. Since 2017, 35 individuals from across the region have been recognized.

22 The 31 use cases are summarized in Annex C by country, topic and implementers.

23 For more information, seehttps://www.iadb.org/es/noticias/hojas-informativas/2004-01-08/grupo-bid%2C2572.html

24 This report is part of the initiative. For more information, seehttps://www.iadb.org/en/fairlac

25 For more information, seehttps://www.idrc.ca/en/research-in-action/artificial-intelligence-development

26 For more information, seewww.ia-latam.com

27 For more information, seewww.standards.ieee.org/industry-connections/ec/autonomous-systems.html

28 For more information, seewww.cminds.co

29 For more information, seehttps://www.innovatorsunder35.com/regions/latin-america/

Newton Fund. Under the auspices of the British Embassy, this fund supports AI and Internet of Things projects focused on diverse topics, mainly in Brazil, Colombia and Mexico. The global fund was allocated GBP $375 million for the first stage, which ends in 2020. In turn, the UK export agency has signed an agreement with the Development Bank of Latin America (CAF) for up to USD $200 million to support GovTech and digital economy projects in the region.

BigTech. Some of the technology giants have programs focused on AI for the social good. For example, under this category Google.org awarded 20 recognitions in its latest edition (2019) focused on AI challenges for the social good, two of them for LAC (Colombia and Brazil).[30]. Facebook, for its part, has programs to support entrepreneurs in Mexico and Colombia, and will be working on the development of experimental regulatory initiatives on issues of algorithmic transparency. Similarly, Microsoft's AI for the Planet, AI for Health, AI for Accessibility and AI for Humanitarian Aid programs fund projects that leverage AI on these issues.[31]They currently support a total of 21 initiatives in nine countries in the region (Argentina, Bolivia, Brazil, Chile, Colombia, Mexico, Nicaragua, Peru and Trinidad and Tobago) in the areas of agriculture (seven projects), biodiversity (six), climate change (six) and water (two).

Civil society initiatives. Through the Brazilian digital rights effort of Coding Rights, we seek to mainstream the gender and human rights perspective in the development, regulation and use of new technologies such as AI. It supports a series of projects and researchers in Mexico, Argentina, Brazil, Chile and Colombia. Likewise, the global initiative AI for Climate (of Mexican origin) seeks to accelerate the use of AI for conservation issues and neutralize the CO_2 emissions produced by the AI industry.[32].

Initiatives for talent development. Data Science For All (DS4A)[33]is a 10-week training program in data science and AI launched in March 2020 and coordinated by SoftBank and the company Correlation One, with the collaboration of Harvard University, IDB Lab and Microsoft. The trainings will be held in Bogotá, Buenos Aires, Mexico City and São Paulo.

Mexican startup Dev.f[34]is training talent in 10 LAC countries. At the time of this publication, it had more than 3,500 graduates. EdTech platforms such as Coursera and Platzi (a Colombian company) offer specialized AI courses online for the region. As of March 2020, 193 people had been certified in Platzi's AI course.

Laboratory[35]Laboratoria is a Peruvian startup dedicated to training and specializing women in web development and UX design, and in socio-emotional skills. For almost six years, and with more than 1,300 graduates in Mexico, Ecuador, Peru, Chile and Brazil, Laboratoria contributes to reducing gender gaps in technology.

Saturdays.AI is a non-profit organization that aims to democratize access to knowledge about AI in order to apply it to projects or emerging companies that solve a social problem. The network extends to more than 20 cities in countries such as Ecuador, Colombia, Argentina, Peru, Chile, Bolivia and Paraguay.

30 For more information, see https://ai.google/social-good/impact-challenge

31 For more information, see https://www.microsoft.com/en-us/ai/ai-for-good

32 For more information, see https://forclimate.ai

33 For more information, see https://www.correlation-one.com/ds4a-latam

34 For more information, see https://www.devf.la/

35 For more information, see https://www.laboratoria.la/

Events

The Latin America SumMIT (MIT, 2020) included a thematic panel on the use of AI to meet the SDGs. Meanwhile, the World Summit AI Americas (Montreal 2019, 2020), whose attendees come mainly from Canada and the United States, opened its second edition (2020) to participants from LAC. This event includes panels on climate change, inclusion and ethics. Khipu Latin American Meeting in AI, an annual event whose 2019 edition took place in Uruguay, seeks to support AI talent and companies.

Ethics of AI

Mitigating the ethical risks of AI has become one of the most relevant topics of international discussion. International organizations such as the IDB, the World Economic Forum (WEF), the IEEE, the OECD, the United Nations Educational, Scientific and Cultural Organization(UNESCO) and the European Union (EU), together with academic institutions such as the Institute for Ethics in AI at the University of Oxford, are working on the formulation of guidelines, guides and tools for countries to promote the development of autonomous systems focused on human rights. By the end of 2019, there were more than 90 documents on AI principles published by governments, companies and other actors for this purpose. The most frequently mentioned topics in them have been fairness, interpretability and explainability (Stanford University, 2019).

Among the proposals for ethical principles that have had the most echo among governments are those presented in 2019 by the OECD[36]and by the EU High Level Expert Group on AI. The OECD principles promote safe, fair, trustworthy and robust autonomous systems. They were formally adopted by 42 countries, including seven in LAC: Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico and Peru. On the other hand, the Ethics Guidelines for Trustworthy Artificial Intelligence[37]The recommendations of the European Union were developed by an independent group of 52 experts from academia, civil society and industry. Although these recommendations were designed for the institutions of the European Union (EU), they have served as a reference for other interested countries and industries.

There are other relevant international efforts aimed at developing AI ethics protocols and guidelines for the public and private sectors. These include a series of recommendations that will be published by the UNESCO Expert Group on AI Ethics in 2020. The international group is made up of 24 members, four of whom are from LAC: two from Argentina, one from Brazil and one from Mexico.[38]. In turn, the IEEE has forged a Global Alliance for the Ethical Design of Autonomous and Intelligent Systems, which develops, among other things, standards for the ethical use of AI in various fields of activity.[39]. This has a circle focused on LAC, coordinated by the organization C Minds. For its part, the IDB, under its fAIr LAC initiative, has a group of regional experts dedicated to developing various tools for the responsible use of AI.

Within the framework of this report, the topics included in the definition of AI ethics relate to the responsible use of data to ensure that autonomous and intelligent systems are focused, from their very design, on respect for and protection of human rights. The topics addressed are mainly justice and non-discrimination, privacy, accountability, transparency, explainability and security. This includes both solving the risks intrinsic to data and the technical risks of development and infrastructure, as well as having a public policy for digital transformation and capacity building (Cabrol et al., 2020).

LAC is still at an early stage in developing guidelines, protocols, assessments, regulatory frameworks and social oversight processes on AI ethics issues. Brazil, Argentina, Mexico and Uruguay are

36 For more information, seehttps://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0449

37 For more information, seehttps://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai

38 For more information, seehttps://unesdoc.unesco.org/ark:/48223/pf0000372991

39 For more information, seehttps://standards.ieee.org/industry-connections/ec/autonomous-systems.html

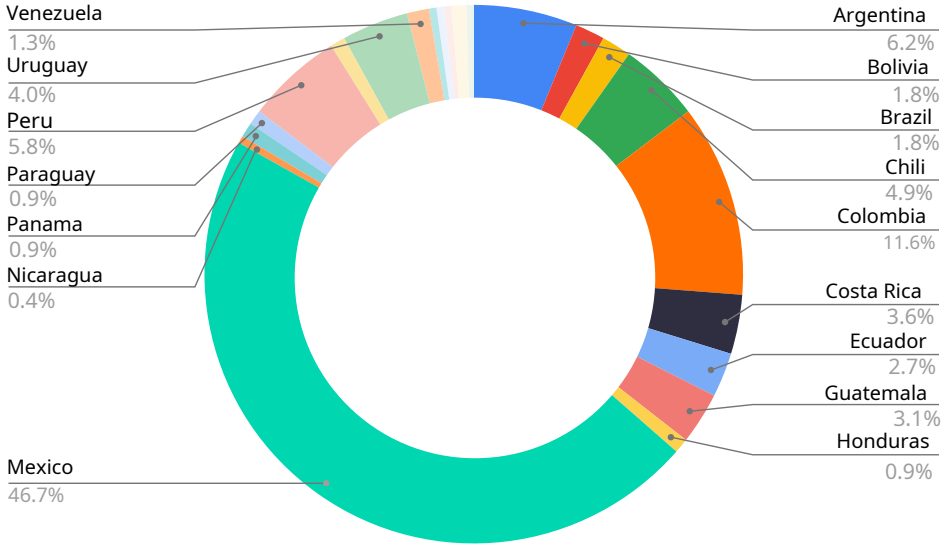
four of the countries that have made the greatest progress in discussions from the public sector. For its part, Uruguay is the country that has made the greatest number of formal advances in the matter. At the time of preparing this publication, Uruguay had concluded its public consultation regarding its AI strategies, within which it has raised the ethical dimensions. The published document will be a living material under constant review, both based on the observations received during the consultation and the results/lessons obtained from the activities defined in the action plan. For its part, the Mexican government (2012-2018) published the principles and guidelines for the ethical use of AI by the Federal Public Administration (APF), a pioneering effort at the international and regional level. However, the current APF (2018-2024) is in arrears to resume the effort. For its part, Argentina created the National Committee on Ethics in Science and Technology (CECTE) in the Ministry of Science, Technology and Productive Innovation (Ministerio de Ciencia, Tecnología e Innovación Productiva) in early 2020 as part of its digital strategy. Brazil included a cross-cutting axis of legislation, regulation and ethical use in the first draft of its national AI strategy in 2019, which has not yet been formally published.

The topic of AI ethics is in its infancy in the region and there is still not enough information on the subject. Given the need to advance in the understanding of different perspectives on the matter, the IDB Group and C Minds, with the support of several allies, launched the first open regional survey on AI for social good. This has allowed us to understand and document the perception of 225 participants. Its main findings are listed below:

- He**58%**From the sample, it is perceived that civil society organizations and others dedicated to generating social impact are considering very little, or hardly at all, the use of AI to meet their goals.
- He**62%**thinks that the topic of AI ethics is absent from public debate or features little.
- The private sector is perceived to be having greater influence on issues related to AI ethics (**40%**), followed by the academic sector (**29%**).
- The AI ethics issues that are being addressed the most are user privacy and security, with a**56%**, followed by system reliability and security, with**37%**.
- More from**70%**of participants do not know an example of an implemented use case of AI for social good in LAC.

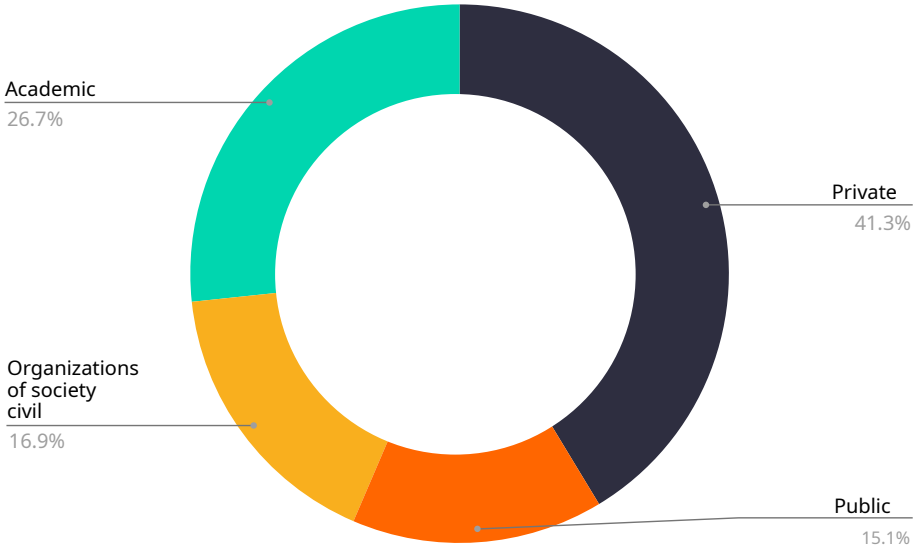
Figure 7.First perception survey on the importance given to the ethics of artificial intelligence in Latin America and the Caribbean

Survey participants shared
your perspective on the following countries

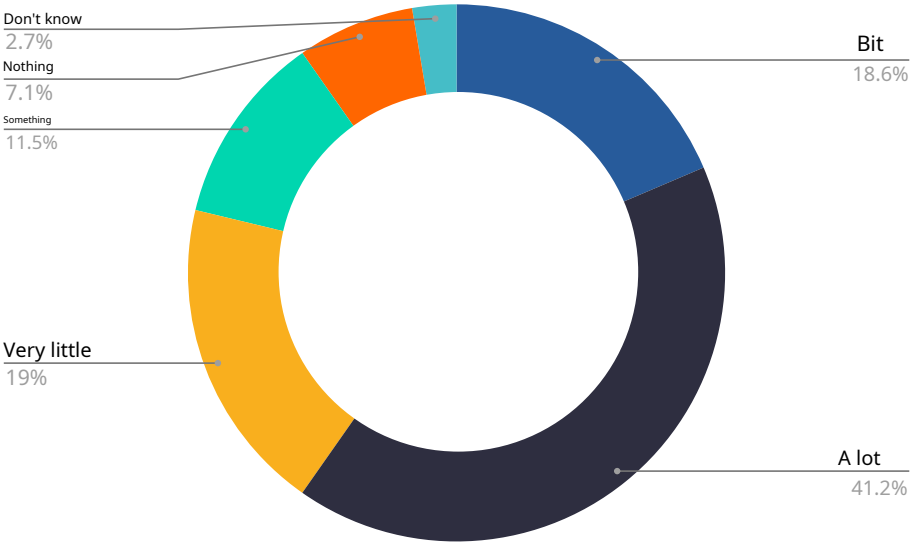


Barbados:0.4% | Dominican Republic:0.4% | Trinidad and Tobago:0.9%

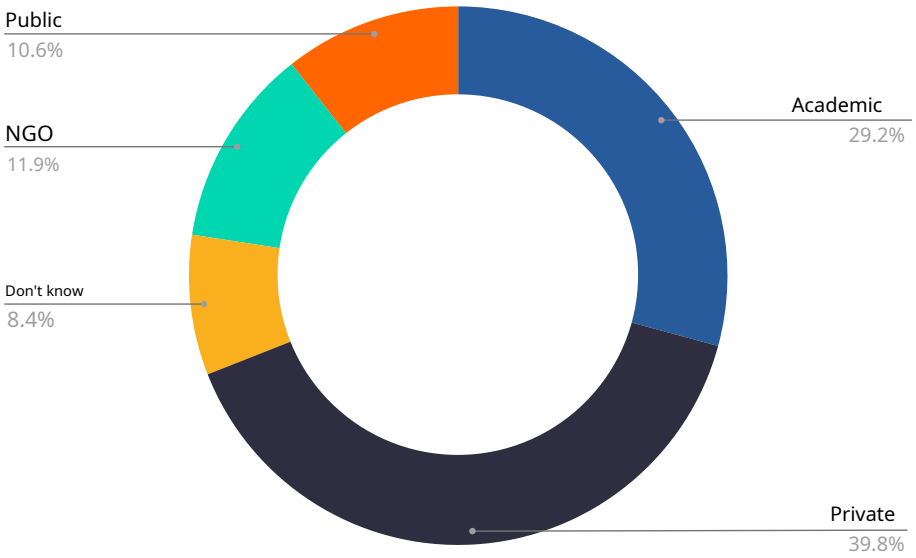
Representation by sector



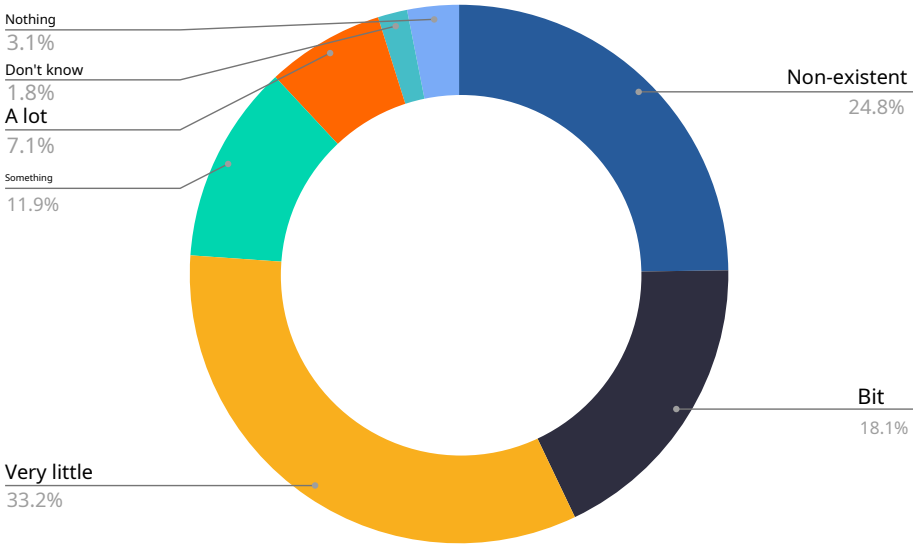
What level of importance do you think the ethics of Artificial Intelligence (AI) has in conversations and agendas
of the sector technological in your country?



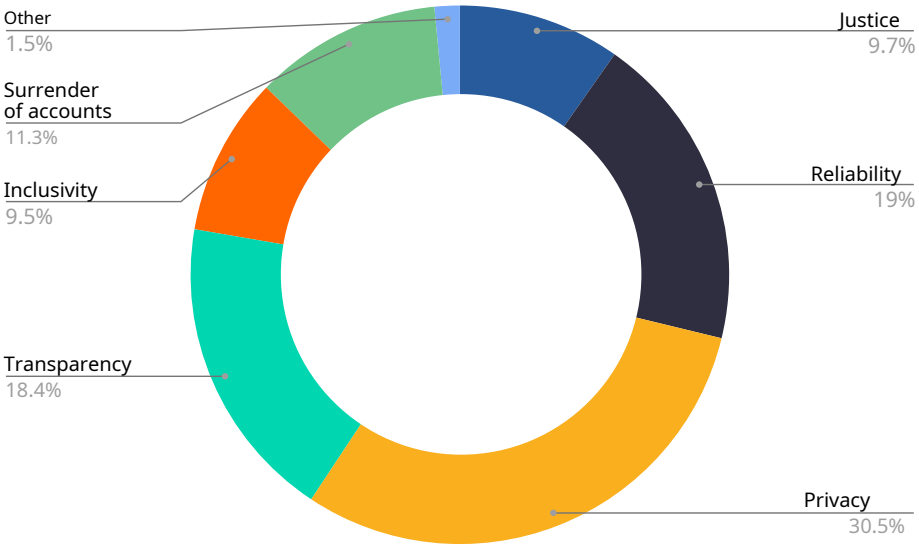
What sector do you consider that is having greater influence on issues related to the ethics of AI?



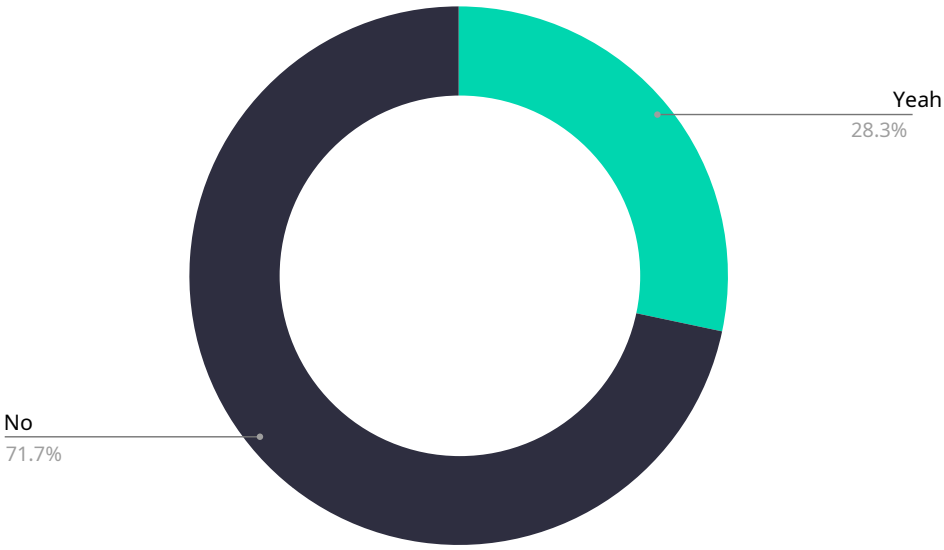
To what extent do you perceive that the topic of AI ethics is included in public speeches, debates, articles, news and statements by politicians in your country?



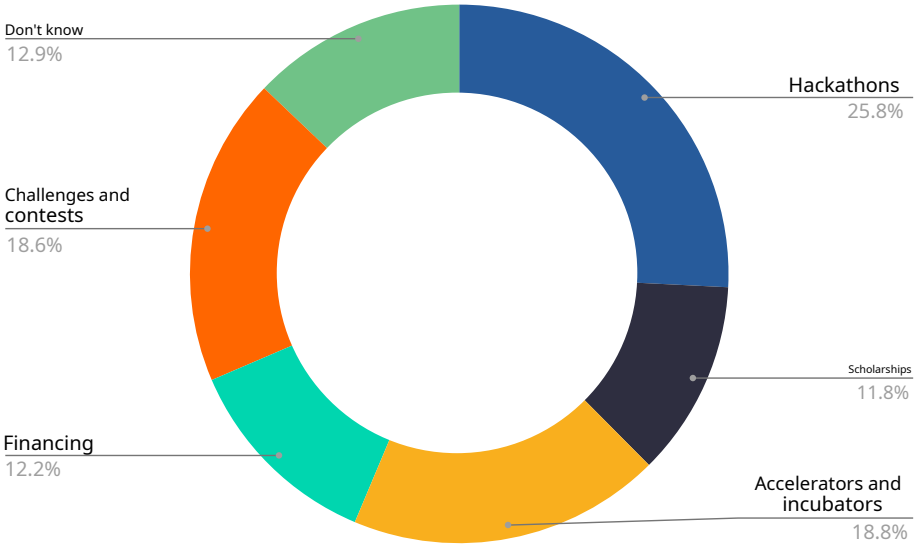
Which ones do you consider? are the AI ethics issues that are being addressed the most in your country?



Do you know any use cases already implemented? that leverages AI for social good in LAC?



Do you know if any of the following incentives exist in your country to promote impact entrepreneurship (social or environmental) that uses AI?



Fountain: Survey "Perception of the importance given to the ethics of artificial intelligence in Latin America and the Caribbean" (2020).

5. STATE OF AI

BY COUNTRY

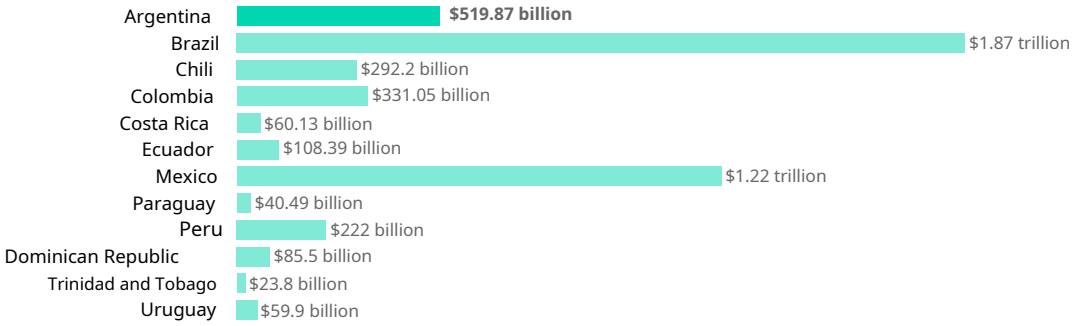
5. STATE OF AI BY COUNTRY

ARGENTINA

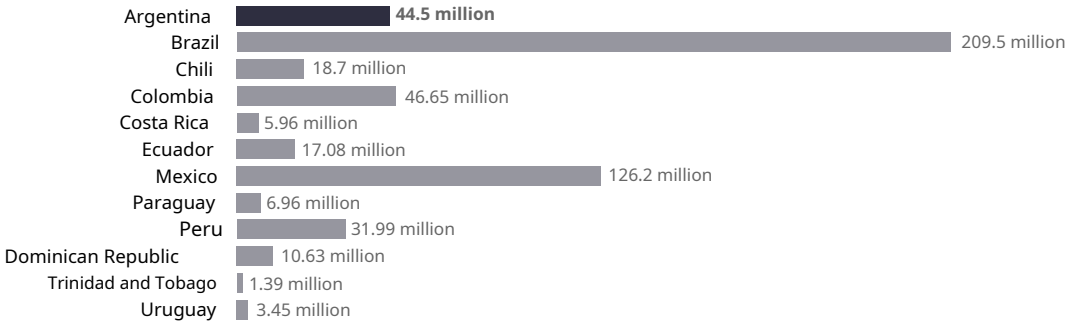
As a context to describe the current state of AI in Argentina, Figure 7 presents a comparison of some economic, demographic, education, human development and equality indicators.

Figure 7. Basic indicators of Argentina: comparative

Size of the economy (USD)



Population



Human Development Indicators

	PISA*	Fitness in English	Labour qualified	Index of development human	Coefficient of GINI
Argentina	**N/A**	**58.38%**	**63.4%**	**0.825**	**41.2**
Brazil	N/A	50.1%	62%	0.759	53.12
Chili	1 (1 was)	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3 (1 was)	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Dominican Republic	N/A	52.3%	50.2%	0.736	45.7
Trinidad and Tobago	N/A	N/d	71.8%	0.784	40.3
Uruguay	2 (do)	54.1%	25.5%	0.804	30.5

* Position among the countries evaluated

Sources: Top panels: World Bank (2019).
Human Development Indicators (from left to right): OECD (2019); English Skills (nd); UN (2019); UNDP (2018); World Bank (2018).

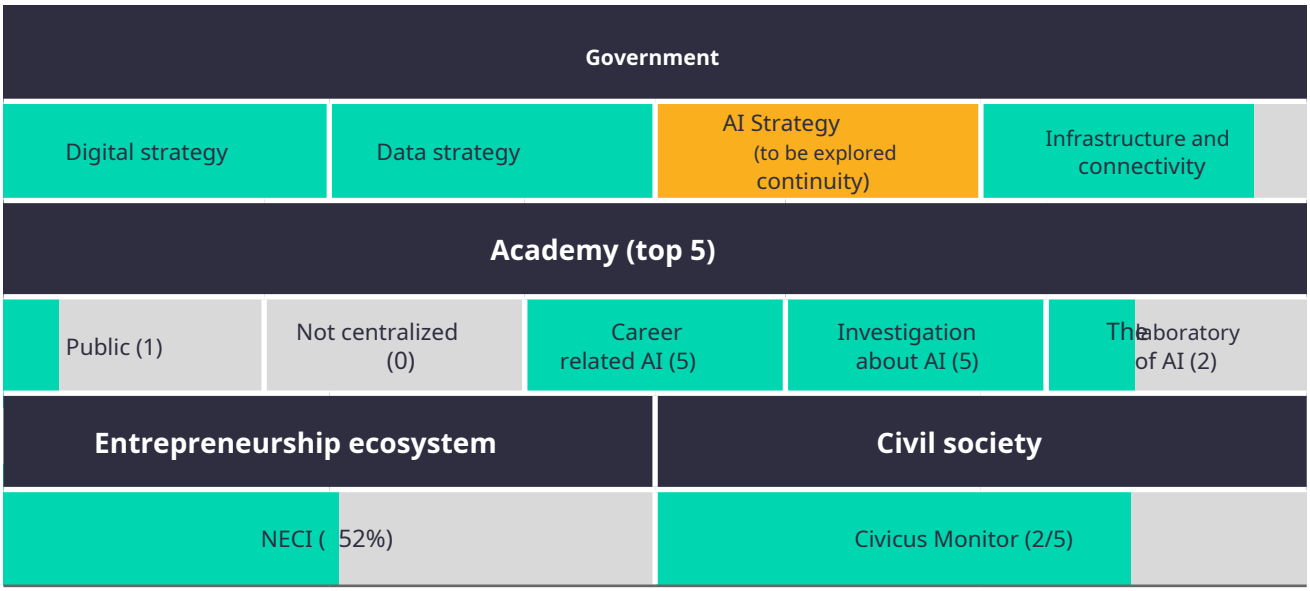
Table 4.Other socioeconomic indicators

Main economic sector (World Bank, 2019)	**PISA** (OECD, 2019)	**Gender index in science, technology, engineering and mathematics (STEM)** (Arredondo et al., 2019)
Agricultural production	Below the average of the 12 countries	53%*
NEI** (GEM, 2019)	**Civicus Monitor** (Civicus Monitor, 2020)	
5.2/10	Conditions for action of civil society organisations: reduced (2/5)***	

*Fountain:*Own elaboration.
* Participation of women researchers in STEM fields in Argentina (versus men).
* * National Entrepreneurship Context Index (NECI).
* * * The explanation of the indicator can be found in Annex B.

Table 5 summarizes the progress made by various sectors in Argentina in establishing the foundations for promoting AI for the social good.

Table 5.Efforts to lay the foundations for AI in Argentina, by sector



*Fountain:*Prepared by the authors. The indicators are in Annex B.

Government

Digital strategy: Yes

Issued in November 2018, the Argentine Digital Agenda is the culmination of national and international efforts initiated more than a decade ago. Defined by the Planning and Monitoring Council (a plural group made up of different government institutions and led by the Secretariat of Modernization), the agenda focuses on economic and social development, and includes legal, infrastructure and public policy projects to coordinate official initiatives related to the use of new technologies, digital inclusion and the configuration of an efficient and citizen-centered government, according to the Official Gazette of the Republic of Argentina.[40] It also seeks to promote Argentina's international prominence in the digital transformation process.

40 For more information, see https://www.boletinoficial.gob.ar/detalleAviso/primera/195154/20181105

As a central part of the digital strategy, the Ministry of Science, Technology and Productive Innovation (MINCyT) created the National Committee on Ethics in Science and Technology (CECTE)[41]. This is where ethical problems surrounding the use of new technologies are analyzed, and where proposed laws and public policies related to new technological developments are monitored.[42].

It is worth noting that at the end of 2019, the Argentine Senate created the Future Commission, which includes legislators, rectors of the most important universities, and representatives of the Academy of Science and technological institutions and centers. At the first official meeting, a cooperation plan was formulated to advance in matters related to science and to develop public development policies, including the topic of the future of work.

Data Strategy/Open Data Portal: Yes

The World Bank gives Argentina's statistical capacity a score of 78.88/100, which measures the country's ability to collect, analyze and disseminate high-quality data on its population and economy (World Bank, 2019).[43]As part of the digital strategy, the development of the National Executive Branch's Data Opening Plan was contemplated, which, among other actions, made its Open Data Portal available to citizens.[44].

At the time of this publication, the portal had 941 databases from more than 30 public organizations covering issues of government, foreign affairs, economy, science, technology, agribusiness, energy, population and education, among many others, according to the same plan.

AI Strategy: Ongoing

The National AI Plan, which is part of the Argentina Innovadora 2030 Plan and the Digital Agenda 2030, was circulated on the last day of the presidential mandate of Mauricio Macri's government (December 2015-2019). This document was the result of a development process lasting more than a year, and of consultations with different actors in thematic roundtables and meetings (Unconference on Artificial Intelligence, 2019). One of its main objectives is to build capacity so that Argentina assumes a leading role in technology to promote local development, instead of simply being a consumer of external technologies and advances. In addition, the plan lays the foundations for the new government to take up the issue in a documented manner around identified strategic axes and lines of action focused on the following dimensions: talent; data; supercomputing infrastructure, R&D&i (Innovation, Development and innovation); implementation in the public and private sectors; impact on work; ethics and regulation; international links, and innovation laboratory. At the beginning of 2020, the new administration of the National Executive Branch granted this plan the status of “reference document”. According to local experts, it is possible that the initiative will not be affected by the transition of government and that it will focus on promoting small and medium-sized businesses, since being an inter-institutional and diverse project, numerous actors support it and could follow up on it.

41 For more information, seehttp://www.cecte.gov.ar/

42 The most important activity of this committee is to promote dialogue and bring society and the scientific community together through links that generate have confidence in the transmission of fair and ethical results from the use of technologies.

43 This score is largely due to the fact that, in 2016, the Argentine government enacted the State Modernization Plan, which proposes move towards a modern and efficient public administration at the service of citizens and with trained technical teams that provide solutions within a framework of ethics, transparency, accountability and gender perspective.

44 One of the outstanding qualities of the portal is that it ensures the standardization of information, facilitating the way in which transactions are carried out. queries, even integrating different systems and applications. As indicated on the portal itself, the objective is for citizens to be able to build a community that takes advantage of information and generates value with it. For more information, seehttps://datos.gob.ar/

Infrastructure and connectivity

The country has a digital infrastructure that enables innovation in the use and consumption of technologies. The World Bank's Digital Adoption Index (2019) considers that Argentina has reached 69% of a total technological adoption level; more than 74% of its population has access to the internet, the download speed is higher than the world average and there are 1.3 mobile phone subscriptions per inhabitant (World Bank, 2019). Regarding the development of 5G, Argentina began technical tests since November 2017 (GSMA, 2019), although due to the magnitude of the legal and infrastructure adjustments, the commercial use of this technology is only expected to materialize in 2021 or 2022.

Despite its strengths, according toheAccording to the World Economic Forum's Network Readiness Index (NRI), Argentina ranks ninth in the region and 89th out of 139 countries in the world in terms of its readiness to take advantage of the opportunities offered by Information and Communication Technologies (ICT) (WEF, 2017). Among the indicators that affect its position are the low effectiveness of its legislative bodies, the high cost of mobile telephony, the moderate success of the government in promoting ICT and the low government adoption of advanced technologies (WEF, 2017).

According to the GSMA Intelligence Consumer Survey (GSMA, 2016), income inequality is a barrier to digital inclusion in Argentina. Nearly 30% of people surveyed without an internet connection consider that the price of equipment and services represents a barrier to their adoption. Likewise, according to the IDB Broadband Accessibility Index (which measures the percentage of income that a basic broadband connection represents for the 40% of the population with the lowest income), citizens in the LAC region allocate 10% of their monthly income to fixed or mobile broadband, while in OECD countries the figures are 2% (mobile broadband) and 3% (fixed broadband) (IDB, 2020).

In terms of cybersecurity, the International Telecommunication Union (ITU) gives Argentina a score of 0.407 out of 1, placing it 11th out of 33 in the Americas region and 94th out of 175 in the world.

Academy

Argentina is one of the LAC countries whose basic education curricula include specific objectives or subjects on basic computer skills (GSMA, 2016). This allows young people to acquire from an early age the minimum skills and understanding of the potential of using technology.

Although AI is a topic present in university programs, there is little transversality outside the areas of engineering. Business and economics degrees constitute an area of opportunity for the study and use of AI.

According to the QS World University Rankings (2019), the five best universities in Argentina are located in the capital and only one of them is public (Table 6).[45]While this represents an obstacle to the scope of capacity building and accessibility to AI-related careers, there are also quality, free institutions in other regions of the country that offer relevant programs for the development of the ecosystem. At such universities, there are not only AI-related curricula, but also research to develop capabilities and train talent in the country.

45 In addition to the Argentine universities that occupy the top five positions in the QS World University Ranking (2019) and that have programs In addition to the bachelor's degree programs in technology and AI, there are at least five other training centers with relevant offerings at the undergraduate level, and especially at the postgraduate level, as recorded in the Times of Higher Education ranking (2020): the National University of the South (public), the National Technological University (public), the University of San Andrés (private), the Torcuato di Tella University (private) and the Buenos Aires Institute of Technology (private). Several of them develop lines of research on the subject and have both AI and technological innovation laboratories. Although most are concentrated in Buenos Aires, the National University of the South is in Bahía Blanca and the National Technological University has 30 locations throughout the country.

Table 6.The five best universities in Argentina and their relationship with AI*

University	# 1. University from Buenos Aires	# 2. University Southern	# 3. Pontifical University Catholic Argentina (UCA)	# 4. University from Belgrano	# 5. University from Palermo (UP)
Type of institution	Public	Private	Private	Private	Private
Location	Buenos Aires	Buenos Aires	Buenos Aires	Buenos Aires	Buenos Aires
Racing related with AI	✓	✓	✓	✓	✓
Postgraduate studies related with AI	✓	✓	✓	✗	✓
Investigation about AI	✓	✓	✓	✓	✓
Laboratory of AI	✓	✓	✗	✗	✗
Laboratory of innovation technological	✓	✓	✓	✓	✗

*Fountain:*Prepared by the authors. Information obtained from the website of each institution.

* Universidad Austral also appears among the top five in the Times Higher Education ranking (2020).

Other relevant institutions

In Argentina, other relevant institutions also operate in this field: (i) the National Institute of Agricultural Technology (INTA)[46], an educational center with international coverage that focuses on technological innovation in the agricultural sector; (ii) the National Scientific and Technical Research Council (CONICET), the country's main organization dedicated to promoting science and technology with researchers in different branches of AI; and (iii) the National Agency for the Promotion of Research, Technological Development and Innovation, which connects researchers, projects and funds dedicated to these topics. The last two organizations depend on the Ministry of Science, Technology and Innovation.

Also noteworthy is the effort of the Center for Studies in Technology and Society (CeTyS) of the University of San Andrés, through which the preparation of a series of documents within the framework of the GuIA Project (seven publications) is being facilitated for the Spanish-speaking public. These allow for the consolidation of a base dedicated to the reflection and implementation of principles and instruments for AI and digitalization policies.[47]The authors participating in this exercise come from Argentina, Colombia, Chile, Mexico, Uruguay, and Trinidad and Tobago.

Finally, the Artificial Intelligence, Philosophy and Technology Research Group (GIFT) brings together academics from various disciplines whose contributions contribute to a better understanding of the ethical problems that arise around exponential technologies such as AI.[48].

46 For more information, seehttps://inta.gob.ar/documentos/argentina-national-institute-of-agricultural-technology-inta

47 They focus on challenges and opportunities from an ethical, legal, political and socioeconomic perspective in the context of Latin America. See more information at:https://guia.ai/

48 Within the framework of the CETyS Guia Project, this group participated with the research "Humanistic Tool Box." It presents a series of of philosophical reflections aimed at clarifying the nature of AI and its relationship with human intelligence, as well as a review of recent literature on the main ethical risks associated with this technology.

Efforts from the entrepreneurial ecosystem and civil society

Argentina is one of the countries with the most startups dedicated to AI (Costa, 2019). Since the creation of the Entrepreneurship Law, efforts have focused on using AI technologies, including machine learning and deep learning.

Examples of impact startups leveraging AI include Bandit[49], dedicated to the area of human resources. It has designed a tool that empowers and strengthens recruitment processes by establishing the best skills of workers and the needs of companies. Other emerging companies have emerged from there, including EmiLabs[50], a recruiting platform that recently raised USD $2 million (Lopez, 2019).

In the social sector, initiatives have emerged that are laying the groundwork for fostering an ecosystem that leverages AI for social good. Below are some of these efforts:

- **Argentine Foundation for Artificial Intelligence**[51]**:**It is a non-profit organization that promotes the development of a sustainable AI ecosystem to generate impact in Argentina and the world. The foundation encourages dialogue on the topic, as well as the dissemination, promotion and linking of AI topics and projects.
- **Argentine Society of Informatics (SADIO)**[52]**:**Created in 1960, SADIO aims to identify, unify and expand knowledge of the sciences and techniques of information processing, as well as the practice of objective and quantitative methods for decision-making. It also offers numerous courses and workshops that mainly focus on data analysis through machine learning, AI applications and development of programming skills, among others.
- **Checked:**[53]It is considered a reliable organisation when it comes to fact-checking. Together with Africa Check, Full Fact and the UK's Open Data Institute, it received funding from Google to use AI to detect disinformation campaigns and fake news.

Use cases

Below is a summary table of the main AI use cases in Argentina.

Table 7.Main AI use cases in Argentina

Name: Amanda Care		
For more information: www.amanda-care.com	*Year they started using AI:* 2019	*SDG:*3 (health and well-being) 
*Actors involved:*insurers, hospitals and pharmaceutical corporations		*Current status:*early stage startup
*What is proposed:*Optimize monitoring and follow-up practices between medical staff and patients.		

49 For more information, seehttps://bandit.io/

50 For more information, seehttps://www.emilabs.ai/

51 For more information, seehttps://iaar.site/

52 For more information, seehttp://www.sadio.org.ar

53 For more information, seehttps://chequeado.com/acerca-de-chequeado/

Brief description of the project: Amanda Care is a virtual assistant designed to monitor large numbers of patients to prevent health issues. Like a personal assistant, Amanda ensures that patients are connected to doctors using messaging tools already adopted by users such as WhatsApp and Facebook Messenger, among others. Amanda improves patient stay and protocol compliance, while reducing healthcare costs.	
Applications of AI	Natural language generation, natural recognition, virtual agents, machine learning, *hardware* optimized with AI, decision making and natural language processing.
How they use AI	He *software* Amanda Care uses machine learning to handle a natural conversation with the user and identify the best contact strategy (Facebook, WhatsApp, etc.) based on their preferences. By reviewing those conversations, Amanda follows each entry in context, identifies any deviation from protocol, and triggers alerts to service providers.

Fountain: Information provided by the IDB for the purposes of this report (2020).

Name: DYMAXION LABS

For more information: www.dymaxionlabs.com	*Year they started using AI:* 2018	*SDG:* 1 (no poverty), 2 (zero hunger), 11 (sustainable cities and communities), 13 (climate action), 16 (peace, justice and strong institutions) and 17 (partnerships to achieve the goals) 
Actors involved: Dymaxion Labs		*Current status:* emerging company in the consolidation stage.
What is proposed: Optimize resource allocation through evidence-based decision making.		
Brief description of the project: It structures, collects and analyses satellite geographic data to support decision-making on resource use, for which it intelligently installs Internet of Things (IoT) sensors. It also shortens project development times to incorporate irregular settlements into urban planning. It allows for rapid and economical experimentation and validation of hypotheses.		
Applications of AI	Machine learning platforms, *hardware* AI-optimized, decision making, image recognition	
How they use AI	Dymaxion uses AI and computer vision to analyze geospatial data in satellite images. Depending on the image, it stores them in different databases to understand how climate change is evolving or what variables are relevant to the topic.	

Fountain: Information provided by Dymaxion Labs for the purposes of this report (2020).

Name: Kilimo		
For more information: https://www.kilimo.com.ar/	*Year they started using AI:*2015	*SDG:*2 (zero hunger), 6 (clean water and sanitation), 12 (responsible production and consumption) and 13 (climate action) 
*Actors involved:*Kilimo		*Current status:*company in scaling stage
*What is proposed:*Since agriculture consumes 70% of the world's freshwater, Kilimo seeks to optimize its use to avoid waste.		
*Brief description of the project:*Kilimo helps agricultural producers optimize water use through customized irrigation programs, which in turn reduces costs. Kilimo manages to reduce water use in crops by up to 40%. In 2019 alone, 15 billion liters of water were saved on 50 thousand hectares. It currently has operations in Argentina, Chile, Uruguay, Paraguay, Peru, Brazil and the United States (Kilimo is a private company incorporated in the United States with two subsidiaries, one in Argentina and one in Chile).		
Applications of AI	Machine learning platforms, data science and satellite image identification.	
How they use AI	Based on field data, satellite images and large historical databases, the machine learning model can estimate crop water consumption over seven days and provide periodic advice on the amount of irrigation.	

*Fountain:*Information provided by Kilimo for the purposes of this report (2020).

Name: Laura		
*For more information:*nd	*Year they started using AI:* 2019	*SDG:*16 (peace, justice and strong institutions) 
*Actors involved:*Ministry of Finance of the Province of Cordoba		*Current status:*Government project in initial stage
*What is proposed:*Bridging the gap between citizens and government to create faster and more efficient processes that foster good democratic practices.		
*Brief description of the project:*Laura is a*software*This allows you to automate tasks in bureaucratic procedures, managing them in a more efficient and agile way. One of these tasks is the verification of retirement contributions in Anses (Federal Administration), a procedure that an employee must carry out to begin managing the provincial retirement.		
Applications of AI	Process automation	
How they use AI	*The software*connects to the Anses database to check the pension situation of a potential beneficiary, verifying key information such as years of contributions and salaries. In this way, Laura establishes whether a national or provincial benefit is applicable and determines the retirement pension. It also allows for faster detection of possible incompatibilities.	

*Fountain:*Information provided by the Ministry of Finance of the Province of Córdoba for the purposes of this report (2020).

Name: Promethea		
For more information: https://ialab.com.ar/	*Year they started using AI:* 2017	*SDG:* 8 (work and economic growth), 9 (industry, innovation and infrastructure), 11 (sustainable cities and communities) and 16 (peace, justice and strong institutions) 
Actors involved: Faculty of Law of the University of Buenos Aires, Public Prosecutor's Office of the Autonomous City of Buenos Aires		*Current status:* Government project in initial stage
What is proposed: Strengthen citizens' rights, particularly with regard to gender-based violence.		
Brief description of the project: Prometea is part of the IALAB of the Government of Argentina and makes it possible to speed up and make more efficient the process of reporting gender violence by automating certain steps of the administrative procedure through an online platform.		
Applications of AI	Natural language generation, natural recognition, virtual agents, robotic process automation, natural language processing, image recognition.	
How they use AI	Prometea uses machine learning techniques; it operates as an expert system to automate document creation, perform intelligent searches, and assist in data control. It also has an intuitive and user-friendly interface that allows you to “talk” to the system or chat.	

Conclusions

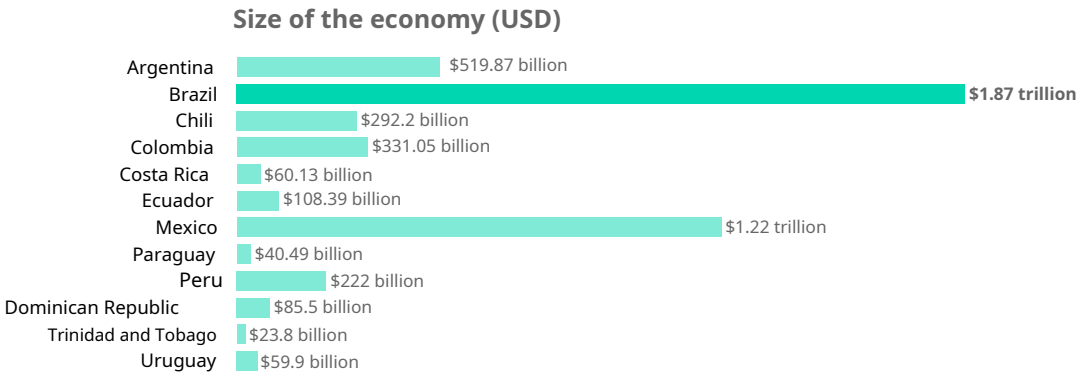
Argentina is a pioneering country in the adoption of AI in LAC. Its AI strategy – still to be consolidated – will be an instrument that contributes to strengthening the AI ecosystem in the country. Likewise, the Commission for the Future is promoting the continuity of tools and the digital strategy.

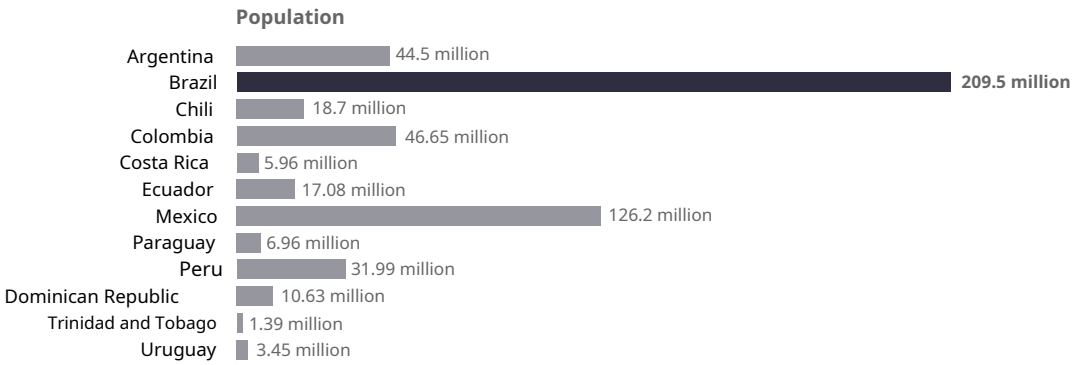
Argentina is a country with a significant history of AI research, both by its main universities and by external research centers. The latter have gained prominence and at least three of them (INTA, CONICET and the National Agency for the Promotion of Research) are dedicated to promoting the development and implementation of AI. The participation of these institutions is an element that distinguishes Argentina from other countries in the region. In the private sector, the entrepreneurship ecosystem has the largest number of start-ups dedicated to AI, thanks to legal support and the participation of angel investors and capital funds. For its part, civil society has already made some specialized efforts in promoting AI and exhibits AI use cases for social good that are at different stages of maturity.

BRAZIL

As a context to describe the current state of AI in Brazil, Figure 8 presents a comparison of some economic, demographic, education, human development and equality indicators.

Figure 8.Basic indicators of Brazil: comparative





Human Development Indicators

	PISA*	Fitness in English	Labour qualified	Index of development human	Coefficient of GINI
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	**N/A**	**50.1%**	**62%**	**0.759**	**53.12**
Chili	1 (1 was)	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3 (1 was)	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Dominican Republic	N/A	52.3%	50.2%	0.736	45.7
Trinidad and Tobago	N/A	N/d	71.8%	0.784	40.3
Uruguay	2 (do)	54.1%	25.5%	0.804	30.5

* Position among the countries evaluated

*Sources:*Top panels: World Bank (2019).
Human Development Indicators (from left to right): OECD (2019); English Skills (nd); UN (2019); UNDP (2018); World Bank (2018).

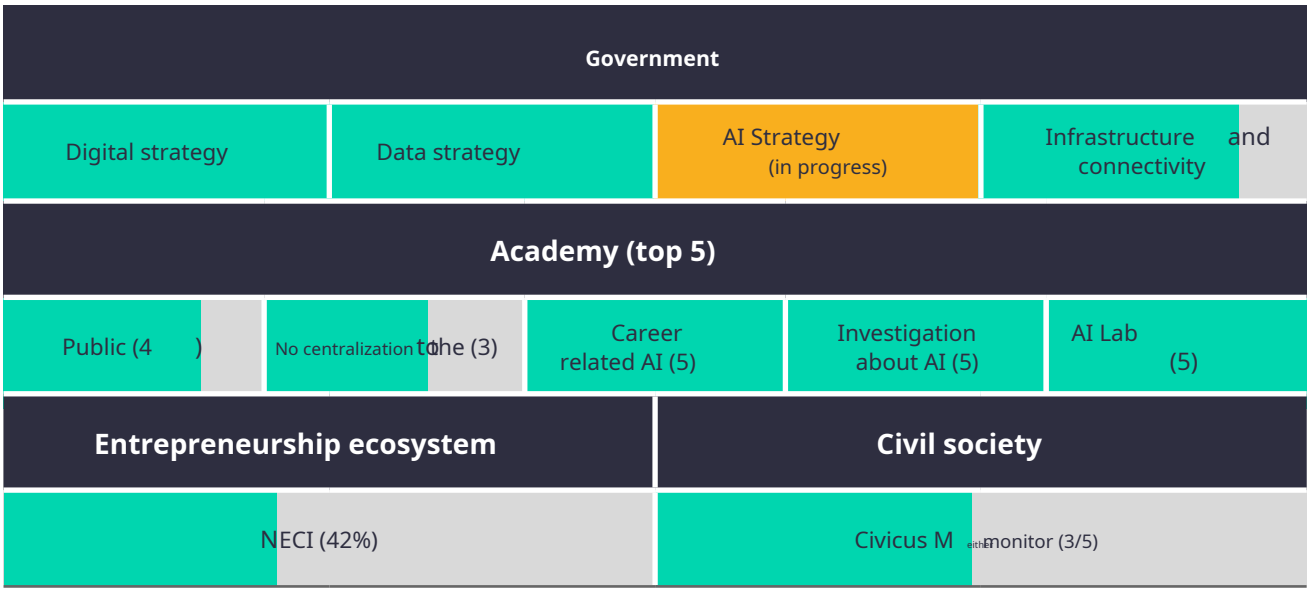
Table 8.Other socioeconomic indicators

Main economic sector (World Bank, 2019)	**PISA** (OECD, 2019)	**Gender index in science, technology, engineering and mathematics (STEM)** (Arrendondo et al., 2019)
Services	Above the average of the 12 countries	29%*
NEI** (GEM, 2019)	**Civicus Monitor** (Civicus Monitor, 2020)	
4.2/10	Conditions for the action of civil society organisations: obstructed (3/5)***	

*Fountain:*Own elaboration.
* STEM degree gap (female graduates from STEM fields in proportion to male graduates), 2016.
* * National Entrepreneurship Context Index (NECI).
* * * The explanation of the indicator can be found in Annex B.

Table 9 summarizes the progress made by various sectors in Brazil in laying the foundations for promoting AI for the social good.

Table 9.Efforts to establish the foundations of AI in Brazil, by sector



*Fountain:*Prepared by the authors. The indicators are in Annex B.

Government

Digital strategy: Yes

The Digital Transformation Strategy (2018-2021) is the result of the efforts of the Interministerial Working Group (GTI), a team of more than 130 experts, and an online public consultation that included the contributions of more than 700 participants from all sectors: government, production, science, academia and civil society.

The strategy is composed of five enabling axes and thematic lines related to digital transformation. The enabling axes are: (i) infrastructure and access to ICT; (ii) research, development and innovation; (iii) building trust in the digital environment; (iv) education and professional skills; and (v) international dimension.

The thematic lines of digital transformation cover topics such as industry, agriculture, digitalization of services and new business models, among others. The responsibility of the Brazilian government to provide a comprehensive framework that contemplates the Sustainable Development Goals (SDG) is also recognized.[54].

Data Strategy/Open Data Portal: Yes

The Brazilian Open Data Portal[55]It allows information to be consulted from the different Public Administration bodies and was contemplated as part of the actions of the Law on Access to Public Information of 2011.[56].

The portal establishes a publication calendar or Open Data Plan that commits each agency to sharing data in certain periods. It also has a mechanism to report if any of them has failed to publish information in a timely manner. At the time of this publication, the portal had information from 157 agencies and 7,098 data sets.[57].

AI Strategy: Ongoing

In May 2019, the federal government, together with the Brazilian Competitive Movement, held the AI in Digital Transformation Seminar (O*Seminar on Artificial Intelligence in Digital Transformation*), which brought together authorities, academics and developers. The objective was to highlight the importance of the government formulating a specific strategy on AI - and not as a complement to the Digital Transformation Strategy 2018-2021 - and also to draw attention to the opportunities it offers, its challenges and its dilemmas.[58].

On the other hand, the Brazilian Ministry of Communications (MCTIC), together with the Steering Committee for the Internet in Brazil (CGI), has proposed creating up to eight Applied Research Centers (CPA) in AI[59]Four of these CPAs will be launched in 2020, laying the foundation for a government-driven AI ecosystem. A variety of activities will be conducted within the CPAs, including applied scientific, technological and innovation research aimed at solving social and environmental problems using AI as the primary tool.

The MCTIC also opened a public consultation on a draft National AI Strategy in the country, which remained open until the end of January 2020.[60]The strategy has two types of axes:**vertical** (research, development, innovation and entrepreneurship; application in the public sector; application in productive sectors; public safety) and**transversal**(legislation, regulation and ethical use; international aspects; and AI governance)[61].

54 To monitor compliance with the objectives of this strategy, four indicators were defined: for infrastructure, the Infrastructure Development Index; the International Telecommunication Union (ITU) Information and Communications Technology Index; for cybersecurity, the ITU Global Cybersecurity Index; for e-commerce, the United Nations Conference on Trade and Development (UNCTAD) Business-to-Consumer Digital Trade Index; and for e-government, the United Nations Digital Government Development Index.

55 For more information, seewww.dados.gov.br/

56 It emerged from a collaborative process with open resources in which experts and interested citizens participated. This effort won the from the federal government's 2015 Best Practices Competition.

57 The portal makes available to users different free educational resources to teach them how to use the platform, the data and the best practices in managing large databases.

58 This seminar highlighted the importance of supporting universities and research centres to promote advances in this technology. Dialogue was also encouraged on the ethical implications of AI, including issues of transparency and privacy, among others.

59 For more information, seehttps://www.mctic.gov.br/mctic/opencms/textogeral/Os-Centros-de-Pesquisa-Aplicada-CPA-em-Inteligencia-Artificial-ia.html

60 For more information, see:http://www.mctic.gov.br/mctic/opencms/salaImprensa/noticias/arquivos/2019/12/MCTIC_lanca_consulta_publica_para_a_Estrategia_Brasileira_de_Inteligencia_Artificial.html

61 For more information, seehttps://www.mctic.gov.br/mctic/opencms/textogeral/Os-Centros-de-Pesquisa-Aplicada-CPA-em-Inteligencia-Artificial-IA.html

Infrastructure and connectivity

The World Bank's 2016 Digital Adoption Index ranked Brazil 43 out of 180 (fourth among the twelve countries included here). However, according to the World Economic Forum's Network Readiness Index (NRI) (WEF, 2016), Brazil ranks 72 out of 129 (sixth among the twelve countries included here) in terms of its capabilities to leverage ICTs. While the costs of adoption and use of these technologies at the individual and business sector levels were considered affordable, the ICT promotion agenda was not judged to be sufficiently robust.

By 2017, the percentage of the population with internet access in Brazil reached 68%, which places the country close to the LAC average (UNESCO, 2019). According to the diagnosis presented in the Brazilian Digital Transformation Strategy, based on data from the National Telecommunications Agency (Anatel), it is considered that one of the factors that has facilitated the increase in internet access in recent years is the concentration of 86% of the population in urban areas (Brazilian Digital Transformation Strategy, 2018).

Strengthening infrastructure and access to ICT is the first thematic axis included in the Brazilian Digital Transformation Strategy. This is a relevant aspect for the country, given its large territorial extension and the need to expand the internet network. One of the main obstacles to achieving affordability is the taxes that consumers pay for mobile services, which represent more than 30% of their total cost.

One of the determining factors for continuing the digital transformation in Brazil is access to broadband. During the last Mobile World Congress (MWC, 2019), Brazil announced that it will hold a spectrum auction for 5G in March 2020 (Jaimovich, 2019).

In terms of cybersecurity, the International Telecommunication Union (ITU) Global Cybersecurity Index 2018 gives Brazil a score of 0.577 out of 1, placing it sixth out of 33 in the Americas region and 70th out of 175 in the world.

Academy

Brazil has renowned regional educational and research centers, which have promoted the development and innovation of topics related to AI.

In terms of accessibility, Brazil's outlook for talent development at the undergraduate level is promising: the five universities ranked highest by the QS World University Rankings (2019) are public and have campuses in various parts of the country (Table 10). Furthermore, all offer relevant undergraduate and graduate degrees, lead related research, and have AI centers.

The country has other universities that offer AI programs, including the Federal University of Minas Gerais (UFMG). This has been an important ally in the development of AI at the national level and has contributed to relevant projects.[62]. For its part, the Federal University of Santa Catarina (UFSC)[63]has a leading AI research laboratory.

62 Among these projects is Kunumi, an AI solutions company that seeks to promote the emergence of an AI ecosystem in Brazil, which includes training professionals, fostering entrepreneurship and promoting interaction between academia and business. Another success story is that of XQuad, a group of electrical engineering graduate students from UFMG who were finalists in the international AlphaPilot competition. This was a race in which autonomous drones had to overcome obstacles in the shortest time possible.

63 For more information, see https://en.ufsc.br/

Table 10.The five best universities in Brazil and their relationship with AI*

University	# 1 University of Sao Paulo	# 2 University State of Campinas	# 3 University Federal River of January	# 4 University Federal of Sao Paulo	# 5 University State Paulista
Type of institution	Public	Private	Public	Public	Public
Location	8 locations in the state of São Paulo Paulo**	3 locations in São Paulo Paulo	4 locations in the state of Rio of January	6 locations, all in the state from Sao Paulo	A total of 22 distributed headquarters- you in differ- you have points of the country
Racing related with AI	✓	✓	✓	✓	✓
Postgraduate studies related with AI	✓	✓	✓	✓	✓
Investigation about AI	✓	✓	✓	✓	✓
Laboratory of AI	✓	✓	✓	✓	✓
Laboratory of innovation technological	✓	✓	✓	✓	✓

*Fountain:*Prepared by the authors. Information obtained from the website of each institution.

* The Universidade de São Paulo, the Universidade Estadual de Campinas and the Universidade Federal de São Paulo also appear in the Times Higher Education ranking (2020).

* * Bauru, Lorena, Piracicaba, Pirassununga, Ribeirão Preto, São Carlos, Santos and São Paulo.

Other relevant institutions

The Brazilian academy has also forged alliances with different sectors to form specialized centers such as the*Advanced Institute for Artificial Intelligence*(AI2), which focuses primarily on solving social problems. Other academic spaces for AI for social good include, for example, LabBCI and LabAssistiva at the Federal University of Rio de Janeiro, where technologies for people with disabilities are researched and developed.

There are also research centers in the country such as the Institute for Technological Research (IP-T),[64]a non-university academic institution supported by the São Paulo Secretariat of Economy. IPT provides innovation, R&D and methodological support services, and offers courses and classes.

The relevance and capacity of Brazil's AI sector has also been recognized by key players such as IBM, which, as part of its AI Horizons Network initiative[65], will open its first AI research center in Latin America at the University of São Paulo (USP) (AI Horizons Network, 2019). This research center will be the largest in Brazil and will be funded in a tripartite manner by IBM, USP and the state government through its*Fundação de Amparo à Pesquisa do Estado de São Paulo*(FAPESP). It will focus primarily on agribusiness, health and financial services.

Finally, it is worth highlighting educational initiatives such as Mundo Senai[66], an online course platform for three million students with more than 23 study centers in cities across Brazil, and which includes subjects such as AI and data science in its curriculum. These courses are taught in collaboration with Microsoft.

64 For more information, seehttps://www.ipt.br/en/institutional

65 For more information, seehttps://www.research.ibm.com/artificial-intelligence/horizons-network/#partnerships

66 For more information, seehttps://www.mundosenai.com.br/

Efforts from the entrepreneurial ecosystem and civil society

Taking the International Monetary Fund's (IMF) 2014 Nominal Domestic Product (NDP) as a reference, Brazil is the richest country in Latin America, as well as being the regional leader in innovation capacity.[67]Entrepreneurship is driven primarily by the large size of its market, but lack of coordination between public policy and the private sector inhibits further growth (Schwab, 2019).

In Brazil, there is an ecosystem of startups that use AI in different ways to advance the fulfillment of the different SDGs. Among them, Nubank stands out.[68](the largest online bank outside Asia), which focuses on financial inclusion and has more than 10 million customers to date. Other examples of various types include Guiabolso[69], a mobile app that uses AI to organize users' personal finances to help them save and make better financial decisions[70].

The use of new technologies in the agricultural sector is also very important in the country. For example, Solinftec[71]is a company dedicated to optimizing agricultural processes through data inputs collected from computers installed in machines and weather stations, among others, to issue recommendations that improve the quality of solutions for small and medium-sized agricultural enterprises (SMEs).

For its part, the social sector has managed to advance discussions on respect for human rights in digital environments. There are organizations such as Coding Rights[72]and Olabi[73]who are working on AI ethics and inclusion issues. Coding Rights is dedicated to defending human rights in the development, regulation and use of new technologies through research, advocacy, development of technological tools, and capacity building in digital security and technopolitics. For its part, Olabi works towards a more socially just world through the use of technology. Among its projects is the Levantamento do Pretalab initiative, which seeks to raise awareness about algorithmic biases and their potential to reinforce discrimination, focusing in particular on Afro-Brazilian women (Brasil de Fato, 2019).

The work of the*Brazilian AI Association*[74](ABRIA) has also had a positive impact in the country. ABRIA emerged in 2017 when 16 AI companies joined forces to accelerate and adopt AI platforms with the potential to improve the productivity of the Brazilian economy. Its goal is to increase the exchange of information between national and international actors; highlight the social benefits of an economy that leverages AI; foster a healthy environment for the development of start-ups; serve as an interlocutor between the public and private sectors; promote innovation and train a qualified workforce.

Other efforts include those of the non-profit organization ITS Rio[75], which is dedicated to promoting spaces for dialogue around AI ethics. In 2018, ITS held the Global AI and Inclusion Forum in Rio de Janeiro as part of the Global Network of Internet & Society Centers (NoC) events.[76].

67 Lugones, Gutti and Le Clech (2007). Seehttps://repositorio.cepal.org/bitstream/handle/11362/5014/1/S0700876_es.pdf

68 For more information, seehttps://nubank.com.br/en

69 For more information, seehttps://www.guiabolso.com.br/

70 This application not only keeps track of purchases and sales, but also allows you to include loans, mortgages and the percentage of rates dynamics so that the user can have greater control over the use of their monetary resources.

71 For more information, seehttps://solinftec.com/

72 For more information, seehttps://www.codingrights.org/

73 For more information, seehttps://www.olabi.org.br/

74 For more information, seehttp://abria.com.br/

75 For more information, seehttps://itsrio.org/en/en-home/

76 For more information, seehttps://itsrio.org/en/search-en/?title=artificial+intelligence

Use cases

Below is a summary table of the main AI use cases in Brazil.

Table 11. Main AI use cases in Brazil

Name: LAURA		
For more information: https://www.laura-br.com/	*Year they started using AI:* 2016	*SDG:* 3 (health and well-being) 
Actors involved: LAURA's partners		*Current status:* Non-profit organization in the scaling stage
What is proposed: Reduce preventable deaths from sepsis, which is currently the leading cause of death in Intensive Care Units (ICU) and one of the main causes of late hospital mortality. The disease is estimated to kill around 230,000 Brazilians each year.		
Brief description of the project: By means of early intervention through a health monitoring platform through which 200,000 patients' cases pass monthly, we seek to reduce these unnecessary deaths. The platform identifies patients in clinical deterioration and notifies the care team in real time, analyzing electronic medical care records. LAURA has already benefited 2.5 million patients and reduced overall mortality by 25%, saving 12 lives a day.		
Applications of AI	Machine learning, decision making, deep learning, natural language processing.	
How they use AI	LAURA analyzes patients' electronic healthcare records and, based on historical data, identifies those at highest risk for sepsis.	

Fountain: Information provided by LAURA for the purposes of this report (2020).

Name: Livox		
For more information: https://www.livox.com.br	*Year they started using AI:* 2019	*SDG:* 10 (reduction of inequalities), 4 (quality education)  
Actors involved: Worcester Polytechnic Institute, Federal Rural University of Pernambuco (UFRPE), Livox International LLC		*Current status:* early stage startup
What is proposed: Include people with disabilities.		
Brief description of the project: Livox is an alternative communication app that enables people with non-verbal disabilities and learning disabilities to communicate and express their feelings and desires up to 20 times faster than with regular AAC (augmentative and alternative communication) devices.		
Applications of AI	Natural language generation, virtual agents, machine learning and natural language processing.	
How they use AI	Livox makes communication easier by allowing people with cognitive disabilities to select and point to images. Livox provides a variety of food and activity icons to use at different times of the day. It uses machine learning and neural networks to predict how likely certain interactions are to be used. It can also simply "talk" to the person with a disability. Livox recognises the conversation and uses natural language processing to generate possible interactions.	

Fountain: Information provided by Livox for the purposes of this report (2020).

Name: Telemedicine Portal		
For more information: https://portaltelemedicina.com.br/en/telediagnostic-platform	*Year they started using AI:* 2016	*SDG:* 3 (health and well-being), 4 (quality education), 9 (industry, innovation and infrastructure), 10 (reducing inequalities), 11 (sustainable cities and communities), 16 (peace, justice and strong institutions), 17 (partnerships to achieve the goals) 
Actors involved: Google (California and Brazil), São Paulo State Health Secretariat (SESSP), São Paulo State Research Support Foundation (FAPESP)		*Current status:* startup in scaling stage
What is proposed: Facilitate rapid and affordable access to quality health services.		
Brief description of the project: Telemedicine is a platform that allows clinics to expand their diagnostic offering quickly and at low cost. Clinics upload the necessary data to the platform so that medical teams at large healthcare institutions can perform diagnoses for those clinics. To this end, the Telediagnosis platform integrates directly with medical devices, as well as national electronic health record (EHR), radiology and laboratory systems, automatically capturing and transferring data through the cloud, where physicians can diagnose in a secure web application.		
Applications of AI	Machine learning, *hardware* optimized with AI, deep learning, natural language processing, cybersecurity, regulatory compliance, image recognition, marketing automation, and unsupervised machine learning techniques for fraud and anomaly detection.	
How they use AI	Machine learning algorithms predict medical diagnoses, which are used to prioritize care in an emergency. Finally, the doctor's interface has predefined diagnostic labels that act as decision trees. This allows doctors to issue 10 times more diagnoses per hour, based on the examinations.	
Fountain: Information provided by the Telemedicine Portal for the purposes of this report (2020).		

Name: R1T1		
For more information: www.projectcompany.org	*Year they started using AI:* 2013	*SDG:* 2 (zero hunger), 3 (health and well-being), 10 (reducing inequalities), 17 (partnerships to achieve the goals) 
Actors involved: Roche; Microsoft; Intel; MI; University of Victoria; State University of Maringá; Harvard University; University of California, Berkeley; Stanford University; Unicamp Sobrati Intensive Care and HUM, Regional University Hospital of Maringá, R1T1		*Current status:* company in consolidation stage
What is proposed: Unify all areas of a hospital through a single robot to reduce the costs of administrative processes and increase efficiency.		

Brief description of the project: R1T1 is a robot for a wide range of applications in the healthcare sector that connects all areas of a hospital. It is able to identify a person's health status without touching them, and the same applies to their mood. It also assists doctors and auxiliary hospital staff. It can be controlled locally or remotely with just an internet connection.	
Applications of AI	*Hardware* optimized with AI, decision making, natural language generation, virtual agents, biometric techniques, robotic process automation, natural language processing, image recognition, cognitive worker assistance and content creation, among others.
How they use AI	They do this through business inputs, data engineering, data science, packaging, refining the pipeline systems, improving the mathematical model, and monitoring. Machine learning pipelines (*AI pipelines*) allow optimal connection between patient needs and the availability of resources and staff.

Fountain: Information from R1T1 for the purposes of this report (2020).

Name: Traive		
For more information: www.traivefinance.com	*Year in which They started to use AI:* 2017	*SDG:* 1 (no poverty), 2 (zero hunger), 3 (good health and well-being), 4 (quality education), 7 (affordable and clean energy), 8 (decent work and economic growth), 9 (industry, innovation and infrastructure), 10 (reduced inequalities), 11 (sustainable cities and communities), 12 (responsible production and consumption), 15 (life on land), 17 (partnerships for the goals)
Actors involved: Traive		*Current status:* early stage startup
What is proposed: Addressing the lack of access to loans and mortgages for micro, small and medium-sized enterprises in the agricultural sector, especially farms. There are approximately 500 million small and medium-sized farms in the world whose agricultural production represents 75% of the world's total food, despite which they only receive 25% of agricultural loans.		
Brief description of the project: Traive solves the problem of agricultural loans through an alternative credit system based on a mix of data from various sources with which the mortgage performance of the applicant is projected in real time; this in turn allows farmers to improve their strategy during the growing season. The mobile application allows them to request loans quickly and easily based on personalized recommendations. It is expected that by the end of 2020 Traive will have supported 2,500 small and medium-sized agricultural operations.		
Applications of AI	Machine learning platforms, *hardware* optimized with AI, decision making, natural language processing, peer-to-peer networking.	
How they use AI	Traive's machine learning model uses data from agronomic, satellite and climatic variables, together with historical data, to optimally measure the risk of any farm, regardless of its size.	

Fountain: Information provided by Traive for the purposes of this report (2020).

Conclusions

With the largest population and GDP in Latin America, Brazil is currently developing its AI strategy. In addition to excelling in digitalization, the government has incorporated cybersecurity strategies, ICT infrastructure, digital content regulations, and security tools for online commerce into its operations. All of this has opened a wide market for new technologies, including AI. For more than five years, Brazil has worked on consolidating good practices in data cleaning, quality, and openness, all of which are vital for the development and adoption of AI. These efforts have resulted in laying the foundations for the future of AI in the public sphere in Brazil.

Regarding AI in academia, it is worth noting that the top five universities are public and that all of them have research and laboratories for both AI and technological innovation. There are also independent technology centers that support the AI research ecosystem in the country.

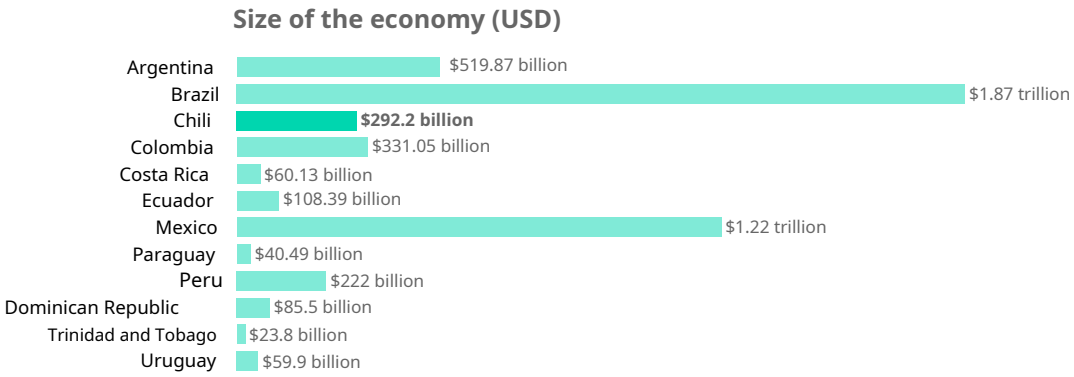
The Brazilian government offers incentives in the form of calls for proposals and prizes to motivate the sector, while access to venture capital is increasing. In this scenario, AI-driven startups are beginning to emerge, especially in the FinTech and AgroTech sectors, which are becoming increasingly important in the international market.

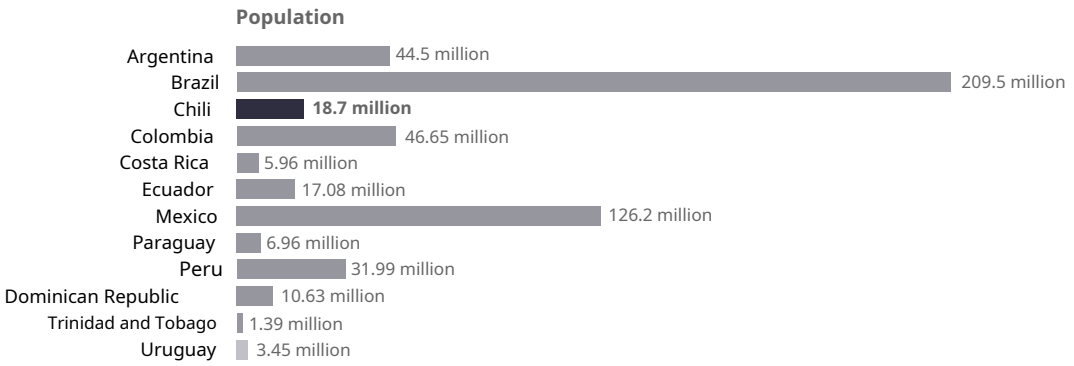
Finally, while experts have determined that the social sector in Brazil is not robust, there are some civil society organizations dedicated to AI for social good issues such as Coding Rights and Olabi, and associations such as ABRIA that foster collaborations between the industry around the topic.

CHILI

As a context to describe the current state of artificial intelligence in Chile, Figure 9 presents a comparison of some economic, demographic, education, human development and equality indicators.

Figure 9. Basic indicators of Chile: comparative





Human Development Indicators

	PISA*	Fitness in English	Labour qualified	Index of development human	Coefficient of GINI
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chili	1 It was	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3 It was	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Dominican Republic	N/A	52.3%	50.2%	0.736	45.7
Trinidad and Tobago	N/A	N/d	71.8%	0.784	40.3
Uruguay	2 do	54.1%	25.5%	0.804	30.5

* Position among the countries evaluated

Sources: Top panels: World Bank (2019).
Human Development Indicators (from left to right): OECD (2019); English Skills (nd); UN (2019); UNDP (2018); World Bank (2018).

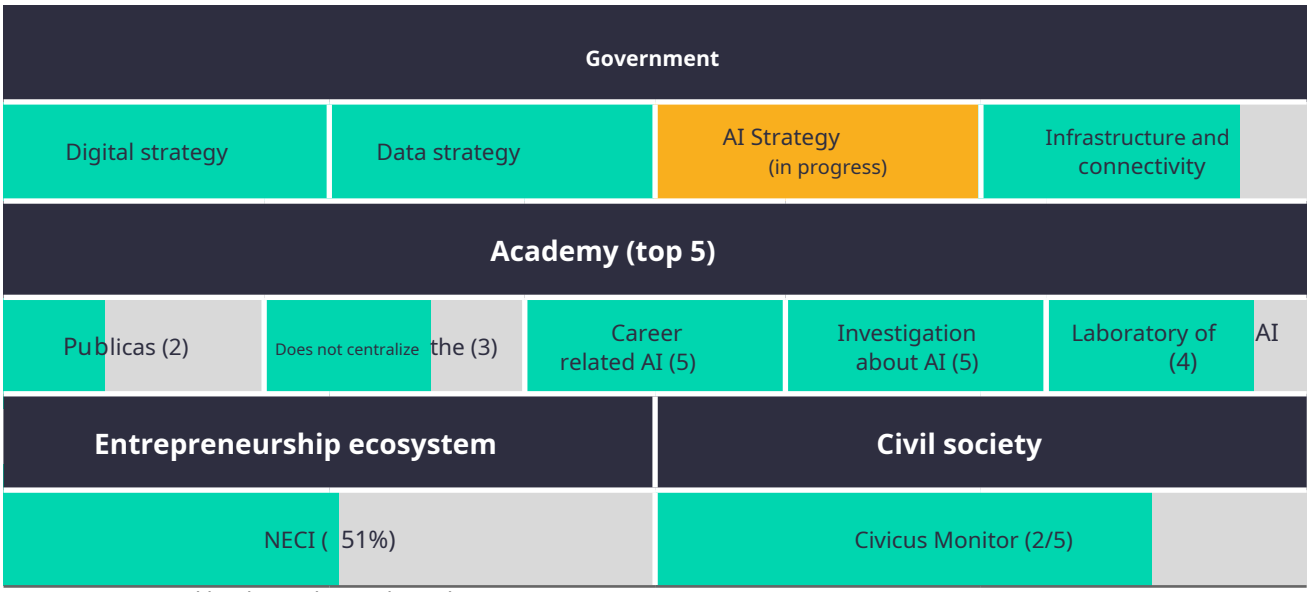
Table 12.Other socioeconomic indicators

Main economic sector (World Bank, 2019)	**PISA** (OECD, 2019)	**Gender index in science, technology, engineering and mathematics (STEM)** (Arredondo et al., 2019)
Industrial	The highest of the 12 countries	32%*
NEI (GEM, 2019)**	**Civicus Monitor (Civicus Monitor, 2020)**	
5.1/10	Conditions for action of civil society organisations: reduced (2/5)***	

*Fountain:*Own elaboration.
* Percentage of women working in the STEM field in the public sector.
* * National Entrepreneurship Context Index (NECI).
* * * The explanation of the indicator can be found in Annex B.

Table 13 summarizes the progress made by various sectors in Chile in establishing the foundations for promoting AI for the social good.

Table 13.Efforts to establish the foundations of AI in Chile, by sector



*Fountain:*Prepared by the authors. The indicators are in Annex B.

Government

Digital strategy: Yes

Representatives from the public and private sectors, as well as academia and civil society, worked on a participatory exercise to define theDigital Agenda 2020[77], a roadmap that proposes 60 measures to advance towards inclusive and sustainable digital development through the use of ICTs. The Digital Agenda is structured around five axes that establish its strategic guidelines: rights for digital development, digital connectivity, digital government, digital economyand digital skills.

77 For more information, seehttp://www.agendadigital.gob.cl/files/Agenda%20Digital%20Gobierno%20de%20Chile%20-%20Noviembre%202015.pdf

One of its characteristics is that it is a flexible agenda, that is, it allows for adaptations and the addition of new measures or high-impact strategic challenges. Thus, by the end of 2019, the number of goals had risen to 63 versus the initial 60.

In April 2019, the Digital Transformation Strategy was launched[78], which has as its main lines of action digital identity, debureaucratization through digitalization, State cybersecurity, use of emerging technologies and a data-based State. These last two points explicitly include the formulation of a data and AI strategy, the automation of public policies through the use of data, and the use of public data for the generation of a Govtech data ecosystem.[79].

Finally, in September 2019, the Digital Transformation Law was approved in Congress.of the State which, within a period of five years, aims to eliminate the use of printed documents in government, make intensive use of data, and create open and efficient interoperability mechanisms.

At the time of preparing this report, progress of 74% was recorded in the axis of rights for digital development, 92% in digital connectivity, 82% in digital government, 85% in digital economy and 69% in the axis of digital skills.

Data Strategy/Open Data Portal: Yes

One of the main results of the Digital Agenda 2020 is the Open Data Portal[80], a platform that currently has 3,761 data sets from more than 520 state agencies. It seeks to promote transparency and accountability to strengthen democracy.[81]One of the challenges facing this portal is the standardization of information in order to facilitate access to citizens.[82].

In order to add value from the intelligent use of this data, a joint project was developed between the Government and Datawheel called DataChile[83]. This is a platform that integrates, visualizes and distributes public data with the aim of improving the efficiency and effectiveness of public decisions. This is done through integrated data that helps reveal gaps in public services, identify opportunities for industrial diversification and promote a better-informed public debate. The platform is currently managed by the Digital Government Division.

AI Strategy: Ongoing

During the first half of 2019, a group of ministries, led by the Ministry of Science, Technology, Knowledge and Innovation (MCTCI), conducted an analysis of the global context regarding AI strategies, the results of which were presented to the President in August. The President, in turn, tasked the MCTCI with implementing a work plan on AI to develop a national policy and action plan. The aim of the work plan is to empower citizens in the use and development of AI tools, fostering debate on their legal, ethical, social and economic consequences. The policy, together with its action plan, will be launched during 2020.

78 For more information, seehttps://digital.gob.cl/doc/estrategia_transformacion_digital_2019_v1.pdf

79 According to the IDB, the concept of Govtech covers all those emerging companies whose technology can be applied to the improvement of public services. public (health, education, mobility), administrative management (records, decision-making, streamlining of processes) and public infrastructure (public Wi-Fi, drones or sensors for connectivity in the streets), as well as the political participation of citizens (electoral processes, public policy decision-making, communication with institutions, social organization, etc.).

80 For more information, seehttps://datos.gob.cl/

81 Anyone can consult the information on this portal, either to carry out independent research, develop their own applications using the Public Administration databases, or to determine what information the Administration considered when making decisions in various areas, in an exercise of transparency.

82 The portal contributes to the Digital Agenda 2020 mission of fostering citizen participation and improving their experience when interacting with public services.

83 For more information, seehttps://en.datachile.io/

To implement this action plan, a committee of 10 Chilean experts on artificial intelligence, data, economics, and social and ethical aspects was formed. Two more academics joined this committee, who led the preparation of the document "Towards an R&D+i+S strategy in AI for Chile"[84].

This work plan is led by the MCTCI Future Unit and by representatives of the Ministries of Economy, Development and Tourism; Social Development and Family; Labor and Social Security; Education; Finance; Interior and Public Security; Transportation and Telecommunications; and Foreign Affairs. The General Secretariat of the Presidency, the National Agency for Research and Development (ANID), the Corporation for the Promotion of Production (CORFO), and the National Training and Employment Service (SENCE) are also participating.

Chile's national AI policy contemplates the development of three axes:

i. Enabling factors: Data, including its sources, standards, protection, etc.; human capital, ranging from school education to job training and retraining, including technical, higher and postgraduate education; and technological infrastructure, including fiber optics, sensor deployment, data centers and 5G networks.

ii. Development of AI and its applications: Elements of basic and applied research in AI, and development and demand for solutions[85].

iii. Ethics, regulatory aspects and social and economic impacts: Ethical, regulatory, economic and social challenges arising from the development and applications of AI, together with the opportunities that arise from the proper use of this technology.[86].

Following a diagnosis of the AI ecosystem in Chile, the preparation of a base document for AI policy is planned, which will integrate the participation of civil society and academia through documents and working groups self-convened by individuals or organizations; seminars with working groups in all regions of the country coordinated by the MCTCI and ANID; and a public consultation prior to the final publication of the policy.

Infrastructure and connectivity

In Chile, more than 82% of the population has access to the Internet, making it one of the countries with the highest connectivity in the region (UNESCO, 2019). It is also estimated that for every 1,000 inhabitants, there are 1,134 cell phone subscriptions, indicating that some people enjoy two or even three subscriptions to mobile phone services.

With a score of 75.62/100 in the World Bank's Digital Adoption Index (2019) and a solid infrastructure, Chile can be considered a country highly prepared for the digital revolution. The Network Availability Index (NRI) is 57%. In addition, it is very likely to become the first in LAC to implement a public 5G network, as proposed at the Mobile World Congress 2019 (El Mostrador, 2019).

In terms of cybersecurity, Chile ranks 9 out of 33 in the Americas, while globally it ranks 83 out of 175 with a score of 0.470 out of 1 in the International Telecommunication Union's 2018 Global Cybersecurity Index.

84 This was handed over to the president and the minister of the MCTCI. For more information, see https://drive.google.com/file/d/1_IFAH3WsUhaXgNCHQ8U-GHpyNIzb25JBC/view

85 The supply and demand of all the actors in the ecosystem are considered: universities, research centers, non-governmental organizations, such as industry and the State.

86 Some examples of topics to be analyzed are the effects on people's privacy and the Sustainable Development Goals (SDG) of the Nations. United Nations, particularly those relating to the environment, labour, gender gaps, justice and democracy, among others.

Academy

According to the QS World University Rankings (2019), the five most important universities in Chile offer undergraduate and postgraduate training in AI-related topics, conduct research on the topic, and have laboratories and/or technological innovation centers; four of them also have a laboratory specialized in AI topics (Table 14).

Furthermore, Chile's academic capacity is enhanced by multiple collaborations with government institutions such as the Corporation for the Promotion of Production (CORFO) and the National Fund for Scientific and Technological Development (FONDECYT), which are allies in research and financing.

Table 14. The five best universities in Chile and their relationship with AI*

University	# 1 Pontifical University Catholic of Chili	# 2 University from Chile	# 3 University of Santiago de Chili	# 4 University of Conception	# 5 University Adolfo Ibanez (UAI)
Type of institution	Private	Public	Public	Private	Private
Location	3 locations, all in Santiago de Chili	2 locations, both in the vicinity from Santiago	3 locations, all in Santiago de Chili	Conception	3 locations: Viña del Mar, Santiago and Miami (USA)
Racing related with AI	✓	✓	✓	✓	✓
Postgraduate studies related with AI	✓	✓	✓	✓	✓
Investigation about AI	✓	✓	✓	✓	✓
Laboratory of AI	✓	✓	✓	✗	✓
Laboratory of innovation technological	✓	✓	✓	✓	✓

Fountain: Prepared by the authors. Information obtained from the website of each institution.
* Two of these universities (Pontifical Catholic University of Chile and University of Chile) are also included in the Times Higher Education ranking (2020).

Other relevant institutions and initiatives

In addition to the aforementioned universities, Chile has the Millennium Institute for Data Fundamentals (IMFD) and the International Institute for Business Innovation (3IE) of the Federico Santa María Technical University to enhance AI capabilities in the country. The IMFD —a benchmark for Latin America— is a multidisciplinary research center that addresses the computational aspect of data and its use as a tool for social impact..For its part, the 3IE has the mission of supporting the development and internationalization of innovative projects. Projects are incubated there, networking sessions are coordinated and competitions are organized such as the Startup Academy IA 2019 Entrepreneurship Tournament, through which innovative projects that incorporate AI for social good were identified.[87].

87 First place was awarded to ALICIA (Smart Legal Assistant), a judicial assistant for cases of late payment and collection trials that seeks provide free assistance to users who would otherwise have to pay a lawyer when they are already facing lawsuits for late payment. ALICIA is a tool that could help the more than two million Chileans (20% of the national population) who annually face lawsuits for debt. This winning project, developed by former students of the Commercial Engineering program at the Pontifical Catholic University of Valparaíso, has been in the incubation phase since the end of 2019.

Other efforts include the GobLab of the UAI University, a public innovation laboratory attached to the School of Government that seeks to improve the quality of life of people through the use of innovative methodologies such as big data analysis (*Big Data*). Among its projects is the development of a predictive model that contributes to the communal citizen security strategy of the Municipality of Lo Barnechea in Chile.[88].

Efforts from the entrepreneurial ecosystem and civil society

According to the Global Competitiveness Index, Chile is the second most competitive country in Latin America after Colombia. In the world, it ranks 33rd out of 140 countries evaluated (FEM, 2018). Chile's competitiveness is due, among other factors, to the stability of its macroeconomic conditions and the development of its infrastructure. Not only has the percentage of established businesses increased, but it has also increased the expectations of job creation from entrepreneurship thanks to efforts such as Start-up Chile.[89], a start-up accelerator created by the government to achieve a high level of entrepreneurship based on innovation.

There is an expanding AI startup ecosystem in the country (Costa, 2019). Examples of startups using AI for social good include U-Planner[90], which works with universities in 16 countries to optimize their processes, and Kimiche[91], a startup that helps parents and teachers improve the quality of education for Chilean students through personalized curricular adaptation plans. There are also organizations such as IA Chile[92], a learning community made up of a group of AI experts who seek to accompany the community of professionals with companies that use emerging technologies.

Examples of public-private efforts include:*Data Observatory*[93], a non-profit organization founded in 2020[94]Its objective is to enhance the benefit obtained from environmental data and other public data of global and unique value that are being generated in the country.[95]. It brings together academia, the public sector, industry and civil society in global alliances to generate solutions and capabilities in data science and related technologies that are useful and have returns in various sectors of the economy. One of its most notable projects aims to leverage AI to explore solutions to phenomena associated with climate change, such as extreme events caused by desertification and sea level changes, among others.

There are also organizations such as the Intelligent Citizenship Foundation[96]which develops digital tools to strengthen democracies. Among its projects is the A+ Alliance, a global group in favour of inclusive algorithms that aims to combat the biases reproduced by AI.

For its part, Derechos Digitales is a civil society organization dedicated to the promotion and defense of human rights in the digital and technological environment. Its main lines of action are freedom of expression,

88 The Data Observatory was created to help close gaps in technological development and increase Chile's role in the fourth revolution industrial. For more information, seehttps://gobierno.uai.cl/centros/goblab/proyecto-modelo-predictivo-prevencion-del-delito/

89 For more information, seehttps://www.startupchile.org/es/about-us/

90 For more information, seewww.u-planner.com

91 For more information, seehttps://database.contxto.com/company/kimche

92 For more information, seehttps://inteligencia.ai/

93 For more information, seehttp://www.dataobservatory.net

94 The actors involved are the Government of Chile (through the Ministry of Science, Technology, Knowledge and Innovation and the Ministry of Eco-Economy, Development and Tourism), together with Amazon Web Services and the Adolfo Ibáñez University, will open the initiative to new partners.

95 Specifically, the Data Observatory focuses on four lines of work to fulfill its mission: (i) gather and make available to the public sets of of globally valuable data in an open manner; (ii) design and implement solutions to acquire, analyze, explore, visualize and offer access to these data sets and accelerate their maximum use; (iii) contribute to the training of talent related to the execution of these actions, and articulate material and courses based on first-hand experiences; and (iv) actively invest in the creation of networks to facilitate technological transfer and association between people who work in different fields but who have a functional similarity in their areas of work with data.

96 For more information, seehttps://ciudadaniai.org

expression, privacy and personal data, as well as copyright and access to knowledge. In 2018, Derechos Digitales published the report "Algorithms and Inequalities", in which they suggest areas of responsibility for companies, government and civil society in terms of preventing automated decisions from affecting people's rights.[97].

Use cases

Below is a summary table of the main AI use cases in Chile.

Table 15. AI use cases in Chile

Name: ALeRCE		
For more information: http://alerce.science/	*Year they started using AI:* 2019	*SDG:* 4 (quality education), 9 (industry, innovation and infrastructure) and 17 (partnerships to achieve the goals) 
Actors involved: **Funders**: Millennium Institute of Astrophysics, Center for Mathematical Modeling **Chilean partners**: REUNA (company), Adolfo Ibáñez University, Andrés Bello University, Austral University, Catholic University of Chile, University of Chile, University of Concepción **International Partners**: Caltech, Harvard University, University of Washington		*Current status:* academic project in consolidation stage
What is proposed: Manage, through automated systems, large volumes of astronomical information from large telescopes and astronomical cameras. This scientific community generates thousands of databases. Currently, these telescopes can produce up to a million events per night and it is expected that in the next few years this number will reach 10 million in the same period. The events must be distributed to the astronomical community through continuous data transmission (*streams*) to be ingested, aggregated, annotated and classified by *brokers* astronomical. The volume of data generated by new telescopes requires the organization and classification of new events using automatic systems.		
Brief description of the project: ALeRCE is one of the first *brokers* astronomical alerts in the world and the first to publicly provide the classification of all astronomical alerts generated by the Zwicky Transient Facility (ZTF), located in California. ALeRCE offers various services to the astronomical community, among which the ingestion of the *stream* ZTF data to perform a classification based on the first alert associated with an event (early classifier) and another based on the temporal evolution of all alerts associated with an event (late classifier), using computational learning techniques in both cases.		
Applications of AI	Machine learning and deep learning platforms, robotic process automation, cognitive worker assistance, image recognition.	
How they use AI	ALeRCE allows automatic communication between its database and tracking telescopes through API, and also provides different public web interfaces for searching for new supernova candidates (snhunter.alerce.online), or for exploring all time series and their classifications (alerce.online), among other services.	

Fountain: Information provided by Andrés Bello University for the purposes of this report (2020).

97 For more information, see https://www.derechosdigitales.org/wp-content/uploads/algoritmo_desigualdad_cast.pdf

Name: DART		
For more information: https://teledx.org/DART	*Year they started using AI:* 2015	*SDG:*3 (health and well-being) 
*Actors involved:*University of Chile and private investors		*Current status:*Government, university and early-stage startup project
*What is proposed:*Diabetes is the most common cause of vision loss in the world's working-age population, so prevention through annual screening is essential. However, there is a significant gap between available ophthalmologic capabilities and the number of diabetic patients requiring screening, which totals more than 460 million. This project aims to expand access to such screening.		
*Brief description of the project:*DART improves access to preventive screening to detect signs of the disease in its early stages by allowing health centers to send photos of their patients' retinas to the DART platform. The images are analyzed, negative cases are ruled out, and potentially positive cases are referred to ophthalmologists who can make a recommendation on the patient's course of action, optimizing doctors' time. The service is used by one million people each month. To date, more than 250,000 patient exams have been analyzed.		
Applications of AI	Machine learning and deep learning platforms, decision making, cognitive worker assistance, and image recognition.	
How they use AI	The DART machine learning model was trained on a representative sample obtained from multiple centers and observers to detect signs of diabetic retinopathy.	

*Fountain:*Information provided by TeleDx for the purposes of this report (2020).

Name: Not Company (NotCo)		
For more information: www.notco.com	*Year in which They started using AI:* 2015	*SDG:*2 (zero hunger), 3 (health and well-being), 12 (responsible production and consumption), 13 (climate action), 15 (life on land) 
*Actors involved:*Not Company		*Current status:*emerging company in consolidation stage
Q*What is proposed:*Reduce the environmental impact of mass consumption of animal products by offering plant-based alternatives.		
*Brief description of the project:*Not Company is dedicated to finding formulas that produce the same flavors and nutritional values as traditional animal products, but exclusively based on plant-based products. In just eight months, its first product captured 8% of the market.		
Applications of AI	Natural language generation, machine learning and deep learning platforms, decision making, natural language processing, cognitive worker assistance, and image recognition.	
How they use AI	AI makes it possible to accelerate the research and development process of new prototypes.	

*Fountain:*Information provided by NotCo for the purposes of this report (2020).

Name: Crime Scene Prediction		
For more information: Contact Raul Manasevich, rmanasevich@gmail.com	*Year they started using AI:* 2019	*SDG:* 9 (industry, innovation and infrastructure), 11 (sustainable cities and communities), 16 (peace, justice and strong institutions) 
Actors involved: Government of Chile through the Undersecretariat for Crime Prevention *Developers:* Faculty of Physical and Mathematical Sciences of the University of Chile		*Current status:* Government project in consolidation stage
What is proposed: Contribute to crime prevention by optimizing time and resources.		
Brief description of the project: The Carabineros de Chile predictor is used in all the country's communes to predict the places where crimes are most likely to occur, generating three daily predictions from which the security personnel's shifts are updated.		
Applications of AI	Deep learning and machine learning.	
How they use AI	The predictor delivers daily crime risk maps based on crime reporting data.	

Fountain: Information from the Faculty of Physical and Mathematical Sciences of the University of Chile for the purposes of this report (2020).

Name: U-Planner		
For more information: www.u-planner.com	*Year they started using AI:* 2012	*SDG:* 4 (quality education), 10 (reduction of inequalities) 
Actors involved: U-Planner		*Current status:* company in consolidation stage
What is proposed: Generate a real impact on tertiary education, giving access to millions of students who currently do not have that opportunity, either due to performance, dropouts or lack of coverage.		
Brief description of the project: U-planner enables advanced analysis and AI solutions for the management and operation of universities in several countries. They offer products in three areas: Yo. **Smart Campus:** They better organize the facilities of the institutions, optimizing their infrastructure. ii. **Academic:** They implement smart measurement methodologies to incorporate skills-based models, enhancing quality indicators for accreditation. iii. **Student Success:** It centralizes, integrates and guarantees the availability of the services of Higher Education Institutions (HEIs) so as to improve use and provide a quality experience to students and other stakeholders. Today, U-Planner impacts over two million students.		
Applications of AI	Machine learning and deep learning	
How they use AI	Using databases from different universities, U-Planner creates models that allow us to recognize patterns of behavior and therefore identify standardized ways of responding to the different problems faced by higher education institutions.	

Fountain: Information provided by U-Planner for the purposes of this report (2020).

Conclusions

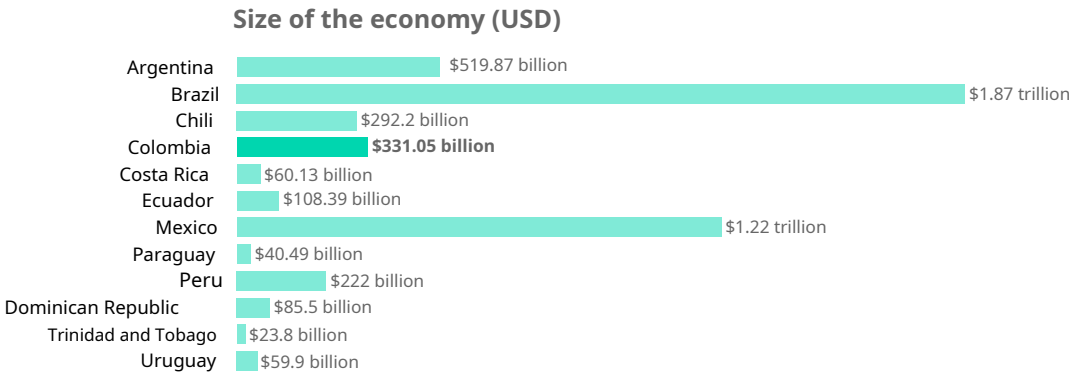
Advances in AI by the public sector, academia and industry are evident. Chile is expected to have its AI Strategy in 2020, which will help strengthen the foundations to accelerate the use of this technology for social good in the country. The fact that institutional spaces are being planned to be opened for AI ethics issues is a good indicator of Chile's interest in strengthening the mechanisms to guarantee the responsible use of this technology.

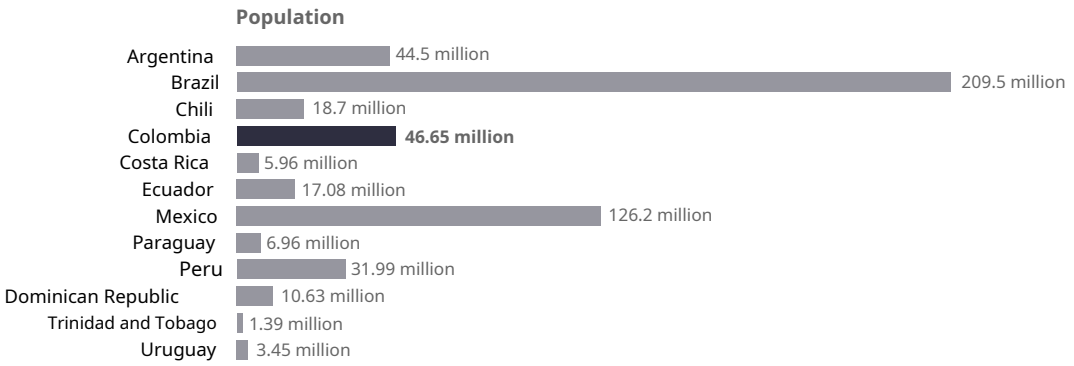
As shown by the results of the PISA exam – in which Chile ranks first in the region – education is a priority for this country. Its universities – both public and private – conduct research on AI and offer related courses. Finally, although the participation of civil society is described as limited, Chile has consolidated organizations that act as promoters of the adoption of AI and the ethical discussions that this generates.

COLOMBIA

As a context to describe the current state of AI in Colombia, Figure 10 presents a comparison of some economic, demographic, education, human development and equality indicators.

Figure 10. Basic indicators of Colombia: comparative





Human Development Indicators

	PISA*	Fitness in English	Labour qualified	Index of development human	Coefficient of GINI
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chili	1 It was	52.89%	69.2%	0.843	46.6
Colombia	**N/A**	**57.38%**	**58.2%**	**0.747**	**49.7**
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3 It was	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Dominican Republic	N/A	52.3%	50.2%	0.736	45.7
Trinidad and Tobago	N/A	N/d	71.8%	0.784	40.3
Uruguay	2 do	54.1%	25.5%	0.804	30.5

* Position among the countries evaluated

Sources: Top panels: World Bank (2019).
Human Development Indicators (from left to right): OECD (2019); English Skills (nd); UN (2019); UNDP (2018); World Bank (2018).

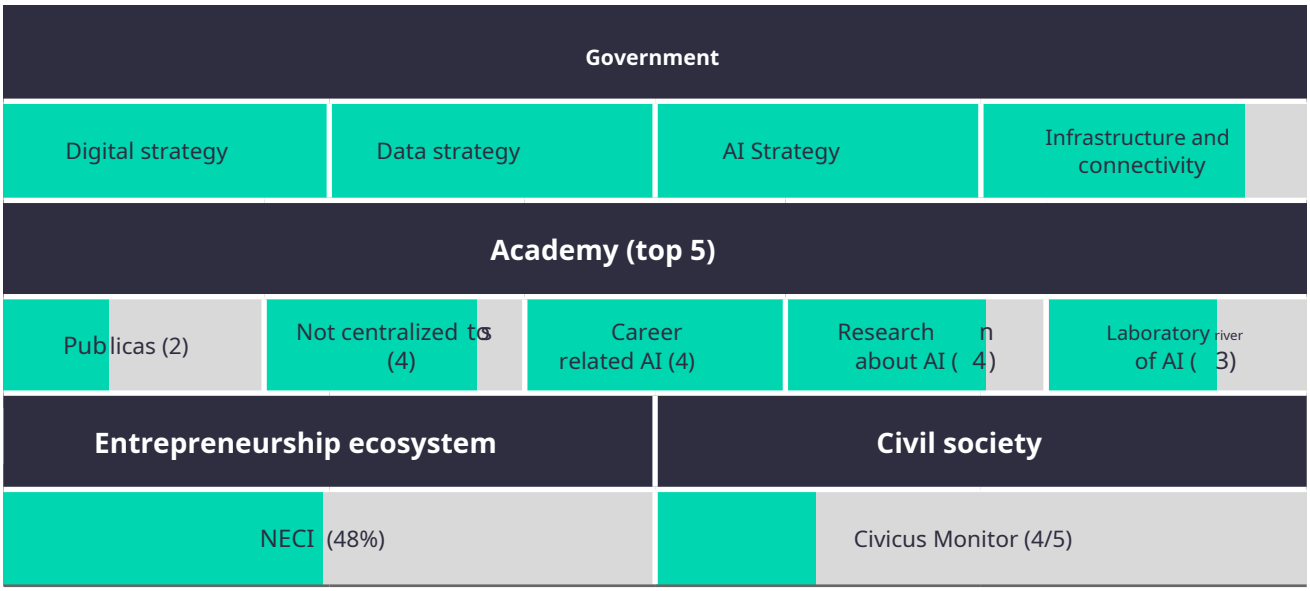
Table 16.Other socioeconomic indicators

Main economic sector *(World Bank, 2019)*	**PISA** *(OECD, 2019)*	**Gender index in science, technology, engineering and mathematics (STEM)** *(Arredondo et al., 2019)*
Production and export of primary goods	Above the average of the 12 countries	38%*
NEI** (GEM, 2019)	**Civicus Monitor** (Civicus Monitor, 2020)	
4.8/10	Conditions of action of civil society organizations: repressed 4/5***	

*Fountain:*Civicus Monitor (2019).
* Percentage of women working in the STEM field in the public sector.
* * National Entrepreneurship Context Index (NECI).
* * * The explanation of the indicator can be found in Annex B.

Table 17 summarizes the progress made by various sectors in Colombia in establishing the foundations for promoting AI for the social good.

Table 17.Efforts to establish the foundations of AI in Colombia, by sector



*Fountain:*Prepared by the authors. The indicators are in Annex B.

Government

Digital strategy: Yes

The National Development Plan[98](PND) 2018-2022 contains the Pact for the Digital Transformation of Colombia[99](TDC). There, three objectives are proposed to achieve digitalization by 2030: (i) to make internet connectivity widespread for both individuals and legal entities; (ii) to develop skills and digital work environments that promote creativity in the service of digital innovation; and (iii) to create an institution that ensures the implementation of the pact and regulates new technologies. This can have an effect on both the productive sector and the public administration, where it is sought to use data intelligence tools to combat corruption.

98 For more information, see https://colaboracion.dnp.gov.co/CDT/Prensa/Resumen-PND2018-2022-final.pdf

99 For more information, see: https://www.dnp.gov.co/DNPN/Plan-Nacional-de-Desarrollo/Paginas/Pactos-Transversales/Pacto-transformacion-digital-de-Colombia/Transformacion-digital.aspx

For its part, the Ministry of Information and Communications Technology of Colombia (MinTIC) coordinates the programs that arise from the pact, mainly the Smart Manufacturing program. The latter, through iNNpulsa (a program of the National Learning Service-SENA), will strengthen relations between companies and academia.

While the TDC proposes a national reform, the PND has a manual for digitalization in the area of local governments. In turn, this pact is an instrument that seeks to strengthen seven of the SDGs defined by the UN: 4 (education), 8 (decent work and economic growth), 9 (industry, innovation and infrastructure), 10 (reduction of inequalities), 11 (sustainable cities and communities), 16 (peace, justice and strong institutions) and 17 (partnerships to achieve the goals).

In 2018, at the Davos Economic Forum, the city of Medellín was chosen as the Spanish-speaking capital to host the Center for the Fourth Industrial Revolution (4IR). This center was inaugurated in April 2019 and houses the work of experts in digital, physical and biological systems aimed at transforming the country's economic and social environment through technology. Its digital laboratory will play an important role in the planning of smart cities, as well as in the development of the Internet of Things. This action has been supported by the signing of AI development agreements with the OECD, where Colombia adheres to the artificial intelligence agreement (OECD, 2019).

Data Strategy/Open Data Portal: Yes

The Open Data Portal[100]The Colombian database provides access to 10,231 data sets from different government entities. It also has different educational tools for the use and exploitation of these data and, in its reports section, it presents a follow-up of the quality of the information by department, thereby promoting the commitment of each subnational entity in terms of ensuring that the information it publishes is presented in accordance with the established guidelines.

The purpose of the portal is for journalists, students, entrepreneurs, civil society organizations and the government to create a data ecosystem that facilitates better and more transparent access to the country's information. To promote the openness and use of this data, the MinTIC published the “Guide for the use and exploitation of open data in Colombia”[101].

AI Strategy: Yes

At the end of 2019, the Colombian government approved the National Policy for Digital Transformation and AI.[102] According to MinTIC, its objective is to promote the strategic use of digital technologies in the public and private sectors. This is expected to boost productivity and promote the well-being of citizens.

This policy seeks to create international alliances for innovation, the design and execution of initiatives that promote entrepreneurship and digital transformation. Its priorities are the creation of an AI market in the country and the attraction of international talent.

As part of one of the strategies of the National Development Plan 2018-2022, the Colombian government, through MinTIC, awarded 25,000 public officials full scholarships on the Coursera and Platzi platforms to strengthen their technological skills through five courses on AI and digital transformation.

100 For more information, seehttps://colaboracion.dnp.gov.co/CDT/Prensa/Resumen-PND2018-2022-final.pdf

101 For more information, seehttps://estrategia.gobiernoenlinea.gov.co/623/articles-9407_brief_guia_datos.pdf

102 For more information, seehttps://colaboracion.dnp.gov.co/CDT/Conpes/Económicos/3975.pdf

Infrastructure and connectivity

In Colombia, just over half of the population (62%) has access to the internet. The country has made 64% progress in its transition to digitalization, according to the World Bank's Digital Adoption Index (2019). Regarding the Network Readiness Index, Colombia scores 49% for readiness.

In the International Telecommunication Union's 2018 Global Cybersecurity Index, Colombia obtained a score of 0.565/1, which places the country in 7th place out of 33 in the Americas and 73rd out of 145 in the world.

Academy

Of the top five Colombian universities according to the QS World University Ranking (2019), the majority offer technical courses and postgraduate courses that train skills for the development of AI technologies (Table 18). As in the Chilean case, three of the five most important universities in the country are private, which represents a challenge for the access possibilities of the general population. These educational centers are concentrated in the northwest region of the country, which could constitute a limitation in the same sense (QS World University Rankings, 2019).

Table 18.The five best universities in Colombia and their relationship with AI*

University	# 1 University of The Andes	# 2 University National of Colombia	# 3 University Externship of Colombia	# 4 Pontifical University Javeriana	# 5 University of Antioch
Type of institution	Private	Public	Private	Private	Public
Location	Bogota and Cartagena	8 locations**	Bogota	Bogota, Cali	Medellin
Racing related with AI	✓	✓	✗	✓	✓
Postgraduate studies related with AI	✓	✓	✗	✓	✓
Investigation about AI	✓	✓	✗	✓	✓
Laboratory of AI	✗	✓	✗	✓	✓
Laboratory of innovation technological	✓	✓	✗	✓	✓

*Fountain:*Prepared by the authors. Information obtained from the website of each institution.

* The Universidad de los Andes and the Universidad de Antioquia also appear among the top five in the Times Higher Education ranking (2020).

* * Bogota, Medellin, Manizales, Palmira, Amazon, Caribbean, Tumaco and Orinoquia.

In Colombia, cross-sector alliances are common. Some of the AI centers listed above receive support through, for example, the Ministry of Science (formerly the Administrative Department of Science, Technology and Innovation-Colciencias). Together with the Ministry of Technology, it develops and implements AI projects in which universities and private actors such as the Bancolombia Group also participate.

Other relevant institutions

Colombia has numerous research institutions that seek to advance knowledge of AI. These include the International University of La Rioja-Colombia (UNIR), which offers a master's degree in AI, and the University of Medellín, which, through the Systems Engineering and Telecommunications Engineering Research Group, leads a line of research on AI for various programs.

On the other hand, there is the Industrial Technological Innovation Center of Colombia (CITIC) of the Ibero-American University Foundation (FUNIBER), which has the support of the Colombian Family Subsidy Fund (Colsubsidio). Its purpose is to exponentially expand the innovation of Colombian companies from a technological perspective, both in their products and in their processes.

Efforts from the entrepreneurial ecosystem and civil society

Of the countries included in this report, Colombia is the most competitive: it ranks 28 out of 140 in the World Economic Forum's Global Competitiveness Index (2018). At the same time, it is one of the LAC countries that shows the greatest advances in entrepreneurships that take advantage of AI. One of the most notable examples is Rappi, the first Colombian technological unicorn. It is a home delivery service for products in nine LAC countries. Among other ways to take advantage of AI, Rappi developed and implemented its own digital banking using FinTech to combat the barrier to access to financing that prevails in Colombia. Another innovative example is NUXTU[103], which uses AI to emulate and enhance the range of human senses of taste and smell through electronic noses and taste buds.

According to local experts, the main drivers of entrepreneurship include both the national government and subnational administrations, which have encouraged the creation of companies through a flexible legal framework and tax incentives.

Some cases are listed below:

Colombia.AI: Colombia.AI is a community of experts, apprentices, and machine learning enthusiasts who, as volunteers, spread data science and AI. Through free monthly talks and workshops, Colombia.AI shares knowledge, learnings, and experiences around technologies that harness the power of data. Its purpose is to unite industry and academia to contribute to the growth and development of AI in Colombia. This community currently has more than 5,700 members in two cities: Bogotá and Barranquilla.

World Economic Forum (WEF) Center for the Fourth Industrial Revolution: This center, based in Medellin, is the first of the FEM in Latin America and the fifth worldwide, along with those in San Francisco, Tokyo, Beijing and Mumbai. This center strengthens Colombia's agenda for the development of policy frameworks on AI, blockchain and other technologies.*(blockchain)*and the Internet of Things. It also seeks to disseminate the benefits and mitigate the risks of emerging technology[104].

Route N: This company was created in 2009 as a business and innovation center in Medellín. Its purpose is to contribute to improving the quality of life of the city's inhabitants through science, technology and innovation. Its vision is to transform Medellín into a city where innovation is the main driver of the economy. To achieve this, it attracts talent, capital and global companies to the city; strengthens the innovative and entrepreneurial business network; and generates STI solutions for the challenges facing Colombia's second city. Ruta N also houses the FEM's Center for the Fourth Industrial Revolution.

103 For more information, see https://www.nuxtu.co/

104 To achieve this, it brings together governments, leading companies, CSOs and experts from around the world in an effort to co-design and test innovative approaches. policy and technology for governance, and also to develop pilots.

As for the efforts of civil society organizations (CSOs), some of them focus on the issue of digital rights. For example, the Karisma Foundation works to promote human rights in the digital world. Another foundation, Derechos Digitales de Latinoamérica, has among its goals the integration of good use of AI in public discourse in Colombia. This is a non-governmental organization that fights to democratize new technologies and promote the use of a more open, secure and human rights-respecting internet.

Use cases

Below is a summary table of the main AI use cases in Colombia.

Table 19. Main AI use cases in Colombia

Name: 1DOC3		
For more information: www.1doc3.com	*Year they started using AI:* 2015	*SDG:* 3 (health and well-being), 4 (quality education) and 10 (reduction of inequalities) 
Actors involved: 1DOC3		*Current status:* startup in scaling stage
What is proposed: Given that there are only 1.9 doctors per 1,000 inhabitants in the LAC region, and only 5% of the population can afford private health insurance, 1DOC3 offers the first level of primary access to health through technology.		
Brief description of the project: 1DOC3 is a digital platform that offers virtual medical guidance so that anyone can consult online, ask questions or chat with a doctor for an affordable price, or consult reliable information for free. 1DOC3 is available throughout the Spanish-speaking world and serves one million people per month.		
Applications of AI	Natural language generation, decision making, natural language processing	
How they use AI	The 1DOC3 model is trained using data from medical encyclopedias, external medical libraries, and medical labels developed by more than 400 physicians, as well as questions and answers circulating on the platform.	
Fountain: Information provided by 1DOC3 for the purposes of this report (2020).		

Name: Peace Accords		
P *For more information:* http://www.acuerdosdepaz.co/	*Year they started using AI:* 2008	*SDG:* 16 (justice, peace and stronger institutions) 
TO *actors involved:* Quantil		*Current status:* Government project and start-up company in the scaling stage
What is proposed: Facilitate citizen understanding of the legal documents arising from the "Colombia Peace Accords" in order to democratize their compliance.		
Brief description of the project: The Colombian government and the Revolutionary Armed Forces of Colombia (FARC) signed the "Agreement for the termination of the conflict and the construction of a stable and lasting peace." It is a long and difficult-to-read document, so Quantil created an algorithm that analyzes the text and can answer specific citizen questions with graphs and concise answers.		

Applications of AI	Natural Language Processing
How they use AI	Quantil built mathematical models in the task of developing a series of algorithms and web-based services that facilitate the study of the agreement in an efficient and intuitive manner. The algorithm analyzes text and generates images, texts and graphs to answer questions such as: **Q:**Does the agreement mention prison sentences? **A:**Yes, in Point 5

*Fountain:*Information provided by Quantil for the purposes of this report (2020).

Name: SISBÉN (Beneficiary Selection System for Social Programs)		
For more information: https://www.sisben.gov.co/	*Year they started using AI:* 2019	*SDG:*1 (end of poverty) 
Actors involved:*National Planning Department, G*overnments, mayoralties		*Current status:*Government project in the escalation stage
*What is proposed:*Improve the distribution of social program resources.		
*Brief description of the project:*SISBÉN is the national survey used by Colombia to obtain reliable and up-to-date socioeconomic information on the most disadvantaged groups throughout the country. It allows the population to be classified according to socioeconomic levels in order to optimize the distribution of resources for social programs.		

Applications of AI	Support in decision making
How they use AI	Through the survey, a machine learning model (Quentile Gradient Boosting) is applied to identify potential beneficiaries of social programs. The Sisbén IV methodology allows identifying not only the population in poverty by income, but also by multidimensional poverty.

*Fountain:*Information from the National Planning Department for the purposes of this report (2020).

Conclusions

In the coming years, in line with its National Development Plan, Colombia aims to make very significant changes based on the use of technology. One of its main goals is to democratize the Internet and achieve a full coverage network in the country. With the Open Data Portal, and with the infrastructure of 5G antennas and prototypes, it is hoped that the adoption of AI can be carried out in a more organic way. In addition, the country is a pioneer in the implementation of an AI strategy by the government. Unlike other nations in the region, Colombia is already executing its AI development and adoption plan at the national level.

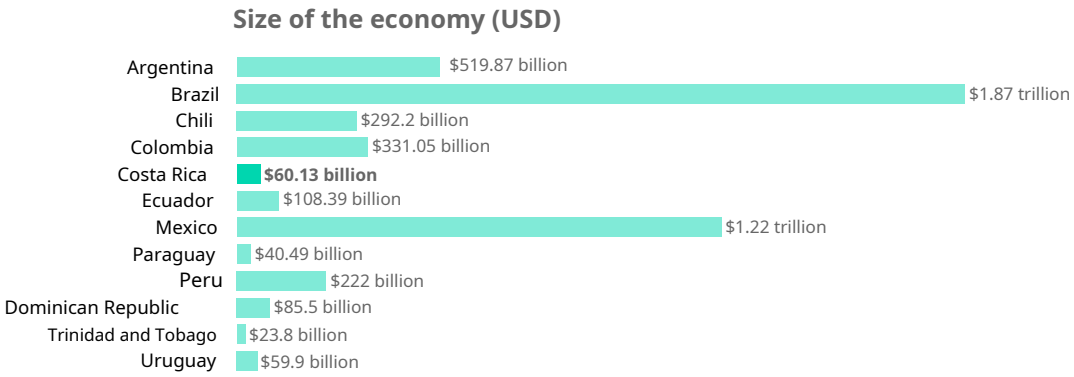
In the academic field, both universities and research centres have produced various studies on AI and its applications. In turn, these centres work jointly with the business and government sectors, as demonstrated in cases such as Ruta N and the FEM Centre for the Fourth Industrial Revolution, both promoted by the government through support and financing policies.

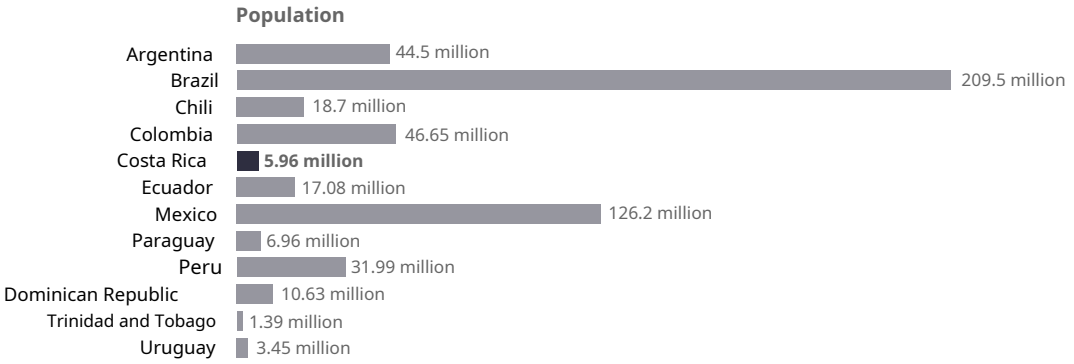
It is worth noting that it is not only the private sector that has an interest in contributing to the implementation of AI. Civil society organizations have launched initiatives that promote the use of AI, while also addressing the ethical and legal conditions for the adoption of this new technology.

COSTA RICA

As a context to describe the current state of AI in Costa Rica, Figure 11 presents a comparison of some economic, demographic, education, human development and equality indicators.

Figure 11.Basic indicators of Costa Rica: comparative





Human Development Indicators

	PISA*	Fitness in English	Labour qualified	Index of development human	Coefficient of GINI
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chili	1 (1 was)	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	**N/A**	**48.75%**	**48.3%**	**0.794**	**48.3**
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3 (1 was)	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Dominican Republic	N/A	52.3%	50.2%	0.736	45.7
Trinidad and Tobago	N/A	N/d	71.8%	0.784	40.3
Uruguay	2 (do	54.1%	25.5%	0.804	30.5

* Position among the countries evaluated

*Sources:*Top panels: World Bank (2019).
Human Development Indicators (from left to right): OECD (2019); English Skills (nd); UN (2019); UNDP (2018); World Bank (2018).

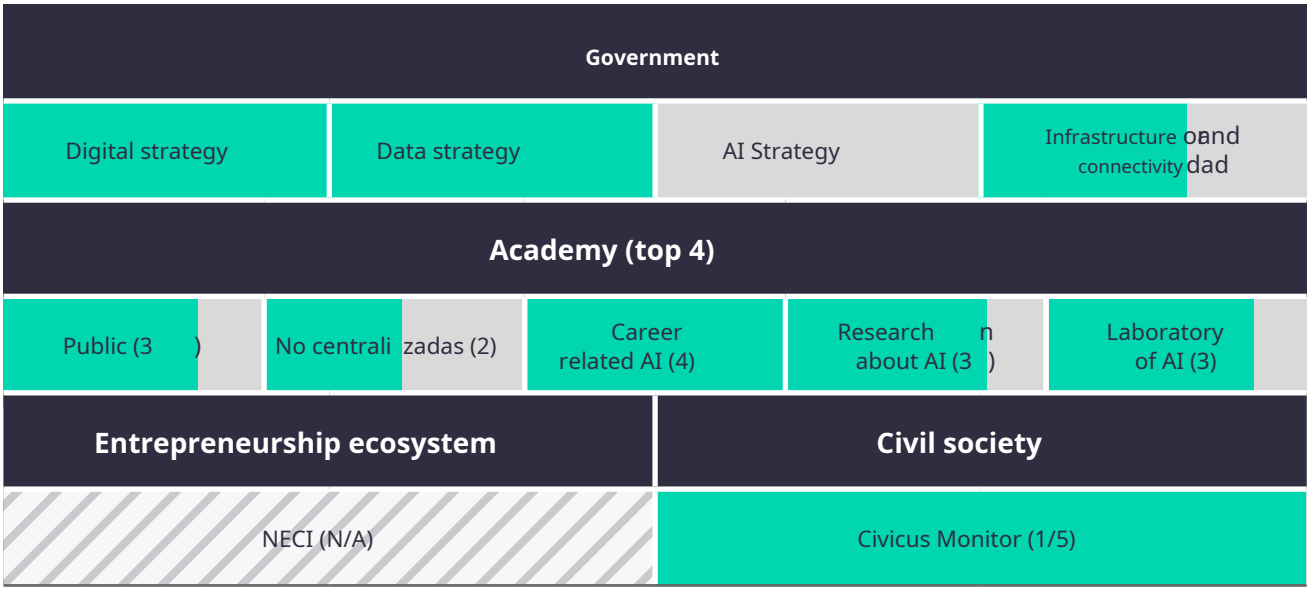
Table 20.Other socioeconomic indicators

Main economic sector (World Bank, 2019)	**PISA** (OECD, 2019)	**Gender index in science, technology, engineering and mathematics (STEM)** (Arredondo et al., 2019)
Agriculture	Above the average of the twelve countries	44%*
NEI (GEM, 2019)**	**Civicus Monitor (Civicus Monitor, 2019)**	
nd	Conditions for action of civil society organizations: open (1/5)***	

*Fountain:*Own elaboration.
* Percentage of women working in the STEM field in the public sector.
* * National Entrepreneurship Context Index (NECI).
* * * The explanation of the indicator can be found in Annex B.

Table 21 summarizes the progress made by various sectors in Costa Rica in establishing the foundations for promoting AI for the social good.

Table 21.Efforts to establish the foundations of AI in Costa Rica, by sector



*Fountain:*Prepared by the authors. The indicators are in Annex B.

Government

Digital strategy: Yes

The Digital Transformation Strategy 2018-2022[105]It is the product of a consultation and co-creation exercise between various actors, which reflected the vision of digitalization for the country in the short, medium and long term. It sets out the strategic axes and lines of action that must be developed in the coming years to make Costa Rica digitally more inclusive, technologically better connected and productively more innovative. The ultimate goal of these transformations is to improve the quality of life of the inhabitants, ensure the business reconversion necessary for industry 4.0 and improve the relationship between the country and the economy.

105 For more information, seehttps://micit.go.cr/images/imagenes_noticias/17-10-2018_Estrategia_de_Transformaci%C3%B3n_Digital_hacia_la_Costa_Rica_of_the_Bicentennial/digital_transformation_strategy_of_costa_rica.pdf

tion between government and citizens. The axes are: digital government, business transformation, innovative society, good governance and Connected Costa Rica.

In this document, Costa Rica recognizes the strategic use of technologies to achieve the comprehensive transformation of people, guided by the basic principles of the 2030 Agenda for Sustainable Development. Likewise, the country adopts the commitments of the eLac 2020 Digital Agenda for Latin America and the Caribbean, including: development of digital infrastructure; promotion of digital transformation and economy; regional digital market; digital government; culture, inclusion and development of digital skills; and use of emerging technologies for sustainable development.[106].

Costa Rica has undertaken binational efforts with the United Arab Emirates (UAE) to accelerate its technological development. This included the signing of a letter of intent between its government (through the Ministry of Science, Technology and Telecommunications) and that of the UAE to carry out cooperation activities for mutual benefit. In this letter, both nations committed to carrying out training activities on topics such as data mining and intelligence.

The country has a high index of electronic government development (0.70 out of 1) and provision of state services (0.67 out of 1), which places it among the ten most advanced countries in terms of digital government in Latin America, according to the 2018 ranking carried out by the United Nations (Digital Transformation Strategy towards the Bicentennial Costa Rica 4.0, 2018).

Data Strategy/Open Data Portal: Yes

Since 2013, every two years the government, academia, the private sector and civil society jointly develop Open Government Action Plans[107]These constitute a roadmap that sets out a series of commitments to promote transparency, accountability and inclusion. To date, Costa Rica has developed three biannual action plans (2013-2014, 2015-2017 and 2017-2019) comprising 58 commitments.

In addition to these plans, within the framework of its open government initiative, Costa Rica has an Open Data Portal[108]which allows citizens to consult information from various ministries and other official entities on topics such as industry, economy and trade.

AI Strategy: No

Costa Rica has not made, nor is it currently making, efforts to define a national AI strategy. However, some topics related to this technology—including Industry 4.0 technologies, digitally intelligent government, inclusive comprehensive services, among others—are addressed in the aforementioned 2018-2022 Digital Transformation Strategy.

According to a study commissioned by Microsoft and conducted by the Center for the Implementation of Public Policies for Equity and Growth (CIPPEC), Costa Rica has significant potential for AI development. The document suggests that if the adoption rate of AI-related technologies increases, economic growth would reach an additional percentage point of GDP per year over the next decade, reaching 5.7%. To overcome the challenges and take advantage of this opportunity, the role of the State is central in terms of promoting and facilitating the process of technological adoption (Albrieu et al., 2019).

106 As a result of the efforts mentioned above, important achievements have been made in recent years in terms of digital government. As an example, For example, Costa Ricans have a digital signature and legal recognition of digital documents; this is thanks to the implementation of the single digital health record (EDUS).

107 For more information, seehttp://gobiernoabierto.go.cr/planes-de-accion/

108 For more information, seehttp://datosabiertos.presidencia.go.cr/home

Infrastructure and connectivity

In terms of both connectivity and digital infrastructure, Costa Rica achieves high levels compared to the regional average. It ranks third in the Network Readiness Index (NRI), reflecting digital adoption by 66% of its population. Costa Rica's Digital Adoption Index stands at 63%.

According to a GSMA report (2018), Costa Rica is an example of successful coordination between different public agencies in infrastructure to promote digital inclusion in the country. In 2015, the government launched the National Telecommunications Development Plan with the purpose of reducing the digital divide, promoting efficient use of the spectrum, and providing universal and affordable access to broadband, all taking into account that a large number of Internet users access the network from their mobile phones. This plan was jointly developed by the Ministry of Science, Technology and Telecommunications, the regulator Sutel, the Department of Social Security of Costa Rica and the Ministries of Health and Education.

Currently, according to data from the GSMA report, mobile internet reaches just over 60% of the Costa Rican population, which places it as the fourth country in the region with the highest mobile internet penetration, after Chile, Uruguay and Argentina (GSMA, 2018).

In terms of cybersecurity, the International Telecommunication Union gives Costa Rica a score of 0.221 out of 1 in the 2018 Global Cybersecurity Index, placing it 18th out of 33 countries in the Americas and 115th out of 145 in the world.

Academy

According to UNESCO data, Costa Rica has 572 researchers per million inhabitants (UNESCO, 2018).. In addition to the work carried out by the National High Technology Center(CeNAT) in the field of AI,The four Costa Rican universities with the highest ranking for their undergraduate degrees in the QS World University Rankings (2019) conduct research on AI and offer courses related to the topic. Three of them are public, which facilitates access to the preparation and training of talents. Most are concentrated in the central region of the country, although as it is a small territory with an adequate public transport network, the difficulties for people who want to access this type of education are less.

Unlike the other countries included in this report, under the selection criteria mentioned at the beginning of this document, in the case of Costa Rica the QS World University Ranking only classifies four universities (Table 22).

Table 22.The four best universities in Costa Rica and their relationship with AI*

University	# 1 University of Costa Rica	# 2 University National Costa Rica	# 3 Technological of Costa Rica	# 4 University Latin American of Science and Technology
Type of institution	Public	Public	Public	Private
Location	Saint Joseph	Heredia	Carthage	Saint Joseph
Racing related to the AI	✓	✓	✓	✓
Postgraduate studies related to the AI	✓	✗	✓	✓
Research on AI	✓	✗	✓	✓
AI Lab	✓	✓	✓	✓
Laboratory of innovation technological	✓	✓	✗	✓

*Fountain:*Prepared by the authors. Information obtained from the website of each institution.

* The University of Costa Rica also appears in the Times Higher Education ranking (2020) as the best in the country.

Other relevant institutions

In addition to the universities listed in Table 22, it is worth mentioning the Colegio Técnico Profesional de Escazú (CTP), which opened a neuroscience and AI classroom, the first of its kind in Latin America. The goal of the local government of Escazú is to become a smart city, to which the establishment of this classroom contributes significantly.

One of the notable strengths of the Costa Rican case is the solidity of the alliances between various sectors. For example, in an effort to expand the teaching of AI in Costa Rica, the Ministry of Science, Technology and Telecommunications (MICITT) partnered with Texas Tech University to offer an introductory AI program to professionals in the fields of systems engineering, ICT and related fields. All interested parties received 100% scholarships. This initiative was part of the efforts of the MICITT Program of Innovation and Human Capital for Competitiveness (PINN), which is financed with a loan from the IDB.

For its part, the Technological Institute of Costa Rica has hosted international AI events such as the International Conference and Workshop on Bioinspired Intelligence (IWOBI). This was organized together with four other Costa Rican universities: the University of Costa Rica, the National University, the State University at a Distance and the National Technical University.

Another example of a relevant institution in this area is the CeNAT mentioned above. There, universities collaborate with government areas and the private sector. Founded by the National Council of Rectors (CONARE), CeNAT focuses onthe development of research and postgraduate studies in high-tech areas, including AI. There is also the National Laboratory of Artificial Intelligence (LaNIA) which is part of CONARE, among others.[109].

109In addition to the collaboration between the five universities that comprise it (Technological Institute of Costa Rica, University of Costa Rica, National University National University of Costa Rica, National Technical University, State Distance University),CeNAT has strategic alliances with the government through MICITT and the National Council for Scientific and Technological Research (CONICIT), as well as with institutions, companies and prestigious national and international research centers.

CONARE has four laboratories: (i) the PRI LaboratoryAS, which performs analysis of photogrammetry, remote sensing, geographic information systems, spatial data infrastructure, geodesy and computer sciences; (ii) the National Nanotechnology Laboratory (LANOTEC), (iii) the CENIBiot Laboratory, which works on biotechnology scaling in the region, and (iv) the National Advanced Computing Collaboratory (CNCA). In the latter, researchers and developers of advanced computing interact in areas of convergence and application of computer sciences with natural sciences, engineering, humanities, social sciences and arts.[110].

In 2018 alone, CeNAT recorded 202 projects developed within the framework of a tripartite collaboration (academia, government and private sector); 319 knowledge transfers; 54 scientific publications; two researchers in the United States registry of inventors; 210 users of the cluster (supercomputer); 126,260 students and professors from public universities with access to the Eduroam network; five science fairs and olympiads; 4,000 producers benefited with technical assistance on issues of variability and climate change; and 276 publications in the media (Sibaja, 2019).

Efforts from the entrepreneurial ecosystem and civil society

Costa Rica ranks fourth in Latin America among the best countries for developing entrepreneurship (Bosma and Kelley, 2018). Currently, it is beginning to register some collaborative efforts on the topic of AI for social good, which are linked to regional initiatives and international actors to enhance their impact.

The country is part of the network *Google Developer Group*, which seeks to connect and promote developers who use Google technologies. Within the framework of this group, Costa Rica promotes and disseminates educational information of a technical nature. It also has a chapter of 10x Impact, which promotes preparation for the future of work within the framework of technological acceleration and automation through education and the dynamism of the entrepreneurial ecosystem.

Among other initiatives, there are two recently created ones in which the country participates. The first is fAIr Costa Rica, which is the result of a collaboration between the IDB Group and the Government of Costa Rica to promote the responsible use of AI in the provision of social services from the public and private sectors in the country. The second is Singularity Summit Costa Rica, which took place in February 2020. Experts in technological and social innovation issues met there to educate on the use of new technologies, including AI.

Use cases

Below is a summary table of the main AI use cases in Costa Rica.

Table 23. Main AI use cases in Costa Rica

Name: PARMA		
For more information: http://martinvc96.pythonanywhere.com/demo/	*Year they started using AI:* 2018	*SDG:*3 (health and well-being) 
Actors involved: Costa Rican Institute of Technology, Max Peralta Hospital, Costa Rican Social Security Fund of the Government of Costa Rica		*Current status:*academic project in initial stage

110 The CNCA participates in scientific research and technological development projects together with Costa Rican state universities and in coordination with sectors such as the government and industry. In these joint projects, the collaborative carries out scientific and technical research tasks, assistance in the development of computing infrastructure, development of training programs, advice on the management of project funds and collaboration in the formation of alliances or networks (PRIAS, 2017).

What is proposed: Streamline and provide access to breast histopathology analyses.	
D*short description of the project:* Through a system called HATCH, PARMA enables the identification of regulatory networks of the proliferation phenotype of cancer cells following chemotherapy, assisting physicians in detecting abnormalities and diagnosing breast cancer.	
Applications of AI	Machine learning platforms, activation maps and deep convolutional networks
How they use AI	Parma develops an algorithm that performs a genomic functional analysis of cancer cells using RNA interference to identify regulatory networks associated with proliferation and death in response to genotoxic chemotherapy. It generates biocomputational tools, as well as a model for data analysis and the generation of hypotheses of potential control points of the phenomenon, which were validated experimentally.

Fountain: Information provided by PARMA for the purposes of this report (2020).

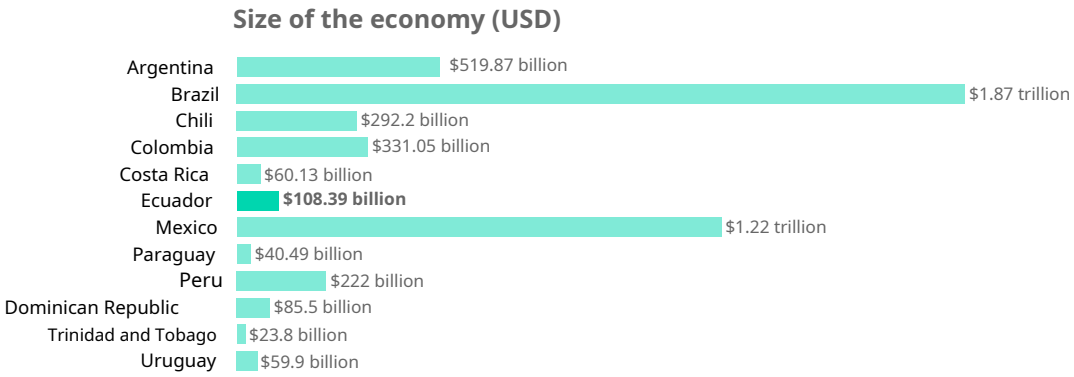
Conclusions

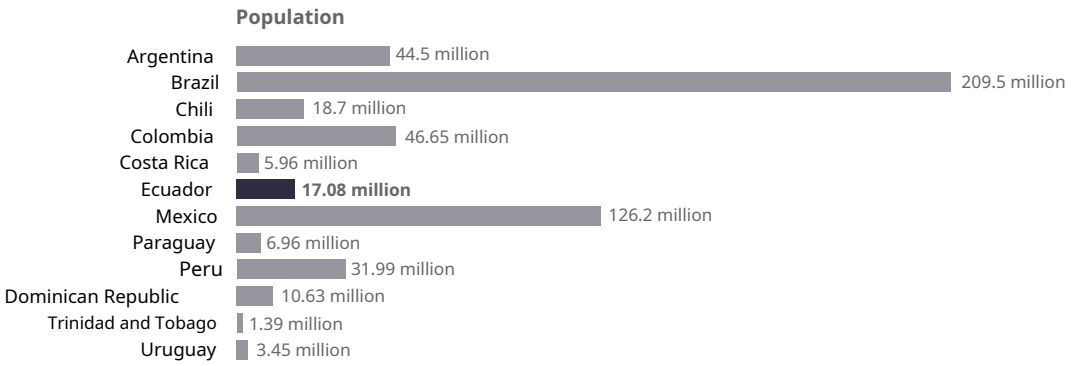
The transformation approach of Costa Rica's digital plan shows that the public sector is interested in developing new technologies. However, the AI ecosystem is still in its infancy, although there are some promising initiatives such as the fAIr LAC Costa Rica hub, which aims to become a space for experimentation for multiple actors around the application of AI use cases for social good and the provision of more effective public services.

ECUADOR

As a context to describe the current state of AI in Ecuador, Figure 12 presents a comparison of some economic, demographic, education, human development and equality indicators.

Figure 12. Basic indicators of Ecuador: comparative





Human Development Indicators

	PISA*	Fitness in English	Labour qualified	Index of development human	Coefficient of GINI
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chili	1 (1 was)	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Ecuador	**N/A**	**46.75%**	**46.6%**	**0.752**	**44.7**
Mexico	3 (1 was)	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Dominican Republic	N/A	52.3%	50.2%	0.736	45.7
Trinidad and Tobago	N/A	N/d	71.8%	0.784	40.3
Uruguay	2 (do)	54.1%	25.5%	0.804	30.5

* Position among the countries evaluated

Sources: Top panels: World Bank (2019).
Human Development Indicators (from left to right): OECD (2019); English Skills (nd); UN (2019); UNDP (2018); World Bank (2018).

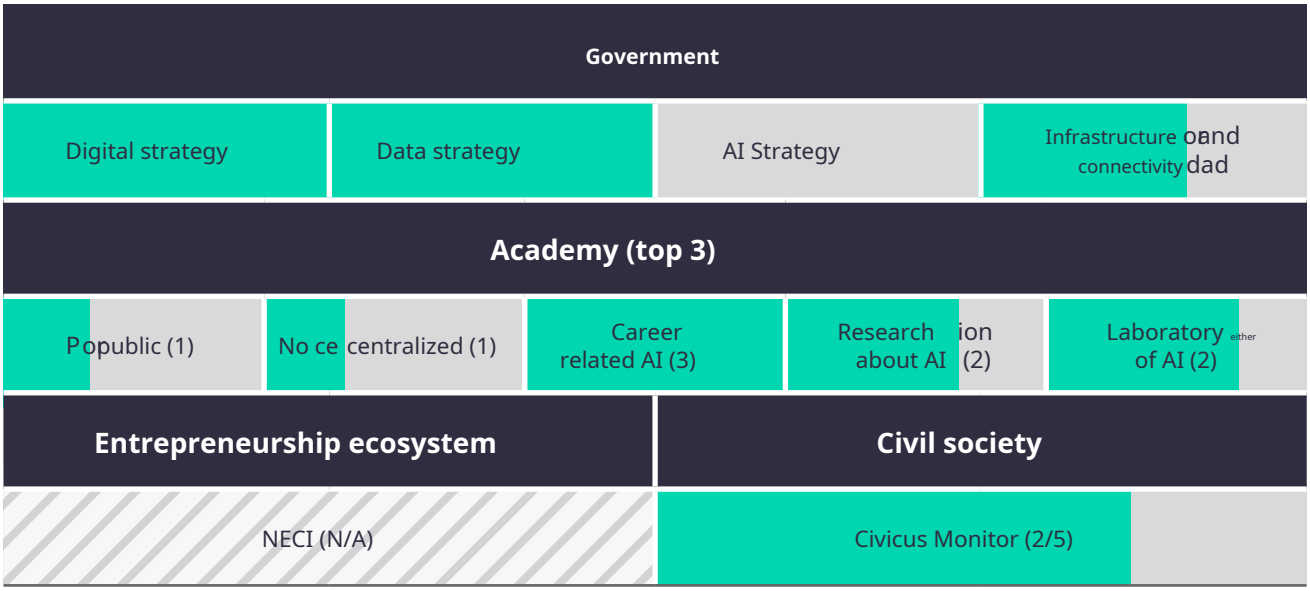
Table 24.Other socioeconomic indicators

Main economic sector *(World Bank, 2019)*	**PISA** *(OECD, 2019)*	**Gender index in science, technology, engineering and mathematics (STEM)** *(Arredondo et al., 2019)*
Energetic	nd	37%*
NEI** (World Bank, 2019)	**Civicus Monitor** (Civicus Monitor, 2019)	
nd	Conditions for action of civil society organisations: reduced (2/5)***	

*Fountain:*Own elaboration.
* Participation of female researchers in STEM areas in Ecuador (versus men).
* * National Entrepreneurship Context Index (NECI).
* * * The explanation of the indicator can be found in Annex B.

Table 25 summarizes the progress made by various sectors in Ecuador in establishing the foundations for promoting AI for the social good.

Table 25.Efforts to establish the foundations of AI in Ecuador, by sector



*Fountain:*Prepared by the authors. The indicators are in Annex B.

Government

Digital strategy: Yes

In July 2019, the "Launch of the policy to turn the country into a Digital Ecuador" was held, an initiative that seeks to lead this South American nation towards the technological forefront by promoting the democratization of telecommunications services. Within the framework of this meeting, the Ecuador Digital strategy was announced, made up of three programs: (i) Ecuador Conectado, which seeks to achieve 98% connectivity of telecommunications services by 2021; (ii) Ecuador Eficiente y Ciberseguro, whose purpose is to offer 80% of central government procedures online by 2021; and (iii) Ecuador Innovador y Competitivo, which aims to define the National Digital Transformation Agenda.

As part of this strategy, one of the objectives of the Ecuadorian government is to install 1,000 free Wi-Fi zones and promote electronic commerce to make the country an innovative and competitive place (Ecuador Digital, 2019).

Data Strategy/Open Data Portal: Yes

Within the framework of the National Electronic Government Plan 2018-2021, the Ministry of Telecommunications and Information Society of Ecuador, in coordination with the Presidency of the Republic and the National Secretariat for Planning and Development, promoted spaces for participation in which solutions are designed for citizens. From there, the National Data Policy emerged.

Ecuador is developing its own Open Data Portal[111]. At the end of 2019, it had 128 data sets from 16 organizations, and an Open Data Guide[112], a support tool to ensure that the information published by each official entity is standardized. The government has also undertaken other projects, including the creation of the BIOWEB database, which arises from the collaboration between the Secretariat of Higher Education, Science, Technology and Innovation (SENESCYT) and the Pontifical Catholic University of Ecuador to produce the largest collection of data on biodiversity in Ecuador; it currently covers nearly 470,000 national species.

AI Strategy: No

At the time of this publication, Ecuador was conducting dialogues between government, academia, industry and civil society on the importance of undertaking joint efforts for the development of AI. To this end, the International Center for Advanced Studies in Communication for Latin America (CIESPAL) held a discussion in October 2019 to publicize the progress made in incorporating AI in the fields of finance, transportation and health at the national level.

Infrastructure and connectivity

Of the 12 countries studied for this report, Ecuador is the second with the lowest internet access: 57% of the population (IDB, 2020). It is also ranked at the bottom of the World Bank's Digital Adoption Index (9 out of 12), as well as the WEF Network Availability Index (8 out of 12). This implies that it does not yet have the structural capacities necessary to adopt and develop AI-related technologies (World Bank, 2016). However, Ecuador is in the initial stage of building a framework in which these capacities can be generated, a process in which relevant actors such as civil society, academia and the private sector participate.

In the 2018 Global Cybersecurity Index of the International Telecommunication Union (ITU), Ecuador achieves a score of 0.367 out of 1, corresponding to position 14 out of 33 in the Americas and 98 out of 145 in the world.

Academy

In Ecuador, the government and academia are working together to build bridges that link AI and innovation through the National System of Science, Technology, Innovation and Ancestral Knowledge.

According to the QS World University Rankings (2019), the three best universities in the country for undergraduate degrees (Table 26) have limited offers of programs or spaces that promote the development of AI in the region. Of these three, only the Escuela Politécnica del Litoral has undergraduate, graduate, research and other programs.

111 For more information, see http://www.datosabiertos.gob.ec/

112 For more information, see http://www.datosabiertos.gob.ec/wp-content/uploads/downloads/2016/08/GuiaDatosAbiertos.pdf

tion and laboratories related to the development of technical capabilities for AI. It should be noted, however, that while the other two universities do not offer technical degrees, they do generate knowledge through research on topics relevant to AI, including those related to its ethical aspects. Two of the three universities mentioned are private and are located in Quito, the capital, while the third is public and has two additional locations: one in Guayaquil and another in Manglaralto.

Table 26.The three best universities in Ecuador and their relationship with AI*

University	# 1 San University Francis of Quito	# 2 High School Polytechnic of the Coast (ESPOL)	# 3 Pontifical University Catholic of Ecuador (PUCE)
Type of institution	Private	Public	Private
Location	Quito	Guayaquil and Mangroves	Quito
Related careers with AI	✓	✓	✓
Related Postgraduate Courses with AI	✗	✓	✗
AI Research	Only as part of the works of students' thesis and in forums**	✓	✓
AI Lab	✓	✓	✗
Laboratory of technological innovation	✗	✓	✗

*Fountain:*Prepared by the authors. Information obtained from the website of each institution.
* The Pontifical Catholic University of Ecuador (PUCE) is also among the top five in the Times Higher Education ranking (2020).
* * This university has hosted academic forums where knowledge about AI is shared.

Other relevant institutions

The International University of La Rioja-Ecuador offers a university master's degree in AI to train local talent.

The country also has non-university research centers that are partly dedicated to AI, such as the Data Analytics and AI Applied to Cybersecurity working group, and the Smart Data Analysis Systems Group (SDAS Group), founded by Professor Diego Peluffo of Yachay Tech University. Experts and researchers from various academic institutions in Ecuador, Colombia, Brazil, and Argentina converge there to research and analyze complex and time-varying data, formal methods for the development of machine learning, and sensor networks.

Efforts from the entrepreneurial ecosystem and civil society

Ecuador is ranked 91st out of 138 countries in the global ranking of entrepreneurship according to the World Economic Forum (2015). There are no visible efforts in AI for social good. There are important advances in the development of entrepreneurial culture and in the promotion of emerging technology-based companies. For example, ImpaQto, a shared workspace community, has been an important driver in the development of this entrepreneurial ecosystem.

As for civil society, science and technology are issues that figure on its list of priorities. In particular, the RED Infodesarrollo Corporation carries out actions aimed at designing mechanisms that guarantee citizens' rights of access to information technologies.

Use cases

Below is a summary table of the main AI use cases in Ecuador.

Table 27. Main AI use case in Ecuador

Name: SpeakLiz		
P*For more information:* https://www.talovstudio.com	*Year they started using AI:*2019	*SDG:*4 (quality education), 8 (decent work and economic growth) and 10 (reduction of inequalities) 
TO*actors involved:*Talov Studio		*Current status:*early stage startup
*What is proposed:*There are 290 million people with visual impairments and 470 million with hearing impairments worldwide. This initiative seeks to take advantage of the area of opportunity that exists to promote the effective and absolute inclusion of these groups with disabilities.		
D*short description of the project:*Talov offers mobile-friendly accessibility tools that help people with hearing and visual impairments increase their levels of independence in everyday tasks. The SpeakLiz app allows the user to transform sign language into speech and text in real time.		
Applications of AI	Machine learning platforms, natural language processing, image recognition, sound recognition and gesture recognition (human movements)	
How they use AI	Through image and gesture recognition, and natural language processing, the AI model translates movements into written language.	

*Fountain:*Information provided by Talov Studio for the purposes of this report (2020).

Conclusions

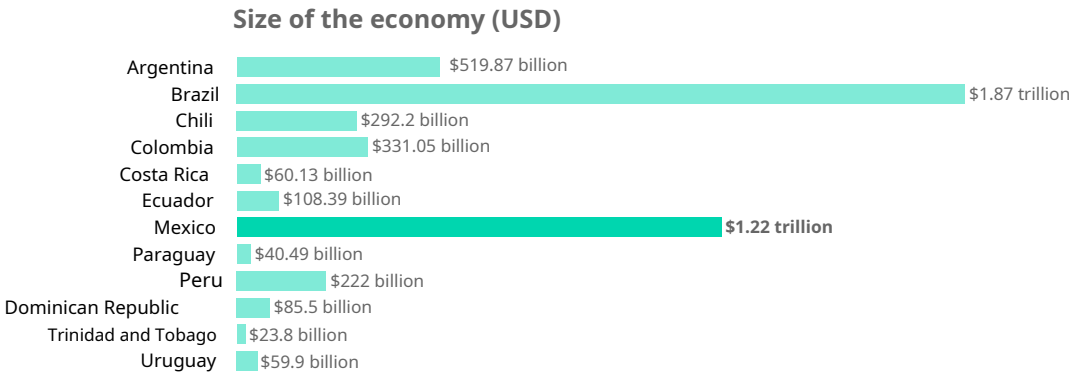
The Ecuador Digital national strategy aims to put the country at the forefront of connectivity, efficiency, cybersecurity, innovation and competitiveness. The government is interested in involving the different sectors to contribute to the digitalization of the country, supporting citizens with free internet and the business sector with incentives for electronic commerce. Within the framework of the National Open Data Policy, the country created an Open Data Portal as a result of the participation of the different sectors involved in the development of the initiative.

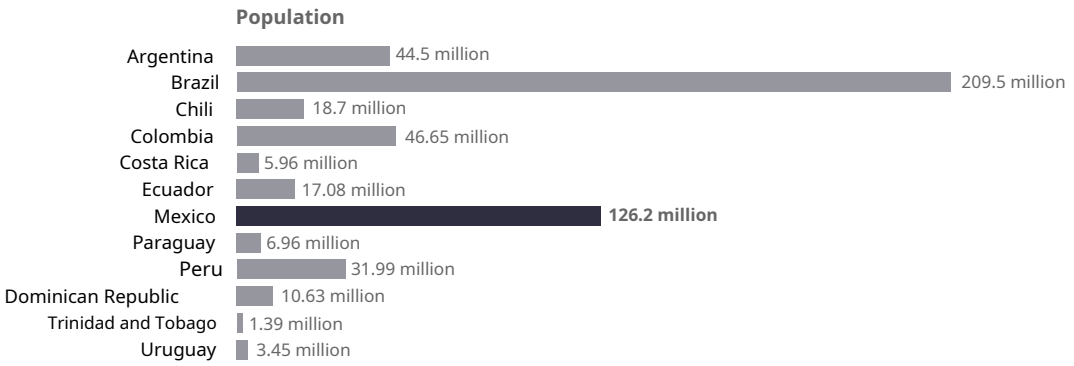
Although Ecuador's academic offering is nascent compared to other countries in the region, it is important to recognize that knowledge is generated there through research on topics relevant to AI, as well as its ethical and technical aspects. According to local experts, Ecuador is one of the LAC countries where there are difficulties in establishing and developing new ventures. There are some efforts to address them, including the Ecuador Digital program, which offers incentives and calls for all companies seeking to boost the technology sector. Ecuador's efforts in AI are incipient. The potential for leveraging this technology will depend, among other things, on improving its foundations in terms of digitalization.

MEXICO

As a context to describe the current state of AI in Mexico, Figure 13 presents a comparison of some economic, demographic, education, human development and equality indicators.

Figure 13. Basic indicators of Mexico: comparative





Human Development Indicators

	PISA*	Fitness in English	Labour qualified	Index of development human	Coefficient of GINI
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chili	1 (I was)	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3 (I was)	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Dominican Republic	N/A	52.3%	50.2%	0.736	45.7
Trinidad and Tobago	N/A	N/d	71.8%	0.784	40.3
Uruguay	2 (do)	54.1%	25.5%	0.804	30.5

* Position among the countries evaluated

Sources: Top panels: World Bank (2019).
Human Development Indicators (from left to right): OECD (2019); English Skills (nd); UN (2019); UNDP (2018); World Bank (2018).

Table 28.Other socioeconomic indicators

Main economic sector (World Bank, 2019)	**PISA** (OECD, 2019)	**Gender index in science, technology, engineering and mathematics (STEM)** (Arredondo et al, 2019)
Manufacture	3rd	32%*
NEI** (GEM, 2019)	**Civicus Monitor** (Civicus Monitor, 2020)	
5.2/10	Conditions of action of civil society organizations: repressed (4/5)***.	

*Fountain:*Own elaboration

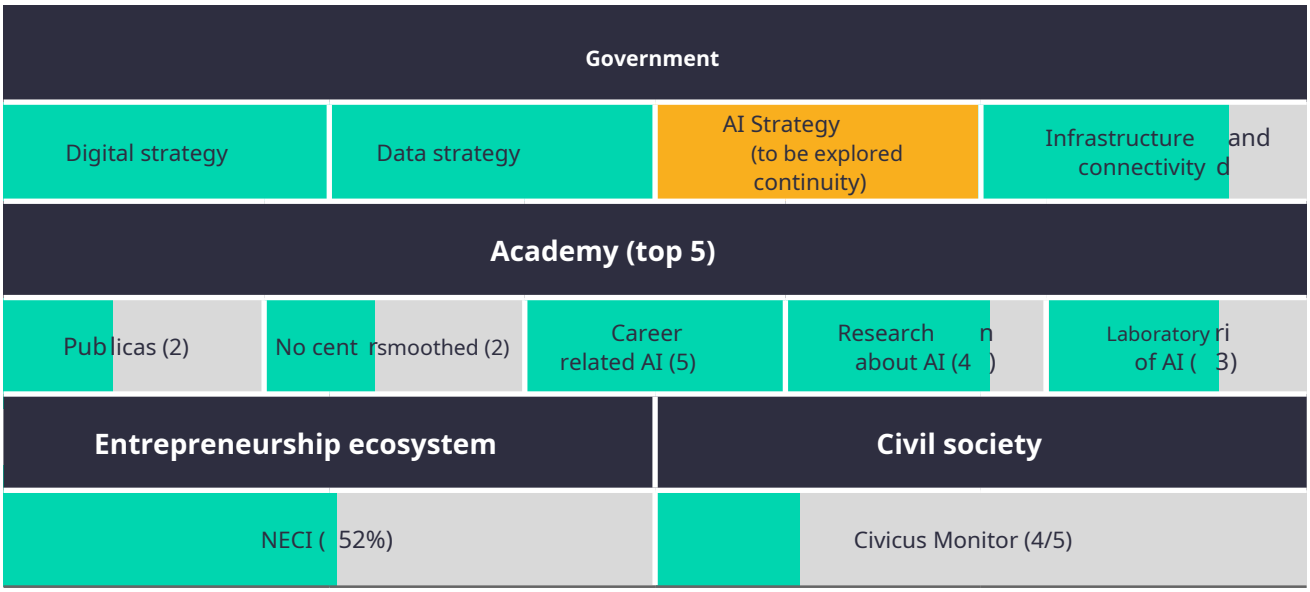
* Percentage of women working in the STEM field in the public sector.

* * National Entrepreneurship Context Index (NECI).

* * * The explanation of the indicator can be found in Annex B.

Table 29 summarizes the progress made by various sectors in Mexico in establishing the foundations for promoting AI for the social good.

Table 29.Efforts to establish the foundations of AI in Mexico, by sector



*Fountain:*Prepared by the authors. The indicators are in Annex B.

Government

Digital strategy: In progress

Mexico developed a National Digital Strategy[113](EDN) for the period 2013-2018. This was the roadmap that enabled the government to collaborate with international institutions and organizations, experts, civil society organizations, authorities from other countries, companies and citizens, in order to promote technological innovation in favor of the country's development and guide the actions of public officials in terms of digitalization (National Digital Strategy: We Transform Mexico, 2018).

The following were the five main objectives of the EDN 2013-2018: (i) government transformation, (ii) digital economy, (iii) educational transformation, (iv) universal and effective health, and (v) civic and social innovation.

113 For more information, see https://www.gob.mx/mexicodigital/

citizen participation. To achieve these objectives, the government proposed five enabling instruments: (i) open data, (ii) legal framework, (iii) interoperability and digital identity, (iv) inclusion and digital skills, and (v) connectivity. Three main indicators were used to monitor progress on the objectives set out in this strategy:Network Availability Indexof the World Economic Forum, the number of internet users as reported in the ENDUTIH(National Survey on Availability and Use of Information Technologies in Homes) and theICT Development Index[114] of the International Telecommunication Union (ITU).

Although the 2019-2024 administration has maintained the EDN Coordination in an office attached to the Presidency of the Republic, it has not yet announced the development of a new digital transformation agenda. However, there are some efforts that point towards a democratization of connectivity to close the digital divide in the country. The Secretariat of Telecommunications and Transportation (STC), based on Art. 9 of the Federal Law of Telecommunications and Broadcasting (LFTR), stated that "[p]olicies and programs for universal coverage and social coverage must be planned, established, implemented and conducted" in accordance with the 2019 Social Coverage Program. The latter was created precisely for the purpose of identifying communities with high and very high risk of digital marginalization to provide network, telecommunications and radio frequency services.

Data Strategy/Open Data Portal: Yes

In 2015 the government signed the International Open Data Charter[115], thereby reaffirming its commitment to adopt them and to promote both transparency and accountability. Based on the above, and as part of the EDN (2012-2018), an Open Data Portal was created[116]where 40,727 data sets from 280 government institutions are currently housed.

Although the 2019-2024 Administration is in arrears in defining the follow-up and direction towards a national open data policy, in 2019 it announced the launch of Data México, an initiative promoted by the Ministry of Economy that provides the opportunity to have better public data and design economic policy based on evidence.

Likewise, some local governments have promoted open data initiatives. One example is Mexico City with the Digital Agency for Public Innovation (ADIP) (2018-2024), and previously with the Laboratory for the City (2012-2018), the first space for civic innovation at the local level in the region. Other states, including Jalisco, have also made significant efforts in the same direction.

AI Strategy: Ongoing

Based on the EDN, in 2018 the Mexican government presented the first draft of the 2018 MX AI Strategy[117]with a view to laying the foundations for its development in the country. This is how Mexico became one of the top ten nations where the public sector[118]has implemented actions to advance the development of AI (Martinho-Truswell et.al., 2018).

114 For more information, seehttps://www.itu.int/es/ITU-D/Statistics/Pages/default.aspx

115 For more information, seehttps://www.gob.mx/mexicodigital/acciones-y-programas/carta-internacional-de-datos-abiertos

116 For more information, seehttps://datos.gob.mx/

117 For more information, seehttps://www.gob.mx/mexicodigital/articulos/estrategia-de-inteligencia-artificial-mx-2018

118 The strategy envisages five main tasks: (i) developing an appropriate governance framework to foster multi-sector dialogue by creating an AI Subcommittee within the Inter-Secretarial Commission for the Development of Electronic Government (CIDGE); (ii) mapping uses and needs in the industry and identifying best practices in government; (iii) submitting to public consultation the recommendations made in the report "Towards an AI Strategy in Mexico: Taking Advantage of the AI Revolution" prepared by C Minds and Oxford Insights and commissioned by the British Embassy in Mexico; and (v) working with experts and citizens through the AI Subcommittee to ensure the continuity of these efforts during the next administration.

In addition to the diagnostic document, the Coordination of the National Digital Strategy (CEDN), in collaboration with the Digital Government Unit of the Secretariat of Public Function and the AI Subcommittee of the Intersecretarial Commission of Electronic Government, developed, launched for broad consultation and published the General Principles and the Impact Analysis Guide for the development and use of systems with elements of artificial intelligence in the Federal Public Administration in Mexico.[119], the first country in LAC to make an effort of this kind.

Based on the recommendations made in the aforementioned national AI strategy, and seeking the continuity of these efforts, in mid-2018 more than 10 institutions created the multisectoral coalition IA2030Mx[120]. This is an alliance made up of professionals, academic institutions, established and emerging companies, public agencies and other key players in the digital and AI ecosystem in Mexico, with the aim of carrying out concrete actions in this field. The first activity consisted of carrying out the first National AI Survey, which was attended by more than 1,500 people. They are currently working on the formulation of a new proposal for a National AI Strategy organized into six working groups by topic: (i) ethics; (ii) governance, government and public services; (iii) research and development; (iv) skills, capabilities and education; (v) data, digital infrastructure and cybersecurity; and (vi) Mexicans abroad. These groups are co-led by renowned institutions, including the UNAM Center for Complexity Sciences, the Center for Mathematics Research (CIMAT), C Minds, the Scientific and Technological Advisory Forum (FCCyT), the Plenum Group, the Federal Institute of Telecommunications (IFT), the Ministry of Economy (2018-2024), the Ministry of Foreign Affairs (2018-2024), and the Mexican AI Society (SMIA). The result of this collaborative work of more than 180 members of the coalition, coordinated by C Minds, is expected by mid-2020 (Gómez-Mont, Martínez Pinto, & Del Pozo, 2019).

Among the relevant efforts at the state level, the AI agenda developed by the Government of Jalisco stands out, the first in the country —and one of the first subnational governments in LAC— to have an AI department for the use of this technology with a focus on government innovation.

Infrastructure and connectivity

In Mexico, 66% of the population has access to the Internet (UNESCO, 2019). Although efforts are still needed to expand coverage and offer this service to a greater number of inhabitants, the country is already working on the bidding for frequencies to launch 5G services by the end of 2020 (Jaimovich, 2019).

The World Bank's Digital Adoption Index gives Mexico a score of 60.11, placing it seventh out of the 12 countries considered here. The same is true of the World Economic Forum's Network Readiness Index: seventh out of the 12 considered here and 76th out of the 139 countries in the world that are part of this ranking. Although Mexico does not yet have all the structural capabilities to take advantage of the opportunities offered by ICTs, current efforts, as well as those outlined in this document, promise to drive development in this field to achieve greater technological capabilities in the coming years.

Mexico is currently making efforts to reduce the digital divide and facilitate greater coverage and connectivity for citizens. Among these efforts is the recent creation of the Federal Electricity Commission (CFE) Telecommunications and Internet for All, a new government company that aims to achieve connectivity for the entire country.[121]On the other hand, although Mexico City, along with the states of Jalisco, Nuevo León and Querétaro are among those that are formulating

119 The general principles document and the impact analysis guide strengthen IT governance in the federal government and provide a framework for reference for the analysis of the different systems used in the public sector for the management of social programs, policy design and provision of services to people, among others. For more information, see Innova Mx, n.d.https://www.gob.mx/innovamx/articulos/guia-de-analisis-de-impacto-para-el-desarrollo-y-uso-de-sistemas-basadas-en-inteligencia-artificial-en-la-apf

120 For more information, seehttps://www.ia2030.mx/

121 For more information, seehttps://www.cfe.mx/CFETelecom/Paginas/default.aspx

In addition to its own connectivity strategies, the country must address the challenge of making technology and network access affordable for the majority of citizens. According to a survey conducted by GSMA (2018) for Latin America, around 30% of people without an Internet connection surveyed in several countries — including Mexico— said that the price of equipment and services constitutes a barrier to their adoption (Connected Society: digital inclusion in Latin America and the Caribbean, 2016).

In the area of cybersecurity, the country obtains a score of 0.629/1 in the 2018 Global Cybersecurity Index of the International Telecommunication Union (ITU), which places it in 4th place out of 33 in the Americas and 63rd out of 145 in the world.

Academy

In Mexico, both the educational offer and the research in areas related to the development of AI are broad. Among the academic strengths is the capacity of universities to absorb a large number of students in free programs offered by institutions such as the National Institute of Technology of Mexico (TecNM), made up of 266 institutions in the 32 states of the Republic; the National Autonomous University of Mexico (UNAM); and the National Polytechnic Institute (IPN). All of them have headquarters or research centers in different parts of the country. As for private education, in recent years the offer of degrees and postgraduate programs in branches such as data science and specializations in AI has expanded significantly.

Table 30 lists the top five universities in Mexico according to the QS World Ranking at the undergraduate level (2019).

Table 30. The five best universities in Mexico and their relationship with AI*

University	# 1 National Autonomous University of Mexico (UNAM)	# 2 Technological Institute of Higher Studies of Monterrey (ITESM)	# 3 Anahuac University Mexico	# 4 National Polytechnic Institute (IPN)	# 5 Technological Institute Self-employed Mexico (ITAM)
Type of institution	Public	Private	Private	Public	Private
Location	City of Mexico and Area Metropolitan	Headquarters throughout the country**	State of Mexico and City from Mexico	Headquarters throughout the country***	City of Mexico
Racing related with AI	✓	✓	✓	✓	✓
Postgraduate studies related with AI	✓	✓	✓	✓	✓
Investigation about AI	✓	✓	✓	✓	✗
Laboratory of AI	✓	✓	✗	✓	✗
Laboratory of innovation technological	✓	✓	✓	✓	✓

Fountain: Prepared by the authors. Information obtained from the website of each institution.

* UNAM and ITSEM also appear among the top five in the Times Higher Education ranking (2020).

* * State of Mexico, Sinaloa, Puebla, San Luis Potosi, Saltillo, Queretaro, Monterrey, Laguna Coahuila, Irapuato, Hidalgo, Guadalajara, Cuernavaca, Ciudad Obregon, Ciudad Juarez, Mexico City, Chihuahua, Chiapas, Aguascalientes, North Sonora, Tampico, Toluca, Zacatecas, Morelia, Leon and Veracruz.

* * * Leon, Zacatecas, Hidalgo, Tlaxcala, Queretaro, Tijuana, Mexico City, Campeche, Cancun, Culiacan, Mazatlan, Mochis, Morelos, Oaxaca, Reynosa and Tampico.

Other relevant institutions

The National Council of Science and Technology (CONACYT) is a public and autonomous body within which there is a consortium[122] specialized in promoting AI research and implementation projects. In addition, Mexico has the Artificial Intelligence Research Center (CIIA) of the Universidad Veracruzana, one of the oldest (founded in 1994). There is also the Mexican Society of Artificial Intelligence (SMIA), which is responsible for various publications and coordinates the Annual Mexican International Congress of Artificial Intelligence (MICAI), and the Mexican Academy of Computing (AMEXCOP), which focuses especially on AI research. Finally, the National Institute of Astrophysics, Optics and Electronics (INAOE) offers a specialized postgraduate course in which the current and future uses of AI are explored.

On the other hand, there is the Center for Research and Advanced Studies (CINVESTAV)[123], a Mexican public institution specialized in the development of science and technology, and in research and training in postgraduate STEM. It had the first AI program in the country in 1981. In turn, the CentroGeo[124], is a public research entity integrated into the CONACYT system dedicated to scientific research, the training of high-level academics, and technological development and innovation focused on geospatial information sciences. Likewise, the Center for Scientific Research and Higher Education of Ensenada (CICESE) stands out.[125], in Baja California, is a regional entity that is organized into research groups in the areas of parallel and distributed computing; image processing and vision; scientific computing; process engineering, and *software* and artificial intelligence. It is worth mentioning that Mexico has a developed program to promote supercomputing, with facilities at the Autonomous University of Puebla and CINVESTAV-IPN, among other places. It has also recently established state AI research centers, one in Jalisco and another in Yucatán. It also has efforts such as the AI center at the Tecnológico de Monterrey.

For all the above reasons, Mexico's academic sector is considered one of the most advanced in artificial intelligence in Latin America.

Efforts from the entrepreneurial ecosystem and civil society

The Mexican AI entrepreneurship ecosystem has boomed in recent years. Among the most notable startups are Prosperia Labs, Artificial Nerds, Quantum Labs and other established companies such as Nearshore Solutions, Bluemessaging and Territorium Life. All of them offer different types of services aimed, in some cases, at the efficiency and automation of processes, and in others, at solving social challenges using AI systems.

Although Mexican impact entrepreneurs share similar challenges to those of the rest of the region, they have also taken advantage of the growing interest in the benefits of this technology, as well as the existence of better-articulated communities of practice. There are also social organizations such as The Data Pub, a community focused on data science, AI.Saturdays and From Zero to Data Science, groups based in Guadalajara that work on training specialized talent and that work closely with entrepreneurs in search of articulating projects of greater scope.

A notable example of these collaborative efforts between sectors is the signing of an agreement between the Ministry of Foreign Affairs and the National Autonomous University of Mexico (UNAM), whose purpose is to develop AI-driven solutions in favor of vulnerable migrant communities. Another of

122 For more information, see https://www.consorcioia.mx

123 For more information, see https://www.cinvestav.mx/

124 For more information, see https://www.centrogeo.org.mx/

125 For more information, see https://www.cicese.edu.mx/

One of UNAM's relevant projects is to set up an AI laboratory with the support of Microsoft.

Local-level efforts include the Global Shapers Mexico City Hub's AI Perception Survey; the WEF Youth Community, which explored and identified examples of AI initiatives for social good;[126]; and TalentLand[127], a consortium made up of the government of the State of Jalisco and various allies (universities, local governments, industry, civil society), based in Guadalajara and which since 2017 has brought together more than 60,000 young talents each year in a week of talks, hackathons, and conferences about the use of emerging technologies such as AI.

Examples of AI for social good include the work of organizations such as C Minds[128], a women-led institution dedicated to innovation that seeks to accelerate the positive impact of new technologies in Mexico and the region. C Minds has been promoting AI initiatives for social good since 2017. She was an institutional co-author of the study[129]which led to the development of the national AI strategy by the Federal Administration 2013-2018, and co-founded the National AI coalition in Mexico, IA2030Mx, and the first AI center for social good in the country (fAIr Jalisco), together with the IDB Group, the Government of Jalisco and the Tecnológico de Monterrey, among other initiatives. It has also developed tools, guides and regulatory frameworks for the responsible use of AI in Mexico and other LAC countries.

Organizations such as SocialTic, Article 19, R3D: Network in Defense of Digital Rights and the NGO Derechos Digitales have played a central role in defending data privacy, protecting and promoting rights in digital environments, and discussions on ethical issues, including the opportunities and challenges arising from facial recognition technologies.

Use cases

Below is a summary table of the main AI use cases in Mexico.

Table 31.Main AI use cases in Mexico

Name: Support for workers and migrants		
For more information: http://www.saiph.org/ http://infrarural.com/	*Year they started using AI:* 2007	*SDG:*1 (end of poverty), 4 (quality education), 8 (decent work and economic growth) and 9 (industry, innovation and infrastructure) 
*Actors involved:*DLP Laboratory, National Autonomous University of Mexico (UNAM), Ministry of Foreign Affairs (SRE), Infrarural (project), Gabilooo Digital Consulting		*Current status:*academic project with government support in consolidation stage
*What is proposed:*Addressing the lack of updated labor skills in rural migrant and worker populations with a view to making them part of the Fourth Industrial Revolution.		

126 Through an analysis of 28 cases, it was established that the AI ecosystem for the public good is at a very early stage in Ciudad Mexico: around 60% of the projects have been in place for less than a year. It was also determined that the main barriers to developing these initiatives have been the lack of financial resources focused on social good, and the limited availability and access to quality data that form the basis of intelligent systems.

127 For more information, seehttps://www.talent-land.mx/

128 For more information, seehttp://www.cminds.co

129 For more information, seehttps://docs.wixstatic.com/ugd/7be025_ba24a518a53a4275af4d7ff63b4cf594.pdf

Brief description of the project: Smart tools are designed to guide rural workers and migrants in developing their digital and creative skills so that they can access well-paid jobs on the Internet that will not be automated in the near future. These tools are used to introduce workers to tasks they will perform on the Internet to acquire certain digital skills while earning a salary. This ensures that the rural worker or migrant can earn a living while learning.	
Applications of AI	Natural language processing, deep learning platform, decision making, machine learning platforms, virtual agents.
How they use AI	Use AI to identify the best sequence of micro-jobs on the internet to help workers and migrants advance in the development of their digital skills and thus access better salaries.

Fountain: Information provided by UNAM for the purposes of this report (2020).

Name: CEDO Intercultural

For more information: cedo.org	*Year SDGs started:* 13 (climate action) *use AI:* 2017 
Actors involved: Department of Marine and Coastal Sciences of the Autonomous University of Baja California Sur, Udall Center for Public Policy Studies of the University of Arizona and the Department of Marine Ecology of the Center for Scientific Research and Higher Education of Ensenada	*Current status:* NGO in consolidation stage
What is proposed: Mitigating the impact of climate change on marine life.	
Brief description of the project: CEDO's platform allows for the analysis of available information on climate change to determine how the media frames this science and the adaptation strategies of coastal states in Mexico. This is done in order to provide decision-makers in resource management with an overview of the level of understanding and acceptance of the information by local fishermen, given the influence that these reports have on the development and application of policies.	
Applications of AI	Machine learning, *hardware* optimized with AI, emotion recognition.
How they use AI	To train and build the topic models, CEDO uses natural language processing. It also applies Latent Dirichlet Allocation (LDA), an unsupervised machine learning approach in which no information is provided on how articles should be classified and no ensemble pre-interpretations are applied to identify groups of words that can be considered as frames, but rather relies on the co-occurrence of words. The trained model is included in a dashboard that presents the results of the study in graphical form and allows it to be used to classify additional texts.

Fountain: Information provided by CEDO for the purposes of this report (2020).

Name: Doc.com		
P*For more information:* doc.com	*Year they started using AI:* 2012	*SDG:*3 (health and well-being), 4 (quality education), 5 (gender equality), 10 (reduction of inequalities) 
*Actors involved:*Doc.com (formerly Docademic)		*Current status:*early stage startup
*What is proposed:*Facilitate access to health services.		
D*short description of the project:*Doc.com is an online platform that quickly and efficiently resolves patient queries through its "medical advice" product. With this tool, any type of query can be resolved by consulting a health professional without necessarily having to undergo a full medical consultation. Doc.com offers medical guidance and psychological support services to the Spanish-speaking world. To date, it has served more than 250,000 people.		
Applications of AI	Virtual Agents,*hardware*optimized with AI, decision making, deep learning, emotion recognition, marketing automation.	
How they use AI	Using recommendation systems—an AI technology—patient input is used to compare it with databases and make medical diagnoses.	

*Fountain:*Information provided by Doc.com for the purposes of this report (2020).

Name: Unima		
For further information: www.unimadx.com	*Year they started using AI:* 2016	*SDG:*3 (health and well-being), 8 (work and economic growth) and 11 (sustainable cities and communities) 
*Actors involved:*Unima		*Current status:*early stage startup
*What is proposed:*Addressing the lack of access to medical services.		
*Brief description of the project:*Unima developed a low-cost device that allows doctors, nurses and healthcare workers to diagnose diseases directly at the point of care in less than 15 minutes and for the cost of USD 1 per test.		
Applications of AI	Machine learning, image recognition and neural networks	
How they use AI	AI algorithms are used in a mobile app that is part of the diagnostic tests conducted in the field. The test, performed with a drop of blood, starts with a biochemical reaction that takes place in a paper-based microfluidic device, which reports a visual reaction that is evaluated in the app through image analysis algorithms and convolutional neural networks. These suggest a final decision based on the diagnostic result of the test.	

*Fountain:*Information provided by Unima for the purposes of this report (2020).

Conclusions

Mexico is a benchmark for the development and implementation of AI for the social good in the region. Although the country still faces significant challenges in terms of connectivity and is lagging behind in taking advantage of opportunities for the development of a digital society, it has the necessary foundations to accelerate the adoption of new technologies, while addressing the task of closing gaps in access and the development of technical and socio-emotional skills. In this regard, the current administration has made bridging the digital divide a priority, and has announced policies to accelerate and guarantee the inclusion of the entire population in the digital age.

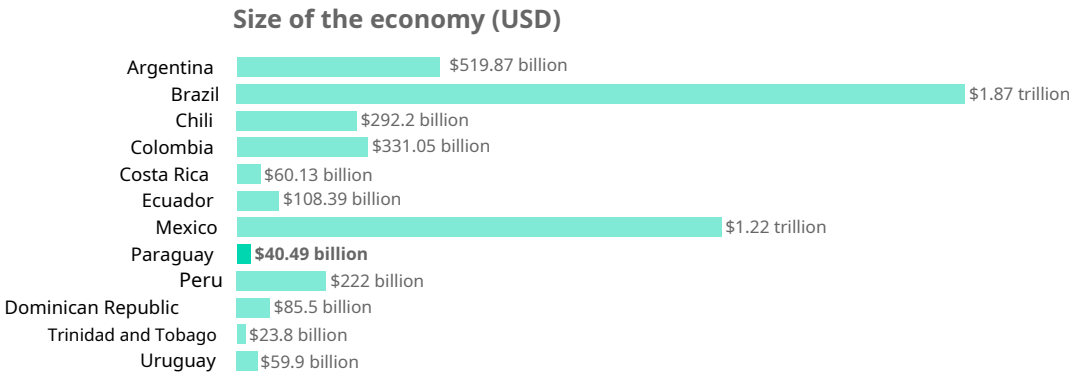
The three great allies of the country's digital transformation are academia, the entrepreneurial ecosystem, and civil society. It is evident that Mexico has a very wide range of degrees, postgraduate courses, campuses, programs, laboratories, and research centers that offer training in topics related to AI. Thanks to this, research on these topics is prolific and there are collaborative initiatives with the business sector, and also with the federal and local governments. In Mexico, there is also a culture of entrepreneurship that is consolidating. From there, innovative solutions to social challenges are being explored in a collaborative manner with those civil society organizations that seek to take advantage of new tools to expand their impact.

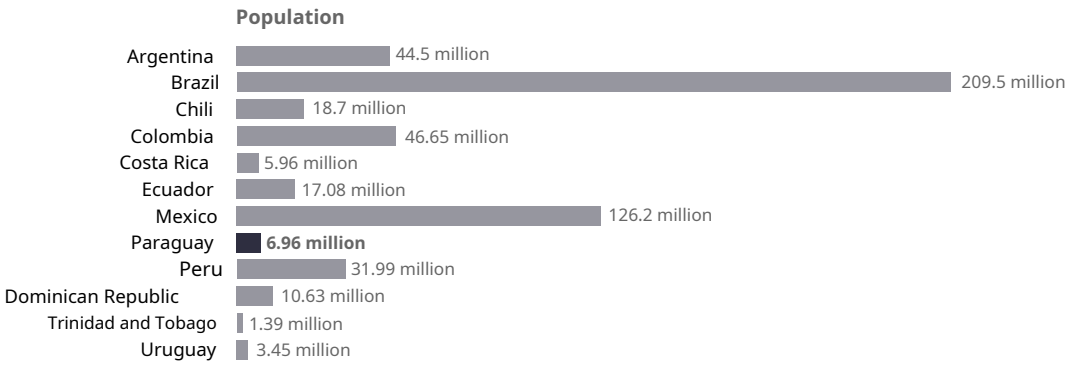
Although Mexico still has several challenges to overcome, it is a fertile country for materializing the promise of AI in the service of social good, as is happening in other more digitally mature countries in LAC.

PARAGUAY

As a context to describe the current state of AI in Paraguay, Figure 14 presents a comparison of some economic, demographic, education, human development and equality indicators.

Figure 14. Basic indicators of Paraguay: comparative





Human Development Indicators

	PISA*	Fitness in English	Labour qualified	Index of development human	Coefficient of GINI
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chili	1 (1 was)	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3 (1 was)	48.99%	40%	0.774	48.3
Paraguay	**N/A**	**52.51%**	**43.8%**	**0.702**	**48.8**
Peru	N/A	50.22%	83.6%	0.750	43.3
Dominican Republic	N/A	52.3%	50.2%	0.736	45.7
Trinidad and Tobago	N/A	N/d	71.8%	0.784	40.3
Uruguay	2 (do	54.1%	25.5%	0.804	30.5

* Position among the countries evaluated

Sources: Top panels: World Bank (2019).
Human Development Indicators (from left to right): OECD (2019); English Skills (nd); UN (2019); UNDP (2018); World Bank (2018).

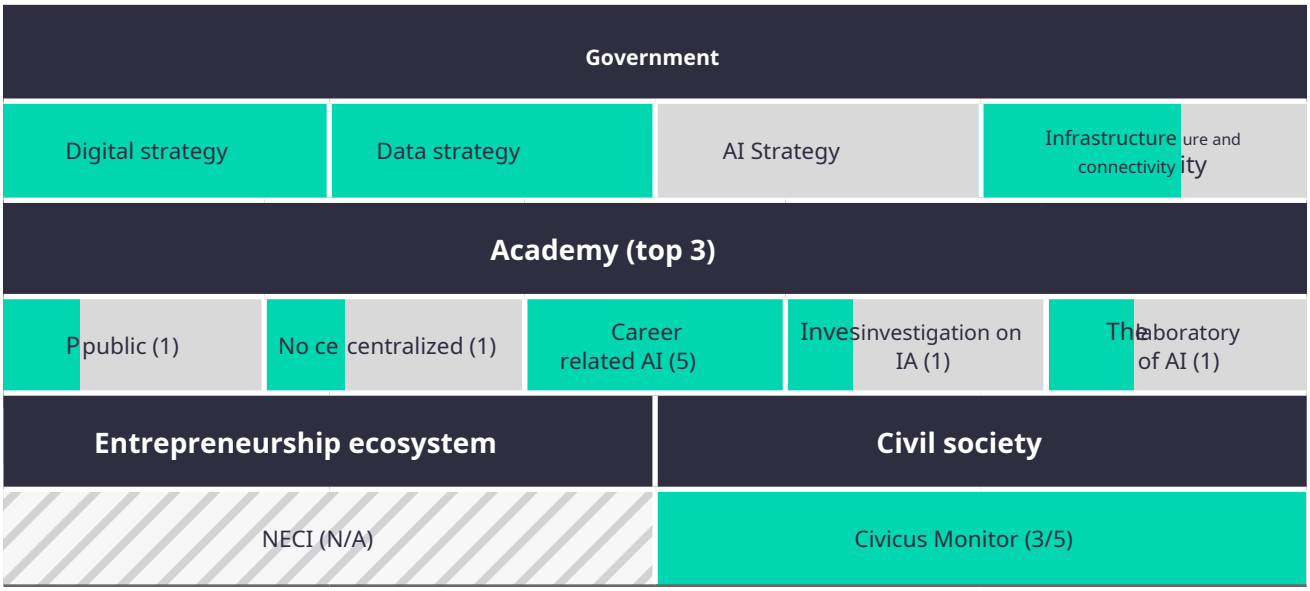
Table 32.Other socioeconomic indicators

Main economic sector (World Bank, 2019)	**PISA** (OECD, 2019)	**Gender index in science, technology, engineering and mathematics (STEM)** (Arredondo et al., 2019)
Agriculture	nd	55%*
NEI** (GEM, 2019)	**Civicus Monitor** (Civicus Monitor, 2020)	
nd	Conditions for the action of civil society organisations: obstructed (3/5)***	

*Fountain:*Own elaboration.
* Participation of women researchers in Paraguay in STEM areas (versus men).
* * National Entrepreneurship Context Index (NECI).
* * * The explanation of the indicator can be found in Annex B.

Table 33 summarizes the progress made by various sectors in Paraguay in establishing the foundations for promoting AI for the social good.

Table 33.Efforts to establish the foundations of AI in Paraguay, by sector



*Fountain:*Prepared by the authors. The indicators are in Annex B.

Government

Digital strategy: Yes

Paraguay received advice from the IDB to develop and structure its Digital Agenda[130], which aims to increase its competitiveness in the global arena through technological transformation. The Digital Agenda, approved in 2018, includes four priority components: connectivity, digital government, digital economy and institutional strengthening (Digital Agenda Support Program, 2018).

130 For more information, see https://www.mitic.gov.py/application/files/9115/5113/6051/Press_Transformacion_Digital.pdf

Data Strategy/Open Data Portal: Yes

Through the Data Portal[131], citizens have simple, free and dynamic access to open government data sets. The objective of this portal is to promote transparency and citizen participation. The portal has 181 data sets published by 31 government institutions and has been used to develop 16 applications[132]For its development, the government was advised by the Democracy and Governance Program of the United States Agency for International Development (USAID) and by the Center for Environmental and Social Studies (CEAMSO) (Center for Environmental and Social Studies, 2016).

AI Strategy: No

Although the Paraguayan government does not yet have a roadmap to develop AI in the country, the Ministry of Information and Communication Technologies, established in 2018, has organized a series of activities to promote this technology, including the IAckathon[133]—version of the InnovandoPy Hackathon —, whose theme was the use of AI as a catalyst for solutions for State services or those of high social value so that they can be incorporated into public management.

Infrastructure and connectivity

Paraguay ranks second to last among the countries studied for this report in the World Bank's Digital Adoption Index and also in the WEF's Network Readiness Index (11 out of 12). It should be noted, however, that as a result of the actions taken to improve in this area, Paraguay has achieved that 65% of its population has access to the Internet (World Bank, n.d.).

In terms of the conditions for the development of ICTs, Paraguay is the LAC country with the greatest lag in terms of the availability of infrastructure for such technologies (GSMA, 2016). It is also among those with the least broadband coverage, ahead only of Venezuela, Honduras, Haiti and Cuba.

In terms of network technologies, according to the World Economic Forum's Network Availability Index, Paraguay ranks last among the 12 countries considered in this report, and 105th out of 139 in the world. Hence, the development of technologies such as AI is an important area of opportunity for the country. In terms of cybersecurity, the International Telecommunication Union (ITU), in its 2018 Global Cybersecurity Index, gives the country a score of 0.603/1, placing it 5th out of 33 in the Americas and 66th out of 145 in the world.

Academy

Neither the QS World University Rankings nor the Times Higher Education consider Paraguay in their lists of universities, so it was decided to include the three best universities cited by uniRank (2020). Of these three (Table 34), only the National University of La Asunción (UNA) appears as a major player in the development of national AI.

131 For more information, seehttps://datos.gov.py/

132 Applications include: Ministry of Education and Culture furniture inventory, Public servant search engine, Tool Search for the infrastructure requirements of the institutions prioritized by the MEC MicroPlanning, Paraguayan Post Office, and the Search Tool for public money assigned and executed in any State entity, among others.

133 For more information, seehttps://hackathon.innovando.gov.py/IAckathon-2019

Table 34.The three best universities in Paraguay and their relationship with AI

University	# 1 National University of Assumption	# 2 Autonomous University from Asuncion	# 3 Catholic University Our Lady of the Assumption
Type of institution	Public	Private	Private
Location	Assumption	Assumption	Assumption, Incarnation, East City, Villarrica, Conception, Carapegua, Saint Ignatius, Colonel Oviedo, Peter John Gentleman
Racing related to the AI	✓	✓	✓
Postgraduate studies related to the AI	✓	✓	✗
Research on AI	✓	✗	✗
AI Lab	✓	✗	✗
Laboratory of innovation technological	✓	✗	✗

*Fountain:*Prepared by the authors. Information obtained from the website of each institution.

UNA students have been known for developing applied AI projects. For example, the winning group of the InnovandoPY Hackathon used AI in traffic cameras to identify motorcyclists without helmets, generate statistics on the matter, and formulate traffic policies. Another group designed FI-Bot, which has the ability to recognize facial emotions through AI using artificial vision techniques and a trained neural network (Mechatronics Engineering Students from La Fiun, 2019). One team designed Mecatronco-Móvil, a vehicle for children with mobility limitations that, thanks to the incorporation of AI into its system, can operate in two modalities: remote control or facial recognition. Other applications developed by students incorporated AI technologies to classify pain levels by interpreting facial expressions, creating a high-precision medical tool (Universidad Nacional de Asunción, 2018).

For its part, the UNA School of Engineering has organized relevant events such as the First International Workshop on Advanced Computing and AI, an initiative aimed at forging collaborations between institutions in the United Kingdom and Latin American countries that are part of the international collaborative experiment DUNE (Deep Underground Neutrino Experiment). Through its Distributed Systems Laboratory, this school also encourages innovation among its students with programs and internships, including one on "Image processing in horticultural products applied to a hydroponic greenhouse." The main lines of research were three: precision agriculture, AI, and distributed systems. The applications focused on hydroponic fertigation, greenhouse automation, image processing through artificial vision and neural networks, and processing of meteorological and environmental data tabulated in a database, among others.

Other relevant institutions

Paraguay's National Council for Science and Technology (Conacyt) has a specialized area for technological research (CEMIT). In 2019, more than 90 R&D projects were selected for a value of more than USD $6 million. Meanwhile, the Program to Support the Development of Science, Technology and Innovation (PROCIT) was designed with IDB financing to promote research projects and to strengthen technological innovation and the National Innovation System of Paraguay.

Efforts from the entrepreneurial ecosystem and civil society

In 2019, Paraguay ranked 125th and 160th (out of 190 countries) in ease of doing business (EODB) and ease of starting a business (EOSB) respectively (World Bank, 2019). These indicators are below average compared to other countries in the region. However, Paraguay is creating incentives to boost entrepreneurship, including the Tigo Conecta Award for medium and large companies; the Citi Microentrepreneur Award, for micro and small companies; and the Tourism and Technology Award of the First National Entrepreneurs Competition 'Tourism and Technology'.

There are also events and platforms that, while not focused on AI, are fostering innovation in the digital economy in general. Such is the case of Digital Bank Asunción[134], an innovation and technology event in financial services and FinTech, and incubation programs such as Challenger Paraguay. On the platform side, there is I-lab Paraguay[135], promoted by the IDB to develop social innovations for the country's most pressing challenges (early childhood education, mobility and transportation, among others) with the participation of civil society, government and industry.

Use cases

Below is a summary table of the main AI use cases in Paraguay.

Table 35. Main AI use cases in Paraguay

Name: Layers against inequality			
For further information: layers.hemav.com		*Year they started using AI:* 2017	*SDG:* 1 (end of poverty), 2 (zero hunger), 4 (quality education), 8 (decent work and economic growth) 
Actors involved: MSDA, HEMAV, Kress Group			*Current status:* consolidated company project
What is proposed: Provide technical support to small farmers and rural farming communities.			
Brief description of the project: Using different tools, the Layers application allows Frutika (a Kress Group company) to monitor the small farmers who sell their crops to them, providing them with technical support and obtaining samples from a single tree to estimate the size and quality of their production.			
Applications of AI	Machine learning platforms, *hardware* AI-optimized, decision-making, deep learning platform.		
How they use AI	They use a database that predicts which activities will generate good agricultural practices to optimize the production of small farms.		

Fountain: Information provided by the MSDA Group for the purposes of this report (2020).

134 For more information, see http://www.digitalbankla.com/proximos-eventos/paraguay/

135 For more information, see http://ilabparaguay.org/

Name: ParaEmpleo		
For more information: paraempleo.mtess.gov.py	*Year they started using AI:* 2017	*SDG:* 1 (end of poverty), 5 (gender equality), 8 (decent work and economic growth) and 10 (reduction of inequalities) 
Actors involved: Government of Paraguay through the Ministry of Labor, Employment and Social Security and Janzz Technologies with the IDB Labor Markets Division		*Current status:* public sector program in consolidation stage
What they propose: Facilitate job insertion.		
D*short description of the project:* ParaEmpleo is a national job placement platform that streamlines job searches and staff selection by matching supply and demand in the labor market.		
Applications of AI	Cognitive worker assistance, Natural language processing, Decision making, Deep learning platform, Machine learning platform, Natural language generation, Natural language recognition	
How they use AI	Algorithms analyse data and suggest the best possible match for candidates and companies. AI helps generate standardised, categorised and usable information in real time, quickly and efficiently, by any member of the institution according to their role and access to this data.	

Fountain: Information provided by the Ministry of Labor, Employment and Social Security for the purposes of this report (2020).

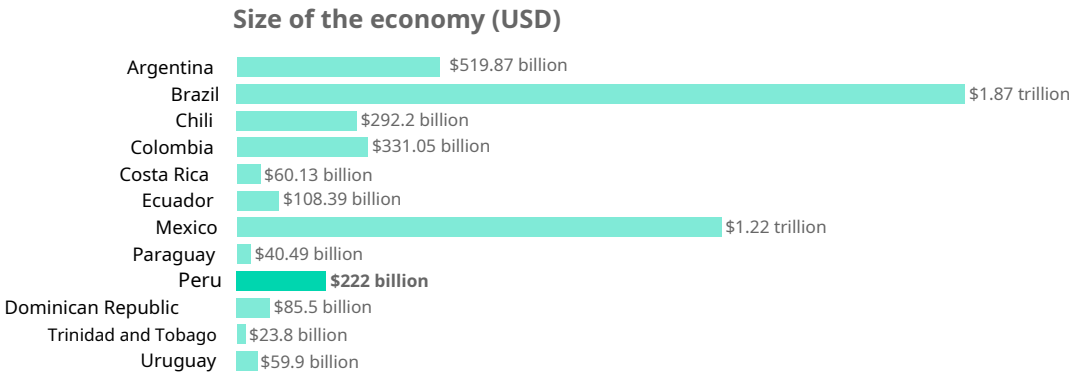
Conclusions

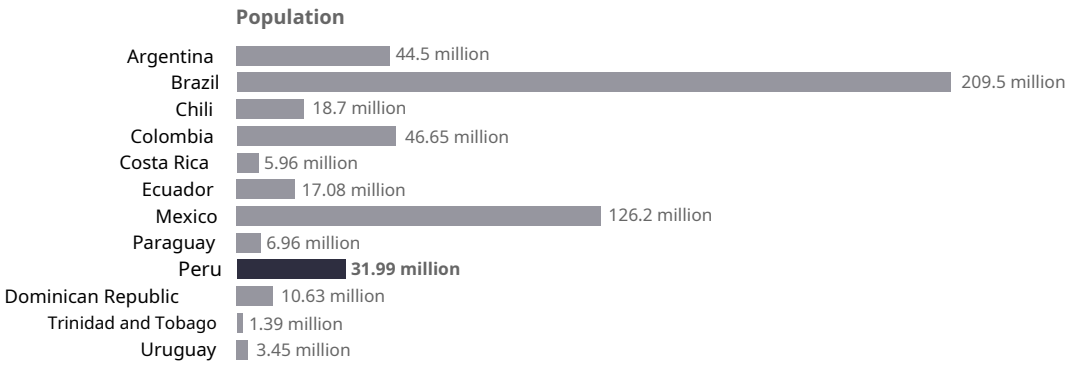
Although Paraguay has a digital strategy and an open data portal, one of its greatest challenges remains the lack of connectivity and investment in infrastructure to promote the use and exploitation of ICTs. For its part, academia has promoted relevant efforts aimed at promoting the strengthening of STEM fields through, for example, hackathons, events and publications in popular magazines. There is educational offering in careers related to AI, although the government is behind in promoting the creation of research centers and prioritizing the use of new technologies such as AI. The support of institutions such as the IDB and the participation of the private sector in the development and adoption of AI is crucial to promote projects and research in this area, as shown in the use cases studied.

PERU

As a context to describe the current state of AI in Peru, Figure 15 presents a comparison of some economic, demographic, education, human development and equality indicators.

Figure 15. Basic indicators of Peru: comparative





Human Development Indicators

	PISA*	Fitness in English	Labour qualified	Index of development human	Coefficient of GINI
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chili	1 (1 was)	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3 (1 was)	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	**N/A**	**50.22%**	**83.6%**	**0.750**	**43.3**
Dominican Republic	N/A	52.3%	50.2%	0.736	45.7
Trinidad and Tobago	N/A	N/d	71.8%	0.784	40.3
Uruguay	2 (do)	54.1%	25.5%	0.804	30.5

* Position among the countries evaluated

Sources: Top panels: World Bank (2019).
Human Development Indicators (from left to right): OECD (2019); English Skills (nd); UN (2019); UNDP (2018); World Bank (2018).

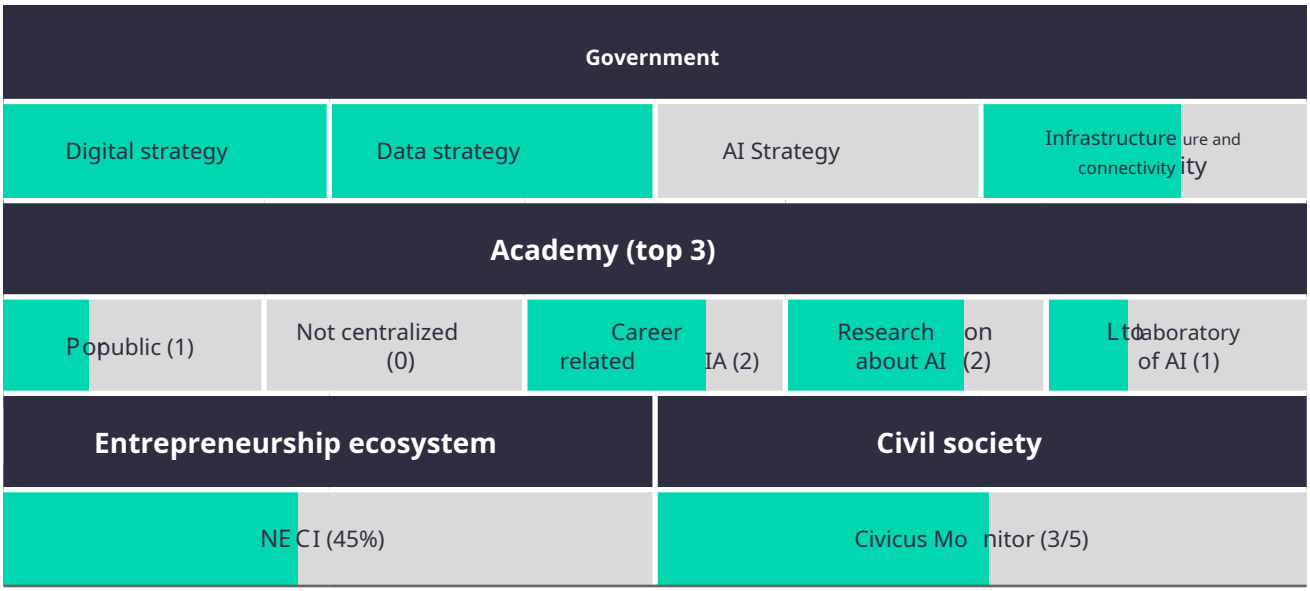
Table 36.Other socioeconomic indicators

Main economic sector (World Bank, 2019)	**PISA** (OECD, 2019)	**Gender index in science, technology, engineering and mathematics (STEM)** (CONCYTEC, 2016)
Agriculture	Above the average of the 12 countries.	31.9%*
NEI** (GEM, 2019)	**Civicus Monitor** (Civicus Monitor, 2019)	
4.5/10	Conditions for the action of civil society organisations: obstructed (3/5)***	

*Fountain:*Own elaboration.
* National Census of Research and Development at research centers of 2015 (CONCYTEC, 2016).
* * National Entrepreneurship Context Index (NECI).
* * * The explanation of the indicator can be found in Annex B.

Table 37 summarizes the progress made by various sectors in Peru in establishing the foundations for promoting AI for the social good.

Table 37.Efforts to establish the foundations of AI in Peru, by sector



*Fountain:*Prepared by the authors. The indicators are in Annex B.

Government

Digital strategy: Yes

Given the digital divide between urban and rural areas, the Government of Peru developed the Digital Agenda in 2006[136]It was established there that Peru would direct its public policy actions, in an intersectoral manner, towards the penetration and massification of ICTs.

The country is currently making efforts to develop a new digital strategy. In 2017, the Secretariat of Digital Government was created[137], an organization that leads the processes of technological innovation and trans-

136 For more information, see https://www.peru.gob.pe/AgendaDigitalPeru/pdf/CODESI%20-%20Presentacion.pdf

137 For more information, see https://www.gob.pe/7025-presidencia-del-consejo-de-ministros-secretaria-de-gobierno-digital

digital training of the State, manages its digital platforms and acts as the governing body of the National Information Technology System.

Since its creation in 2018, activities have been initiated aimed at developing the guidelines for the formulation of the Digital Government Plan (PGD)[138]The latter includes a diagnosis of the current situation of digital government in the country, its objectives, the projects that will be carried out within the framework of its powers and the methodology for preparing the document.

Data Strategy/Open Data Portal: Yes

In 2017, the National Strategy for Open Government Data of Peru was published[139], whose purpose is to promote innovation to generate public value through the use of open data, and at the same time contribute to the economic and social development of the country. It also seeks to strengthen citizen participation, as well as innovation, collaboration and improvement of public services within the framework of an open government.

Among other things, the strategy includes the creation of the National Open Data Portal.[140], which offers educational materials and guidelines that ensure the homogeneity of data presentation, including the Open Government Data Model, the Guide for the Opening of Government Data, the Instructions for the Registration of Datasets and the Guidelines for the Metadata Structure. This portal was recognized by the OECD, along with those of Mexico and England, as one of the easiest to access for citizens, facilitating the management and services provided by the State (Economista América, 2019).

Currently, the Open Data Portal allows the consultation of 1,551 data sets from 1,386 government entities.

AI Strategy: No

At the time of preparing this report, Peru did not have a national AI strategy.

Infrastructure and data

The population has little access to the Internet: only 53% of Peruvians have it (UNESCO, 2019). Likewise, the Digital Adoption Index indicates that Peru is at 55%, which implies that it is halfway towards a widespread adoption of digital technologies (World Bank, 2016).

According to the Network Availability Index, the country is ranked 10 out of 12 considered for this report, only ahead of the Dominican Republic and Paraguay.

Regarding the development of the infrastructure needed to provide a greater percentage of the population with more and better access to the Internet and the use of new technologies, Peru is planning to start a process to tender spectrum in the 700 MHz and 3.5 GHz bands for the purpose of adopting 5G networks (Jaimovich, 2019).

Peru has a score of 0.401/1 in the International Telecommunication Union (ITU) 2018 Global Cybersecurity Index, ranking 12th out of 33 countries in the Americas and 95th out of 145 in the world.

138 For more information, seehttps://www.peru.gob.pe/normas/docs/Anexo_I_Lineamientos_PGD.pdf

139 For more information, seehttps://www.peru.gob.pe/estrategia.pdf

140 For more information, seehttps://www.datosabiertos.gob.pe/

Academy

Table 38 includes the top three universities in Peru according to the QS World University Rankings (2019). Of these, two offer a variety of degrees and postgraduate courses that train students in understanding and managing technologies associated with AI.

Table 38.The three best universities in Peru and their relationship with AI*

University	# 1 Pontifical University Catholic University of Peru (PUCP)	# 2 National University Mayor of San Marcos	# 3 Peruvian University Cayetano Heredia (UPCH)
Type of institution	Private	Public	Private
Location	Lime	Lime	Lime
Racing related with AI	✓	✓	✗
Postgraduate studies related with AI	✓	✓	✗
Investigation about AI	✓	✓	✗
Laboratory of AI	✓	✗	✗
Laboratory of innovation technological	✓	✓	✓

*Fountain:*Prepared by the authors. Information obtained from the website of each institution.
* The Pontifical Catholic University of Peru also appears among the top five in The Times Higher Education ranking (2020).

Other relevant institutions

In addition to the research conducted by the three universities mentioned above, the country has KapAITech, a group of researchers working in the field of AI to improve the quality of life of society. The principal investigator is Dr. Luis Aguilar from the National University of Piura and the main areas of study include machine learning (supervised and unsupervised), deep learning (with generative models) and privacy of artificial intelligence (KapAITech, 2019).

Another important institution is Laboratoria[141], a Peruvian educational startup that trains and specializes women in socio-emotional skills, web development, and UX design. For almost six years, and with more than 1,300 graduates in Mexico, Ecuador, Peru, Chile, and Brazil, Laboratoria has contributed to reducing gender gaps in the field of technology.

Efforts from the entrepreneurial ecosystem and civil society

The latest data on competitiveness show that Peru maintains its position among the top places among the 12 countries selected for this investment report: it ranks 76th in terms of ease of doing business and 133rd in terms of ease of starting a business among the 190 countries considered by the World Bank in its 2019 study.

There are various incentives such as the LEC (Business Leaders of Change) entrepreneurship and innovation award from the EY company and the Everis Foundation awards, which focus on promoting small businesses and making entrepreneurs visible (Everis Awards, 2018). The government also has

141 For more information, seehttps://www.laboratoria.la/

with a platform called Business Creativity[142] which serves as an incubator and accelerator, seeking to promote innovation at a national level. However, one of the main challenges mentioned in the Global Entrepreneurship Monitor (GEM) (2019) is the low level of innovation in its ventures and the low impact they have on the development of Peru.

One of the initiatives that strengthen entrepreneurship and the innovation ecosystem in Peru is Innóvate Perú[143], a program that co-finances business innovation, entrepreneurship and strengthening projects for ecosystem actors, in addition to carrying out other activities such as workshops, events and calls for proposals.

The country stands out in the field of FinTech. In 2019, more than 120 startups were registered in this sector, many of which are in advanced stages and have managed to access investment or global competitions to accelerate their growth. Some of these startups are Quantum Talent (AI, data intelligence, education), Crehana (e-learning, EdTech), Bitinka and Keynua, among others.

The TechCrunch platform confirmed that in 2019 a new record was set in terms of the amount of capital invested in Peruvian startups, which amounted to nearly USD $11 million, that is, 24% more than in 2018. Most of these resources were allocated to the FinTech (47%) and EdTech (37%) sectors.

Among civil society organizations, initiatives such as Data Science Research Peru stand out,[144] a non-profit organization that seeks to disseminate, democratize and decentralize knowledge in data science and artificial intelligence by creating opportunities for new talents through events (DataScience Day, Kaggle Days, PyData Lima and PyCon Peru), workshops and research.

Use cases

Below is a summary table of the main AI use cases in Peru.

Table 39. Main AI use cases in Peru

Name: MIDIS - Early detection of anemia		
For more information: http://www.upch.edu.pe/bioinformatic/anemia/app/	*Year they started using AI:* 2018	*SDG:* 3 (health and well-being), 10 (reduction of inequalities) 
Actors involved: AYNI LAB of the Ministry of Development and Social Inclusion, Peruvian University Cayetano Heredia and Ministry of Production		*Current status:* Government project in consolidation stage
What is proposed: Facilitate access to quality health services for children.		
Brief description of the project: MIDIS is an application used for the rapid and timely detection of anemia in children in a non-invasive manner. It consists of a portable, easy-to-use and low-cost system for the diagnosis of anemia based on the evaluation of the characteristics of the eyelid conjunctiva without the need for a doctor to be present.		
Applications of AI	Machine learning platforms, image recognition.	
How they use AI	The health personnel in charge takes a photograph of the minor's ocular conjunctiva and sends it to a neural network system that processes the image to determine the hemoglobin level and, therefore, the presence or absence of anemia.	

Fountain: Information provided by the Social Innovation Laboratory of the Ministry of Development and Social Inclusion of Peru for the purposes of this report (2020).

142 For more information, see https://creatividadempresarial.upc.edu.pe/

143 For more information, see https://www.innovateperu.gob.pe/

144 For more information, see https://www.datascience.pe/

Name: IRBin		
For more information: https://www.facebook.com/CIRSYSPeru https://www.instagram.com/irbin.pe/	*Year they started using AI:* 2018	*SDG:* 9 (industrial, innovation and infrastructure), 11 (sustainable cities and communities) and 12 (responsible production and consumption) 
Actors involved: Cirsys and the Government of Peru		*Current status:* emerging company in consolidation stage
What is proposed: IRBin seeks to educate and raise awareness about the importance of recycling, given that in Peru 23,000 tons of garbage are generated every 24 hours but only 3% of Peruvians separate their waste daily, which generates a loss of resources and collection time.		
Brief description of the project: Cirsys developed IRBin, the first social robot for recycling in Peru. The robot, almost two meters tall, is a waste container that interacts with users in a playful way every time waste is deposited in it, seeking to educate them on how to separate it. It also provides information related to the amount of waste accumulated there and the users who recycle with it, allowing companies to make sound decisions regarding their commercial waste management strategies. One in three people uses IRBin again.		
Applications of AI	Decision making and image recognition.	
How they use AI	IRBin uses algorithms to intelligently sort the waste deposited in the bin, thus automating the process. Since the information is stored in an online database, each IRBin robot contributes to the massification of the information obtained, which allows for the generation of more precise adaptive models.	

Fountain: Information provided by Cirsys for the purposes of this report (2020).

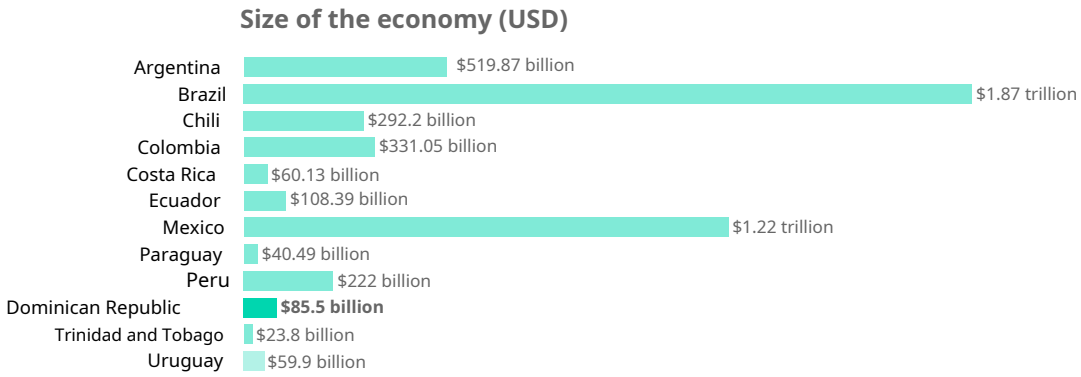
Conclusions

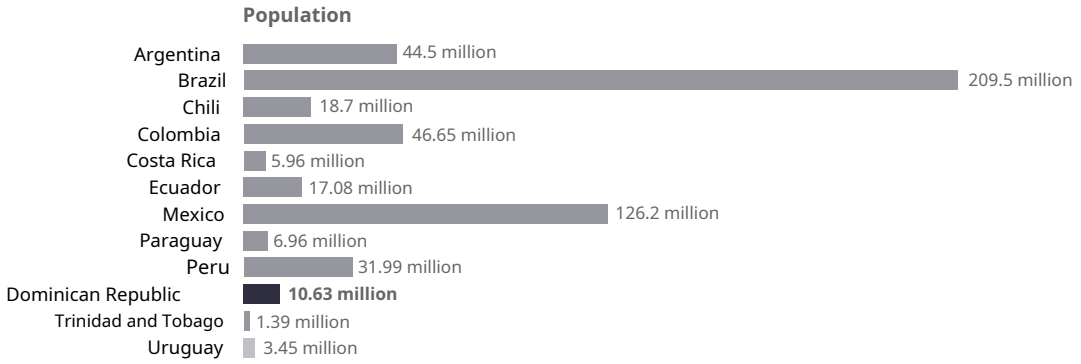
In order to use digital tools for the economic and social improvement of Peru, its government has committed to the digitalization of the country through the development of a Digital Agenda and a National Strategy for Open Government Data. The Secretariat of Digital Government has created an Open Data Portal that, in addition to facilitating the management of State services, allows for more transparent and efficient processes. In the academic field, the three best universities in the country have technology and innovation laboratories. Although Peru has not yet formulated an AI strategy at the national level, the entrepreneurial sector and civil society have promoted a series of ambitious and promising initiatives focused on talent training, reducing digital gaps and taking advantage of new technologies such as AI applied to public health and the environment.

DOMINICAN REPUBLIC

As a context to describe the current state of AI in the Dominican Republic, Figure 16 presents a comparison of some economic, demographic, education, human development and equality indicators.

Figure 16. Basic indicators of the Dominican Republic: comparative





Human Development Indicators

	PISA*	Fitness in English	Labour qualified	Index of development human	Coefficient of GINI
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chili	1 (I was)	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3 (I was)	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Dominican Republic	**N/A**	**52.3%**	**50.2%**	**0.736**	**45.7**
Trinidad and Tobago	N/A	N/d	71.8%	0.784	40.3
Uruguay	2 (do)	54.1%	25.5%	0.804	30.5

* Position among the countries evaluated

Sources: Top panels: World Bank (2019).
Human Development Indicators (from left to right): OECD (2019); English Skills (nd); UN (2019); UNDP (2018); World Bank (2018).

Table 40. Other socioeconomic indicators

Main economic sector (World Bank, 2019)	**PISA** (OECD, 2019)	**Gender index in science, technology, engineering and mathematics (STEM)** (Arredondo et al., 2019)
Tourism	Above the average of the twelve countries	39%*
NEI** (GEM, 2019)	**Civicus Monitor** (Civicus Monitor, 2020)	
4.6/10	Conditions for action of civil society organisations: reduced (2/5)***	

Fountain: Own elaboration.

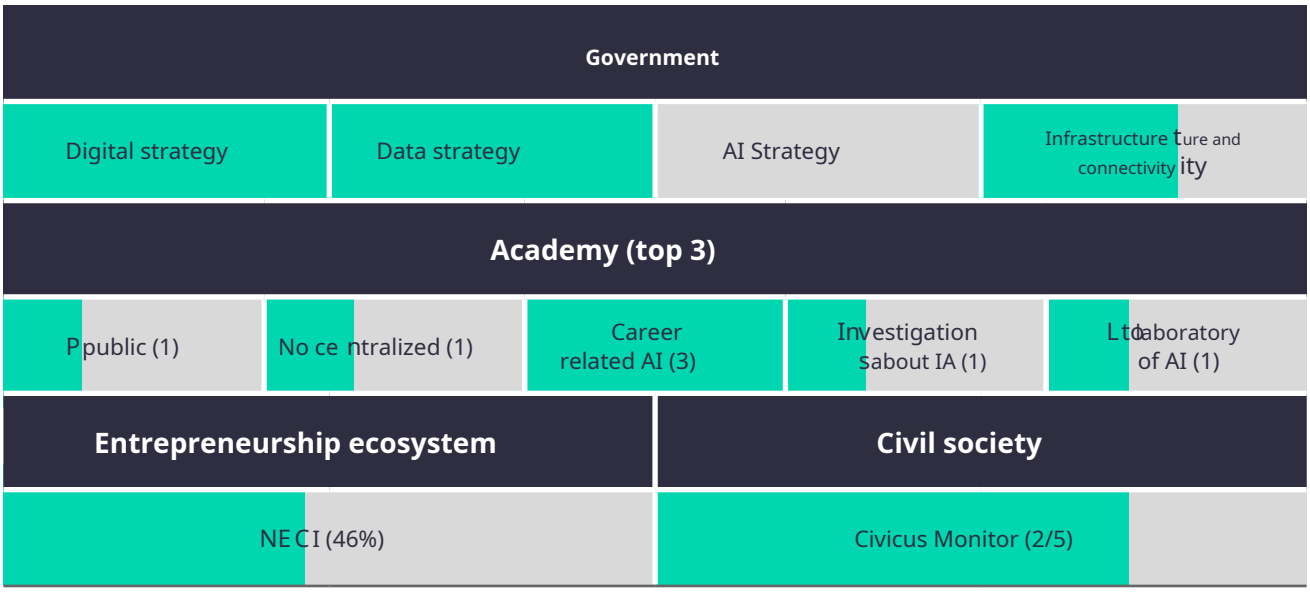
* STEM degree gap (female graduates from STEM fields in proportion to male graduates), 2016.

* * National Entrepreneurship Context Index (NECI).

* * * The explanation of the indicator can be found in Annex B.

Table 41 summarizes the progress made by various sectors in the Dominican Republic in establishing the foundations for promoting AI for the social good.

Table 41. Efforts to establish the foundations of AI in the Dominican Republic, by sector



Fountain: Prepared by the authors. The indicators are in Annex B.

Government

Digital strategy: Yes

The Digital Agenda 2016-2020[145] It covers a set of lines of action aimed at generating the necessary conditions to implement a development and innovation model through ICT. Its objectives are to increase competitiveness, the use of technology, government transparency and employment options, as well as to reduce poverty and provide better services through a digital government and an open data portal.

145 For more information, see https://www.siteal.iiep.unesco.org/sites/default/files/sit_accion_files/do_0352.pdf

The Digital Agenda consists of five main axes: (i) infrastructure and access; (ii) e-government and digital services; (iii) capacity building; (iv) productive development and innovation; and (v) enabling environment. It also has two cross-cutting axes: cybersecurity and social inclusion. Each axis has its own list of indicators to measure the progress of each goal.

Data strategy/open data portal: Yes

The Open Data Portal[146] is the official platform of the Dominican Republic. The website is a unified repository of institutional publications in open formats. This tool aims to enable users to convert data into reusable information and take advantage of different public databases. It also aims to promote the development of applications, both from public administration and from civil society. The portal has 722 data sets from 195 entities.

AI Strategy: No

At the time of writing this article, the government of the Dominican Republic did not have a national AI strategy.

Infrastructure and connectivity

The percentage of the Dominican population with access to the Internet in 2018 was 75% (UNESCO, 2018). In turn, the Digital Adoption Index is 50%, while the Network Availability Index is 42%, pointing to an opportunity in infrastructure issues, a key element to promote connectivity.

Although income inequality is one of the biggest obstacles to reducing the digital divide in LAC, the Dominican Republic is one of the seven countries in the region that are above the affordability threshold for mobile connectivity services (GSMA, 2016). This is evident both at the government level and at the ecosystem level, since in the digital adoption indices of the public sector, as well as of the actors in general, the Dominican Republic is at the bottom of the list of countries studied in this report (GMSA, 2016).

In terms of cybersecurity, the Dominican Republic ranks tenth out of 33 countries in the Americas and 92nd out of 145 in the world, according to the 2018 Global Cybersecurity Index of the International Telecommunication Union (ITU), which gives it a score of 0.430 out of 1 in this aspect.

Academy

Although there is some higher education offerings related to AI, postgraduate options are still limited, as is research on the topic in specialized centers. However, there are some promising initiatives such as the collaboration between the Technological Institute of Santo Domingo and the IDB to open the Laboratory of Innovation and Territorial Intelligence for Dominican Cities (RD – LAB). This seeks to promote the opening of data, accelerate innovative ideas, create linking tools for these and promote the scaling of the laboratory itself (Laboratory of Innovation and Territorial Intelligence for Dominican Cities, 2017). The project has the support of other actors such as the Ministry of Industry, Commerce and MIPyMES (MICM); the Council for the Development of Santiago (CDES) and the Corporación Zona Franca Santiago (CZS); and the Mancomunidad del Gran Santo Domingo (MGSD). For their part, the respective municipalities are supporting the initiative through the Dominican Federation of Municipalities (FEDOMU) and the Dominican Municipal League (LMD).

Since the QS World University Ranking does not include the Dominican Republic in its list of universities, it was decided to include in Table 42 the three best universities cited by Última Hora (2017).

146 For more information, see https://datos.gob.do/

Table 42.The three best universities in the Dominican Republic and their relationship with AI*

University	# 1 Pontifical University Catholic Mother and Teacher	#2 Santo Domingo Technological Institute	#3 Autonomous University of Santo Domingo
Type of institution	Private	Private	Public
Location	Santiago de los Gentlemen	Santo Domingo	Santo Domingo
Racing related to AI	✓	✓	✓
Postgraduate studies related to AI	✗	✗	✗
Research on AI	✓	✗	✗
AI Lab	✓	✗	✗
Laboratory of innovation technological	✓	✓	✗

*Fountain:*Prepared by the authors. Information obtained from the website of each institution.

* Breaking News (2017)

Other relevant institutions

In addition to the aforementioned universities, the Technological Institute of the Americas (ITLA) offers a diploma in AI, while the Institute for Innovation in Biotechnology and Industry (IIBI) —specialized in agricultural technology research and innovation— explores the use of emerging technologies, including AI.

Efforts from the entrepreneurial ecosystem and civil society

The entrepreneurial ecosystem of AI for social good is incipient in the Dominican Republic. Some initiatives are beginning to emerge, such as GENIA, which seeks to promote the development of AI centers in the country and at a regional level.[147]The GENIA organization also encourages young Dominicans to acquire the necessary skills to articulate the local AI ecosystem with the development of the corresponding agenda.

Among the initiatives of civil society in the Dominican Republic, the effort of the Dominican Society of AI (SODIA) stands out.[148]Founded in 2014 by a group of professors, students and collaborators, SODIA is a non-profit scientific institution dedicated to the study, research and dissemination of AI as a scientific-technological discipline. This society seeks to contribute to the creation of an AI ecosystem in the Dominican Republic by organizing local events and collaborating with international associations such as the*Association for the Advancement of Artificial Intelligence*, the C*added Artificial Intelligence Association*, the Spanish AI Association, the Mexican AI Society and the Argentine AI Association.

147 For more information, seehttps://www.lagenia.org/republica-dominicana

148 For more information, seehttp://www.soccdia.org/

Conclusions

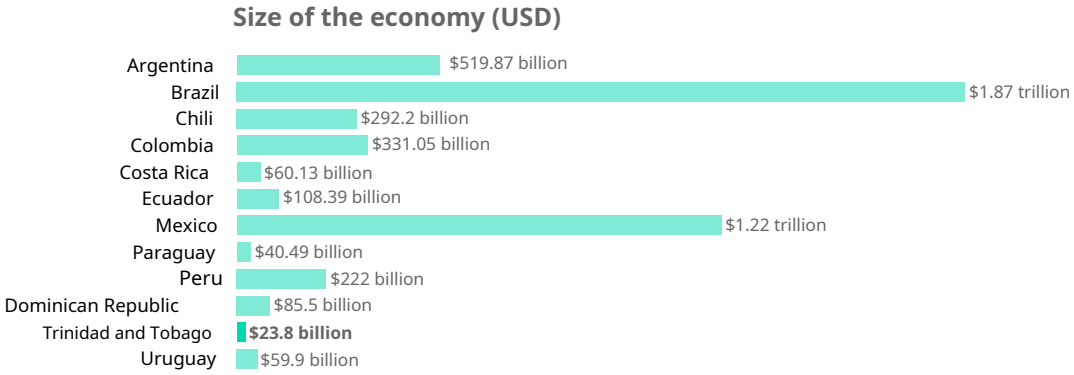
The Digital Agenda 2016-2020 is one of the first steps towards the adoption of AI in the Dominican Republic. Although it does not yet have an institutional AI strategy, the Caribbean nation has a data protection law and an open data portal, two elements that, together with the high percentage of widespread access to the Internet (75%), constitute a solid base for moving towards the use of this new technology. Its main universities offer courses related to AI, which will help in the development of capacities in that area.

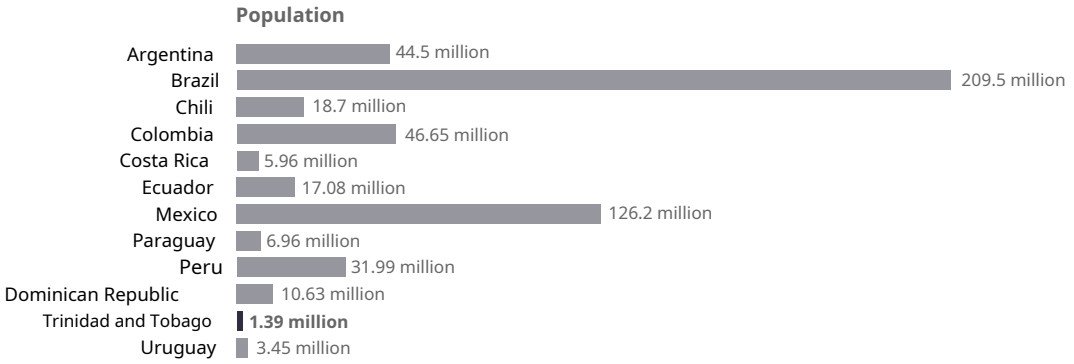
Thanks to a culture of entrepreneurship and investment in infrastructure, it is possible for the private sector and start-ups to play a central role in the development and adoption of AI, which in turn can be leveraged as a tool to strengthen mechanisms that contribute to mitigating the shortcomings of the most vulnerable groups. This will be possible to the extent that different sectors collaborate and the support of international organizations continues.

Trinidad and Tobago

As a context to describe the current state of AI in Trinidad and Tobago, Figure 17 presents a comparison of some economic, demographic, education, human development and equality indicators.

Figure 17. Trinidad and Tobago's Core Indicators: Comparative





Human Development Indicators

	PISA*	Fitness in English	Labour qualified	Index of development human	Coefficient of GINI
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chili	1 (1 was)	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3 (1 was)	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Dominican Republic	N/A	52.3%	50.2%	0.736	45.7
Trinidad and Tobago	**N/A**	**N/d**	**71.8%**	**0.784**	**40.3**
Uruguay	2 (do)	54.1%	25.5%	0.804	30.5

* Position among the countries evaluated

Sources: Top panels: World Bank (2019).
Human Development Indicators (from left to right): OECD (2019); English Skills (nd); UN (2019); UNDP (2018); World Bank (2018).

Table 43.Other socioeconomic indicators

Main economic sector (World Bank, 2019)	**PISA** (OECD, 2019)	**Gender index in science, technology, engineering and mathematics (STEM)** (Arredondo et al., 2019)
Energetic	nd	nd
NECI* (GEM, 2019)	**Civicus Monitor** (Civicus Monitor, 2020)	
nd	Conditions for action of civil society organisations: networks (2/5)**	

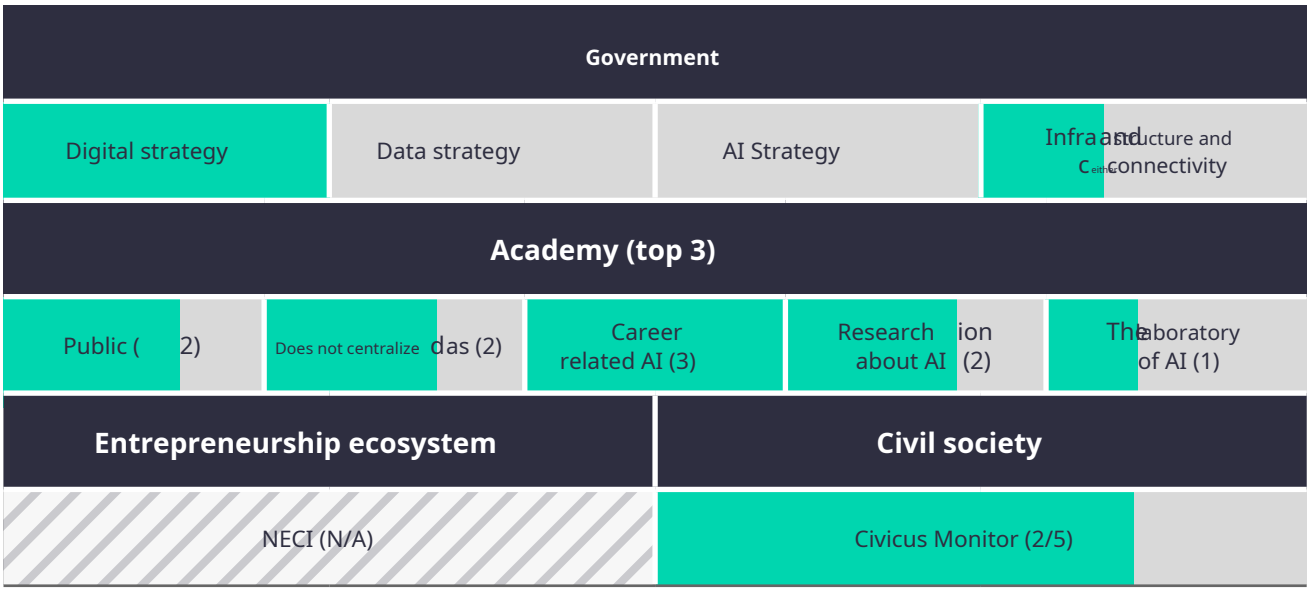
*Fountain:*Own elaboration.

* National Entrepreneurship Context Index (NECI).

* * The explanation of the indicator can be found in Annex B.

Table 44 summarizes the progress made by various sectors in Trinidad and Tobago in laying the foundation for advancing AI for social good.

Table 44.Efforts to lay the foundations for AI in Trinidad and Tobago, by sector



*Fountain:*Prepared by the authors. The indicators are in Annex B.

Government

Digital strategy: Yes

The National Plan for Information and Communication Technologies 2018-2022[149]Trinidad and Tobago's new plan consists of a comprehensive set of plans on connectivity and ICT adoption. The new plan focuses on harnessing the power of people, innovation, industry, education and infrastructure to transform the nation and open the door to a dynamic, sustainable and prosperous future that benefits from new technologies.

In 2009 the state-owned company was created*National Information and Communication Technology Limited*(NICT-CL)[150]to promote the implementation of the National ICT Strategy. This agency provides support to all

149 For more information, seehttp://mpac.gov.tt/sites/default/files/file_upload/publications/NICT%20Plan%202018-2022%20-%20August%202018.pdf

150 For more information, seehttps://ictsymposiumtt.gov.tt/index.php/2018/09/06/about-the-ict-symposium-2018/

Government agencies in the management of ICT strategies and programmes, as well as the design and implementation of solutions. To achieve this, four National ICT Business and Innovation Symposia have been organised to date by the Ministry of Public Administration. One of the objectives of NICTCL is to promote and raise awareness of the role of information and communications technologies and innovation in the digital transformation of Trinidad and Tobago.

Data Strategy/Open Data Portal: No

While Trinidad and Tobago does not yet have an Open Data Strategy, the government does have an Open Data Portal.[151] The database is managed by the Department of Computing and Information Technology at the University of the West Indies, St. Augustine. It is based on the Comprehensive Knowledge Archive Network (CKAN), a world-leading open source data portal. At the time of writing, the portal hosted 30 datasets relevant to topics such as agriculture, imports and exports, and digital access index, among others.

There are other platforms that provide open data in a decentralized way, including *Science & Technology Research Database* (STResearchTT)[152] of the *National Institute of Higher Education, Research, Science and Technology* (NIHERST)[153] This is an open, public, government database that seeks to foster research and innovation.

AI Strategy: No

At the time of writing, Trinidad and Tobago did not have a national AI strategy. However, the Chamber of Commerce and Industry has hosted discussions on the topic exploring aspects such as the impact of AI development on the legal community (CHAMBER TT, 2017).

Infrastructure and connectivity

77% of Trinidad and Tobago's population has access to the internet. Among the 12 countries considered in this report, this Caribbean nation ranks fourth in network readiness for widespread digitalization (UNESCO, 2019), although it is below average, at eighth place, in the Digital Adoption Index (World Bank, 2016). The Network Readiness Indicator (NRI) for Trinidad and Tobago is 49%.

In terms of cybersecurity, the International Telecommunication Union (ITU) in its 2018 Global Cybersecurity Index gives this Caribbean nation a score of 0.188 out of 1, which places Trinidad and Tobago in 19th place out of 33 in the Americas and 123rd out of 145 in the world.

Academy

The QS World University Rankings does not consider Trinidad and Tobago in its list of universities, so it was decided to include in Table 45 the three best universities cited by uniRank (uniRank, 2020).

151 For more information, see https://data.tt/

152 For more information, see http://stresearchtt.niherst.gov.tt/

153 For more information, see http://www.niherst.gov.tt/index.html

Table 45.Trinidad and Tobago's top three universities and their relationship with AI*

University	# 1 The University of West Indies, St. Augustine	# 2 The University of Trinidad and Tobago	# 3 University of the Southern Caribbean
Type of institution	Public	Public	Private
Location	St. Augustine	Arima	St. Joseph
Racing related to AI	✓	✓	✓
Postgraduate studies related to AI	✓	✓	✗
Research on AI	✓	✓	✗
AI Lab	✗	✗	✗
Laboratory of innovation technological	✓	✗	✗

*Fountain:*Prepared by the authors. Information obtained from the website of each institution.
* uniRank (2020).

Other relevant institutions

He*SBCS Global Learning Institute*The Trinidad and Tobago Institute of Technology is a training centre that offers various certifications and diplomas, some of them related to technology and engineering topics. For example, it has an academic area of computing within which certifications are offered in web development, information technology, and computer and information systems, among others. For its part, the Niherst Research Centre promotes STEM disciplines, mainly among children and young people. Despite being independent, this institution receives public and private funding.

Efforts from the entrepreneurial ecosystem and civil society

In 2014, Trinidad and Tobago was ranked, along with Barbados, at the top of the Caribbean region as one of the best countries for entrepreneurship (*The Country*(from Costa Rica, 2014). According to local experts, a prosperous future is projected for the culture of entrepreneurship thanks to the multiple initiatives that public and private institutions offer. Among them is*Youth Business Trinidad and Tobago*(YBTT), a non-profit organization focused on funding projects of young entrepreneurs. There are also international players such as the*Young Leaders of the Americas Initiative*(YLAI), and of a governmental nature such as*The National Entrepreneurship Development Company Limited*(NEDCO), which promote activities for entrepreneurship in general. However, impact entrepreneurship that takes advantage of autonomous and intelligent systems has not yet been developed.

On the civil society side, the initiative of individuals seeking to undertake dialogues and specific actions in favor of technological development stands out. Such is the case of Brigette Hyacinth, international speaker, thought leader on leadership, human resources, AI and digital transformation, and author of the book*The Future of Leadership: Rise of Automation, Robotics and Artificial Intelligence*The latter provides an overview of what is happening in the world of AI and new technologies, and explains to the reader how to manage these changes profitably.

There is also the NGO IAMovement[154], founded in 2014 to drive positive social and environmental change. It aims to achieve its goal by promoting awareness and education about environmental issues.

154 For more information, seehttps://iamovement.org/

social, environmental and economic aspects. It has also become a platform for national debate and dialogue on AI and issues of development and implementation of this new technology.

Conclusions

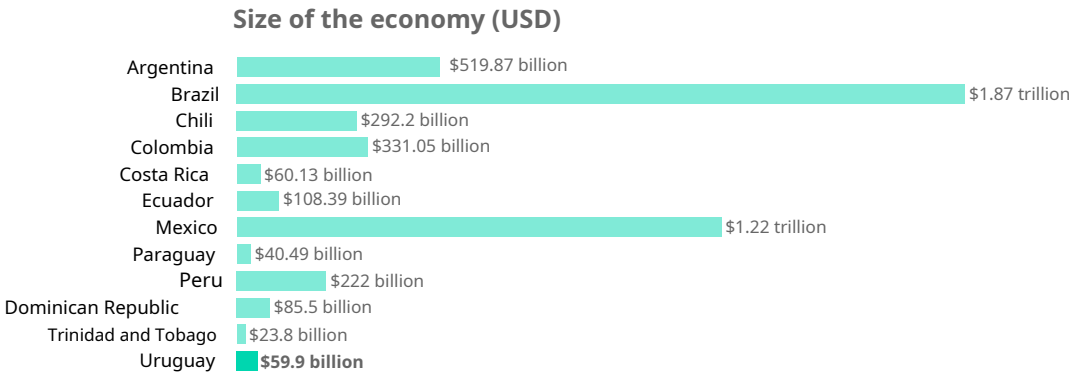
AI is not yet a priority for either the public or private sector in Trinidad and Tobago. The government has shown interest in supporting and increasing the number of entrepreneurs, incubators and accelerators in the country, although it remains to be seen how this ecosystem will evolve in terms of leveraging new technologies such as AI to solve the country's most pressing challenges.

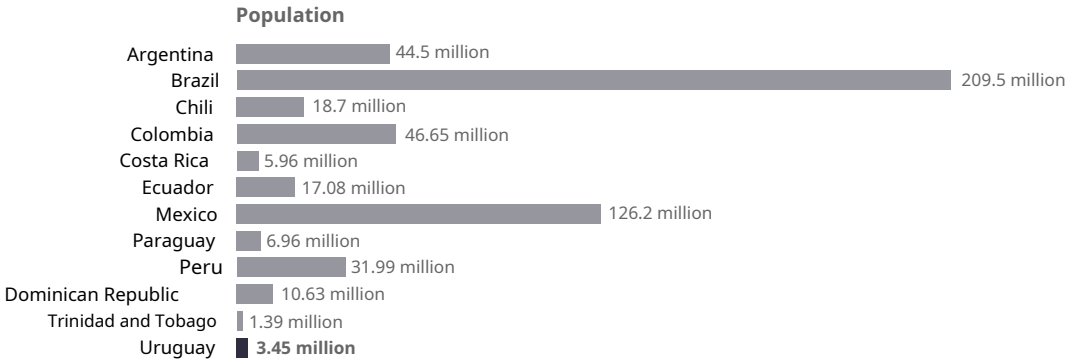
While the nation is leading the Caribbean in innovation, it will be important to continue creating spaces to explore and create new solutions from both the public and private sectors, and for these efforts to be accompanied by drives to direct innovation exercises towards the use of new technologies such as AI. In turn, the nation will rely on its universities to instigate and grow the local talent base in the field of AI, laying the groundwork for leveraging AI for social good.

URUGUAY

As a context to describe the current state of AI in Uruguay, Figure 18 presents a comparison of some economic, demographic, education, human development and equality indicators.

Figure 18.Basic indicators of Uruguay: comparative





Human Development Indicators

	PISA*	Fitness in English	Labour qualified	Index of development human	Coefficient of GINI
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chili	1 (I was)	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3 (I was)	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Dominican Republic	N/A	52.3%	50.2%	0.736	45.7
Trinidad and Tobago	N/A	N/d	71.8%	0.784	40.3
Uruguay	2do	54.1%	25.5%	0.804	30.5

* Position among the countries evaluated

*Sources:*Top panels: World Bank (2019).
Human Development Indicators (from left to right): OECD (2019); English Skills (nd); UN (2019); UNDP (2018); World Bank (2018).

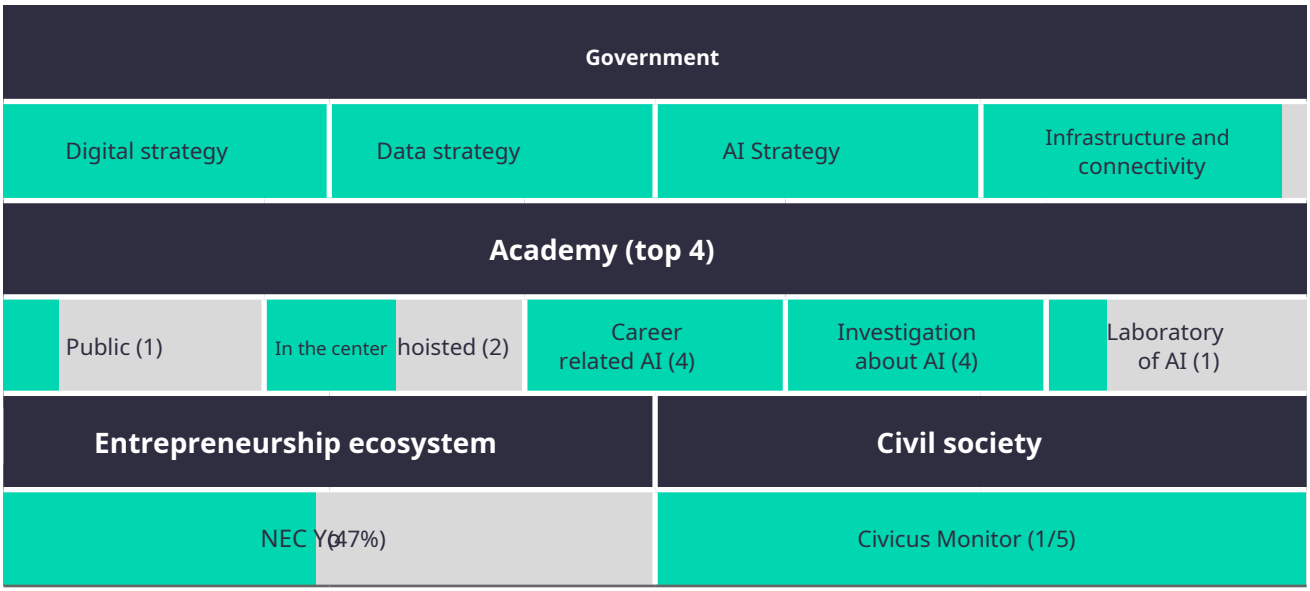
Table 46.Other socioeconomic indicators

Main economic sector (World Bank, 2019)	**PISA** (OECD, 2019)	**Gender index in science, technology, engineering and mathematics (STEM)** (Arredondo et al., 2019)
Agriculture	Second	49%*
NEI** (GEM, 2019)	**Civicus Monitor** (Civicus Monitor, 2019)	
4.7/10	Conditions for action of civil society organizations: open (1/5)***	

Source: Own elaboration.
* Participation of women researchers in Uruguay in STEM areas (versus men).
* * National Entrepreneurship Context Index (NECI).
* * * The explanation of the indicator can be found in Annex B.

Table 47 summarizes the progress made by various sectors in Uruguay in establishing the foundations for promoting AI for the social good.

Table 47.Efforts to establish the foundations of AI in Uruguay, by sector



*Fountain:*Prepared by the authors. The indicators are in Annex B.

Government

Digital strategy: Yes

The Uruguay Digital Agenda 2020[155]This is the fourth one that has been formulated in the country to guide this activity. The first two (2006-2008 and 2008-2010)[156]) were intended to ensure the institutionalization of the infrastructure for digitalization. Once this goal was achieved, the third agenda (2011-2015)[157]prioritized

155 For more information, seehttps://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-knowledge/politicas-y-gestion/programore/digital-agenda-of-uruguay

156 For more information, seehttps://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-knowledge/sites/agencia-gobierno-electronico-society-information-knowledge/files/2019-01/Digital%20Agenda%202008-2010.pdf

157 For more information, seehttps://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-knowledge/sites/agencia-gobierno-electronico-society-information-knowledge/files/2019-01/Digital%20Agenda%202011-2015.pdf

the improvement of services that were already in operation and a gradual expansion plan has been followed based on previous achievements. The latter, in force at the time of writing this report, differs from its predecessors in that it focuses on citizens. Its primary purpose is equity and it is governed by the country's social strategy and the SDGs.

The Uruguay Digital Agenda 2020 is based on four pillars grouped into nine objectives and 46 specific goals. The four pillars of the Agenda are: (i) social policies and inclusion; (ii) sustainable economic development; (iii) government management linked to citizens through technology; and (iv) governance for the information society with an enabling framework that favors its social appropriation. The purpose of the transformation of technologies is to create a structure of social opportunities accessible to all. The six goals are the following: (i) digital inclusion of low-income retirees through the Ibirapitá Plan; (ii) getting more than 60 thousand people to develop professional digital skills; (iii) teaching programming to more than five thousand young people; (iv) formulating more than five study plans on ICT; (v) training more than a thousand students and workers in home automation, robotics, and bio and nanotechnology; and (vi) creating the National System of Repositories of the Timbó Portal to disseminate scientific writings.

The results of this agenda will be monitored by the Agency for Electronic Government and Information and Knowledge Society (AGESIC), an organization that coordinates all the institutions involved.[158].

Uruguay assumed the presidency of the group *Digital Nations* ((formerly known as Digital 5, Digital 7 and Digital 9), thus becoming the first Latin American nation to join this collaborative network of countries with the most digitalized governments in the world. The group seeks to promote best practices in the use of digital technology to improve the lives of citizens (Uruguay Presidency, 2018).

Two of the pending tasks for Uruguay are the promotion and support of transformative innovation projects, and ensuring that technological dynamism is at the service of social changes and responds to the limitations of citizens in terms of accessibility, not only to the Internet but also to technologies in general. The digital agenda aims for technologies to facilitate links between the State and Uruguayans within the framework of their development.

Data Strategy/Open Data Portal: Yes

In 2016, Uruguay published its National Action Plan on Open Government Data,[159] within the framework of its adherence to the International Open Data Charter and in accordance with the principles of the Open Government Partnership, of which it is a member.

As part of this plan, the National Open Data Catalogue was created,[160] which allows access to information available from public bodies, academia, civil society organizations and private companies. This is an important differentiator, since most open data portals only include government data. Currently, the catalogue contains 21 categories of information, content from 47 organizations and more than 2,000 data sets.

AI Strategy: Yes

The topic of ethics in AI was a relevant point in the roadmap for data science and machine learning promoted by Transforma Uruguay (Mesa, 2019). Various stakeholders participated in its development.

158 Among Uruguay's recent achievements are the increase in ICT infrastructure coverage; the access of new populations; tions to the fiber optic socket; the availability of access to high-speed services at a moderate cost, and Internet access for all families with children attending educational institutions, each of whom receives a computer equipped with this service.

159 For more information, see https://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-knowledge/sites/agencia-gobierno-electronico-sociedad-informacion-knowledge/files/documentos/publicaciones/plan_de_accion_nacional_de_datosabiertos_2016_2018.pdf

160 For more information, see https://catalogodatos.gub.uy

civil society actors and various projects were financed, including one on traceability of algorithmic decisions, a topic that had already been explored through initiatives financed by the National Agency for Research and Innovation (ANII).

In May 2019, the Uruguayan government began implementing its AI Strategy[161] in public administration, which had citizen feedback through online consultations (Uruguay Digital, 2018). To date, 70% is reported[162] progress and the government is working on developing guides and good practices[163] This strategy seeks to establish the principles for the use and implementation of AI to improve state services. It is based on four pillars: (i) AI governance in public administration; (ii) capacity building for AI; (iii) use and application of AI; and (iv) digital citizenship and AI.

Infrastructure and connectivity

Uruguay has made significant progress in connectivity in recent years, halving the digital divide between households with different income levels. By 2019, 70% of the poorest households and 99% of the richest had access to the internet. Its use has also evolved markedly: 79% of the population connects daily, compared to 31% in 2010 (EUTIC, 2019).

According to the World Bank's Digital Adoption Index, Uruguay ranks first among the countries considered in this report, while globally it ranks 24th out of 180 countries that make up the index. This suggests that the government, society and business sectors are ready to address the country's digital development (World Bank, 2016).

The World Economic Forum's Network Availability Index ranks Uruguay 43rd out of 139 countries. This means that this South American nation has the potential to take advantage of the benefits of emerging technologies and capitalize on the opportunities offered by digital transformation, especially in terms of strengthening the role of the government in its task of providing services for the social good (WEF, 2016).

In terms of infrastructure issues for connectivity, Uruguay already has the first prototypes for launching 5G networks. This may be the first country with this type of network in the region (Forbes, 2019).

Considering the importance of cybersecurity in view of the implementation of a 5G network, it is encouraging to observe that, with a score of 0.681 out of 1, Uruguay is ranked 3 out of 33 in the Americas and 51 out of 133 in the world according to the 2018 Global Cybersecurity Index of the International Telecommunication Union (ITU).

Academy

Uruguay has distinguished itself by the progress of its different sectors in the implementation of digital technologies and strategies, including AI; the case of academia is no exception.

The University of Montevideo, one of the four best in the country according to the QS World University Rankings (2019), offers a degree in data science for business, where students are trained in the use of tools to analyze large volumes of data. While not all universities have a degree in data science for business,

161 For more information, see https://www.gub.uy/participacionciudadana/consultapublica

162 For more information, see www.uruguaydigital.uy

163 For more information, see https://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-conocimiento/comunicacion/publicaciones/politica-estrategia-datos-para-transformacion-digital

specialized AI laboratory, the top four offer careers relevant to its development and lead research projects on the topic (Table 48).

Table 48.The four best universities in Uruguay and their relationship with AI*

University	# 1 University of The Republic (UDELAR)	# 2 University of Montevideo (UM)	# 3 University Catholic of the Uruguay (UCU)	# 4 University ORT Uruguay
Type of institution	Public	Private	Private	Private
Location	7 locations**	Montevideo	Montevideo, East Point, Leap	Montevideo
Related careers with AI	✓	✓	✓	✓
Related Postgraduate Courses with AI	✓	✗	✗	✓
AI Research	✓	✓	✓	✓
AI Lab	✓	✗	✗	✗
Laboratory of technological innovation	✗	✓	✗	✗

*Fountain:*Prepared by the authors. Information obtained from the website of each institution.

* Uruguay does not appear in the Times of Higher Education ranking.

* * Montevideo, Punta del Este, Rivera, Rocha, Paysandu, Salto and Tacuarembo.

Other relevant institutions

The Uruguayan Technological Laboratory (LATU) has a technological park consisting of five centers, including the Center for the Development of Technological Companies (CDET) and the Center for the Incubation of Technological Companies (Ingenio). The ICT4V Technological Center carries out machine learning projects, including one on fraud prevention in financial transactions.[164], while the Engineering Innovation Center[165]seeks to enhance the entrepreneurial and innovative spirit of engineers and specialists to increase R&D&I activities.

Efforts from the entrepreneurial ecosystem and civil society

The entrepreneurial ecosystem in Uruguay is strengthening entities that are increasingly specialized in the subject, such as the National Development Agency (ANDE) and the Support Network for Future Entrepreneurs (RAFE). The latter is consolidating its role as an institution responsible for promoting entrepreneurship in the country. Although the research for this report did not identify specialized programs in strengthening the capacities of entrepreneurs to take advantage of AI, the high level of digitalization in the country and the various programs to support entrepreneurs make Uruguay fertile ground for the adoption of AI in this sector.

Regarding civil society efforts, there is the Uruguayan Association of Computer Scientists (AsIAP), a professional organization that contributes to the progress and dissemination of ICTs through the dissemination of research, studies and proposals. Its main objectives include advising the State on technical, ethical and legal issues of ICTs; organizing training courses for professionals; and promoting technological specialization in higher education centers. Every year it organizes the Uruguayan Professional Update Computer Science Day, which addresses topics related to ICTs.

164 For more information, seehttps://ict4v.org/es/proyectos/aplicacion-de-aprendizaje-automatico-a-la-prevencion-de-fraude-en-transaccio-credit-free

165 For more information, seehttp://www.cii.uy/quienes-somos/

with AI since 2017 (Uruguay Presidency, 2017). AsIAP receives support from Microsoft, IBM, Universidad ORT-Uruguay and Red Hat.

The Latin American Open Data Initiative (ILDA) was founded in 2012 as a research program that seeks to promote and understand the use of open data in Latin America. ILDA disseminates information through publications about AI and the risks it presents.

Use cases

Below is a summary table of the main AI use cases in Uruguay.

Table 49. Main AI use cases in Uruguay

Name: Bot Detection		
P*For more information:* www.idatha.com	*Year they started using AI:* 2015	*SDG:* 16 (peace, justice and strong institutions) 
Actors involved: IDATHA, National Research and Innovation Agency of Uruguay		*Current status:* consolidated company with project in scaling stage
What is proposed: IDATHA analyses political conversations on social networks, helping to understand users' needs and combat misinformation from malicious sources.		
Brief description of the project: IDATHA joins forces to detect bots that harm the perception of social media users about the political reality of the country.		
Applications of AI	It uses AI technologies for natural language recognition, virtual agents, deep learning platforms, *hardware* Optimized with AI, Decision Making, Deep Learning Platform, Robotic Process Automation, Cyber Defense, Compliance, Content Creation, Peer Networking, Cognitive Worker Assistance, Emotion Recognition, and Image Recognition.	
How they use AI	Kybalion technology is used to provide quantitative and qualitative analysis of conversations on social networks and news portals, detecting bots that could be spreading fake news and distorting public perception.	

Fountain: Information provided by the IDB for the purposes of this report (2020).

Name: Reducing domestic violence		
For more information: nd	*Year they started using AI:* 2018	*SDG:* 5 (gender equality), 16 (peace, justice and strong institutions)  
Actors involved: Inter-American Development Bank (IDB), Chicago Crime Lab, Globant and Government.		*Current status:* multilateral project in consolidation stage
What is proposed: In order to prevent future cases of domestic violence, an algorithm was designed that calculates the resulting probability of recurrence of these crimes through a process of machine learning and strategies designed by international intelligence centers.		

Brief description of the project: A predictive model was generated that uses artificial intelligence algorithms to identify the probability that a victim of domestic violence will suffer a similar event again.	
Applications of AI	It uses machine learning technology that makes a decision.
How they use AI	This tool serves to advise on the decision-making process that may eventually lead to reducing the rates of gender violence and preventing femicides.

Fountain: Information provided by the IDB for the purposes of this report (2020).

Name: Adaptive Mathematics Platform (PAM), Ceibal Plan		
For more information: https://www.ceibal.edu.uy/	*Year they started using AI:* 2013	*SDG:* 2 (zero hunger)
Actors involved: Boards of directors of the Uruguayan educational system: Central Board of Directors (CODICEN), Initial and Primary Education Council (CEIP), Secondary Education Council (CES), Technical Professional Education Council (CETP) *Developers:* Bettermarks		*Current status:* State-owned company in the scaling stage
What is proposed: To compensate for the lack of curricular adaptations in mathematics and logical thinking.		
Brief description of the project: PAM is an adaptive online platform that complements a teacher's mathematics teaching with personalized educational processes according to the needs of each student. It also provides teachers with tools to work with their groups, establish learning goals and propose activities. It has comprehensive evaluation instruments for immediate monitoring and reporting.		
Applications of AI	Data analysis to support decision making	
How they use AI	A network of nodes allows us to identify the conceptual areas of each student and the group that need strengthening, issuing suggestions for each student in their independent work, and also for the teacher.	

Fountain: Information provided by PAM for the purposes of this report (2020).

Conclusions

Uruguay's Digital Strategy consists of a comprehensive plan that addresses the issues of democratization of technologies and inclusion of vulnerable groups; linkage between government and the private sector; transparency in the use of data by the government; inclusion of technology courses in school sectors, and digital citizenship and AI. Along with Colombia, Uruguay is the only country in the region that has an AI strategy in the implementation phase. It is also possible that it will become the first country in the region to have a public 5G network.

In the academic field, there is a high percentage of women in STEM research, as observed in Table 46. Likewise, there is a great diversity of public and private organizations in the country that have dedicated themselves to the promotion and adoption of AI in the different productive sectors. Although the drive for entrepreneurship is growing and consolidating, the government's interest in increasing incentives to accelerate this process is noteworthy. Civil society organizations operate in an environment conducive to carrying out activities to support national efforts in terms of digitalization and the promotion of AI focused on social good.

GENERAL CONCLUSIONS

The approach of ethically developed AI used for social good is a relatively new and promising topic to address the main challenges facing LAC, including the reduction of poverty and inequality gaps. The success of leveraging this technology will depend on numerous factors, namely: the existence of a common vision with which all efforts and actors in AI ecosystems can be aligned; the provision of digital infrastructure facilitated by governments in alliance with the private sector; the training of local talent and research on relevant topics; the adoption of AI by civil society to advance its objectives; the decision to put the human being at the center of all conversations and activities related to AI; the drive of the entrepreneurial ecosystem; and respect for ethical frameworks and guidelines for its development and use. In this sense, the countries studied in this report present different levels of progress in each of the factors mentioned. Uruguay, Colombia, Argentina, Chile and Mexico, among others, exhibit solid foundations for developing the corresponding systems.

Having a national AI strategy for each country, supported by a digital strategy and an open data strategy, will be a priority to achieve the accelerated adoption of AI with a view to democratising its benefits. Likewise, these strategies must be anchored in a resilient infrastructure and guarantee the connectivity of the region's citizens. As cross-cutting axes, these national strategies will have to consider the promotion of innovation, research and development, as well as entrepreneurship and the articulation between sectors seeking to promote the advancement and strengthening of local AI ecosystems.

In the academic field, it will be key for public and private universities in the region to continue offering and strengthening training programs for specialized talent and promoting research on relevant topics in close collaboration with governments and industry; this in order to guarantee training aligned with national and regional needs. Likewise, in order to make training on technologies and innovation more accessible and inclusive, it will be a priority to incorporate more courses related to AI and ethics, particularly, in those public university campuses that are located outside the capital cities.

From the perspective of the entrepreneurial ecosystem, the outlook is encouraging in terms of the type of use cases that were identified, in part, through the survey “Perception of the importance given to the ethics of artificial intelligence in Latin America and the Caribbean.” Many entrepreneurs are experimenting with new business models that seek to produce social impact and achieve financial self-sustainability in order to expand their operations. Although impact entrepreneurs using AI still have a long way to go, they are already showing results that could be scaled within the framework of public policies to promote this ecosystem.

For their part, start-ups and civil society organisations are using AI as a tool to creatively and innovatively solve some of the structural challenges they face. In particular, civil society has the opportunity to leverage AI in an ethical way to boost the impact of its projects, mainly those where AI at the service of social good offers clear added value. Likewise, this sector has enough convening power to start a serious dialogue around the possible ethical risks related to the use of this technology and propose mitigation strategies.

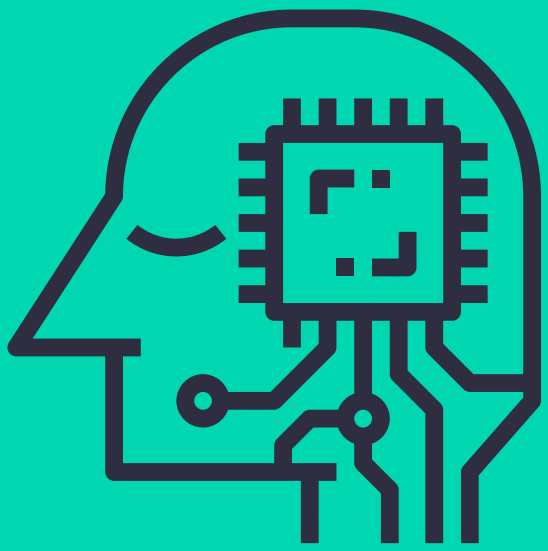
The use cases presented here reflect the potential of this technology in key issues such as health, education, social inclusion and climate change, among others, and also to scale solutions with

with a view to broadening its impact. Documenting and disseminating these cases, and the progress made at the country level in establishing the foundations for AI at the service of social good, are essential to projecting the voice and experience of LAC in international spaces. There, mechanisms will be discussed to develop governance frameworks, standards and ethical principles for AI that are inclusive, have a local perspective and contribute to prosperity and justice in all regions.

It will be important to promote and ensure ethical and responsible development and use of AI across the board. While the countries studied are making incipient efforts in terms of conversations and debates on privacy, accountability, security, transparency and explainability, justice and discrimination, professional responsibility, promotion of human values, and environmental impact, it is imperative to turn these dialogues into concrete preventive and mitigating actions. LAC has significant potential to take advantage of AI, but this entails a profound responsibility to do so in an ethical and responsible manner.

ACRONYMS AND ABBREVIATIONS

LAC	Latin America and the Caribbean
4IR	Fourth Industrial Revolution
IDB	Inter-American Development Bank
ECLAC	United Nations Economic Commission for Latin America and the Caribbean
STEM	Science, Technology, Engineering and Mathematics
EODB	*Ease of Doing Business*or ease of doing business
EOSB	*Ease of Starting a Business*or ease of opening a business
FEM	World Economic Forum
IMF	International Monetary Fund
GEM	*Global Entrepreneurship Monitor*o Global Entrepreneurship Monitor
IEEE	*Institute of Electrical and Electronics Engineers*or Institute of Electrical Engineers and Electronics
AI	Artificial intelligence
R&D&I	Innovation, Development and Innovation
ITU	*International Telecommunications Union*or International Telecommunication Union
ML	*Machine Learning*or machine learning (also data intelligence)
NECI	*National Entrepreneurship Context Index*o Entrepreneurship Context Index National
NRI	*Networked Readiness Index*o Network Readiness Index
OECD	Organization for Economic Cooperation and Development
SDG	Sustainable Development Goals
UN	United Nations Organization
OSC	Civil Society Organizations
SME	Small and Medium Enterprise
TORCH	*Total Early-Stage Entrepreneurial Activity*o Total Entrepreneurship Activity in Early Stages
THE	Times Higher Education
EU	European Union
UNESCO	United Nations Educational, Scientific and Cultural Organization



ANNEXES

ANNEXES

Annex A. Country selection

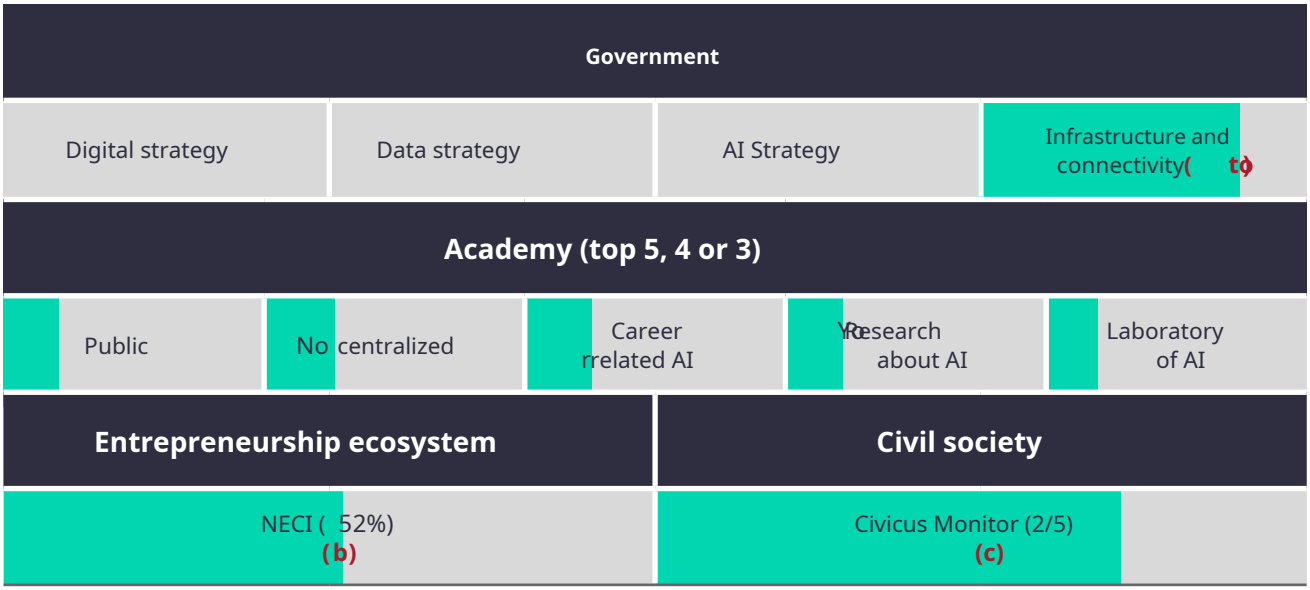
As a first exercise, this report includes the analysis of twelve LAC countries whose selection was based on a subregional balance and the following 21 criteria:

1. Digital strategy
2. Data strategy
3. Existence of open data portals
4. Open Data Index (Open Knowledge Foundation)
5. Adherence to the OECD AI principles
6. Be signatories of the Beijing Consensus (UNESCO 2019)
7. Advances in AI policy
8. Ranking in The Economist Automation Readiness Index 2018
9. Government AI Readiness Index 2019 by Oxford Insights
10. World Bank Digital Adoption Index 2016 Ranking
11. Percentage of the population that uses the Internet
12. Population (World Bank 2018)
13. Percentage of LAC population
14. GDP (2017-18)
15. GDP per capita
16. GDP ranking of the LAC economy
17. Number of secure internet servers per million inhabitants
18. Network speed (2019)
19. Broadband speed (2019)
20. R&D expenditure as a percentage of GDP
21. Number of researchers per million inhabitants

Annex B. Country overview

Table B1 summarizes the information presented in the country sections. It includes data from the report *Global Entrepreneurship Monitor*(2017 and 2019) and information from the World Bank (2019).

Table B1.Summary of advances in technology and AI by country



(to) The average of the Digital Adoption Index score and the Network Availability Index score is calculated
(b) National Entrepreneurship Context Index or NECI
(c) While higher scores normally indicate a better rating, in this indicator the barometer was inverted to make it easier to understand, since here higher scores would be less desirable.

Legend:

- Colors
  - Green: The country has a strategy
  - Orange: The country is developing the strategy
  - Gray: The country lacks a strategy
  - Gray with white lines: No information available
- Barometer: The green barometer indicates the country's progress or level on the block's issue

Country profile

To understand the different starting points of each of the twelve countries analyzed, it is important to take into account It takes into account some of its economic indicators, its educational level and the progress achieved in human development and equality. These data are provided in the figures at the beginning of each country profile, and each is compared with the average of the information from the twelve countries to understand the relative position of the country in question.

- **Economy and population:**Size of the economy (GDP), main economic sector and number of inhabitants (World Bank data from 2018).

- **Education:** Indicators directly related to education, since schooling is one of the fundamental elements in determining the future of technology (Silagadze, 2018). It includes qualified labor, the PISA exam[166] and proficiency in English[167], taking into account that a large part of programming languages are in this language and that the level of aptitude of people can imply a competitive advantage.
- **Human development and equality:** Here, the Human Development Index and the GINI inequality index contextualize the social panorama of the selected countries, since AI for social good aims to reduce the gaps that they reflect. The gender index in the fields of science, technology, engineering and mathematics (STEM) was also added. However, given that at the time of preparing the report, and after an exhaustive search, the researchers did not find a database that recorded the percentage of women in the STEM labor market in Latin America, the data for each country was cited from a different source. Therefore, and unlike the rest of the indicators, this data does not have an internal ranking for the 12 countries studied.
- **Civil society:** Civicus is an organization that monitors the state of civil society freedoms around the world, awarding scores from 1 to 5 out of 5 in its "Civicus Monitor" ranking.[168]. The numbers describe the conditions that civil society has to act within this country:
    - 1/5 - open
    - 2/5 - reduced
    - 3/5 - clogged
    - 4/5 - repressed
    - 5/5 - closed
- **Entrepreneurial environment:** The National Entrepreneurship Context Index or NECI (2019-2020) of the Global Entrepreneurship Monitor (GEM)[169] determines how conducive the environment is for entrepreneurs on an optimal score of 10.

Key players

In an increasingly complex world, the result of globalization and new disruptive technologies, cross-sector collaboration is essential. The commitment and collaborative participation of industry, government, academia and civil society are considered crucial elements for the responsible development and adoption of AI towards the fulfillment of the SDGs. It is therefore important to study the actors involved and the actions they carry out to develop regional, national and local AI ecosystems.

The role each stakeholder plays in the topic of AI for social good and the type of information analyzed for each of these groups are described below.

> Government

According to the IDB, and other organizations that have studied the state of AI in different regions of the world, government action is essential for a country to have the necessary tools to adopt and develop digital and AI initiatives (IDB 2019; Google, 2019; Oxford Insights and IDRC, 2019). Within any private or public initiative, the more the government contributes (whether in fields such as education, health and employment, among others), the greater the percentage of successful cases and growth in the sector (Bernard, 2017; Mazzucato, 2015).

166 Programme for International Student Assessment. This is an OECD project whose objective is to evaluate the training of students when they reach the end of compulsory education, at the age of 15.

167 It was used *English Proficiency Index A Ranking of 100 Countries and Regions by English Skills*.

168 For more information, see https://monitor.civicus.org/about/

169 For more information, see https://www.gemconsortium.org/file/open?fileId=50443

The work of governments regarding the promotion of AI has a double dimension: their own use and the creation of tools to promote its use in the country. On the one hand, AI offers them the possibility of being more efficient[170] when they use these technologies to reduce costs and redesign processes in favor of better provision of public services and administration of assets (Pombo, Gupta, Stankovic, 2018). On the other hand, governments have the powers to: (i) provide the necessary infrastructure for the adoption of AI, (ii) formulate regulatory frameworks and policies that define the direction of a country in digital and AI matters, and (iii) promote its adoption in specific sectors of the economy, defining the direction of the transformation of countries in this way (Navarro, 2018). The government can carry out its work by relying on spaces for meeting, dialogue and exchange with other actors such as business, citizens, civil society organizations, academia, international organizations and global and regional networks of public governance and digital government. Likewise, it can provide the necessary infrastructure to carry out initiatives that promote digital adoption by a greater number of users. Such infrastructure is part of a cutting-edge regulatory framework for data protection, as well as interoperability standards and open data portals, since these platforms are crucial for training AI systems that rely on analyzing massive amounts of data.

To determine the government's progress in terms of strategies and infrastructure aimed at promoting the development of AI, the four pillars that constitute the foundations for a successful adoption of AI in the country were considered: digital strategy, open data strategy, AI strategy and connectivity and infrastructure indicators. In the case of the latter two, connectivity was estimated based on the percentage of internet access and the number of mobile subscriptions, since according to experts in the ICT sector, mobile telephony capacity is directly related to a country's broadband adaptability capacity (2018). For infrastructure, the World Bank's Digital Adoption Index and the WEF's Network Readiness Index (NRI) were used.

Advances in 5G networks by country were also recorded, given the capacity of this technology to accelerate cloud services; the latter empower AI systems, as they allow them to analyze data and learn even faster than is currently possible. The convergence of 5G networks (speed) with the Internet of Things (sensors and data) and with artificial intelligence (predictive and trend analysis) has the potential to accelerate the economic and social transformation framed within the Fourth Industrial Revolution.

Finally, information is provided on the state of cybersecurity in each country, since this is crucial for any system that uses AI because it refers to good practices for protecting systems, networks and programs from digital attacks. These normally aim to access, change or destroy sensitive information; extort companies, governments or users; or interrupt business processes.

Table B2 below summarizes the information analyzed.

Table B.2. Summary of information analyzed in the government section

Government			
Digital strategy	Data strategy	AI Strategy	Infrastructure and connectivity
Yes / No / In process	Yes / No / In process	Yes / No / In process / To explore continuity	Networked Readiness Index Digital adoption index 5G Cybersecurity

Fountain: Own elaboration.

170 That they make extensive use of ICT, among other criteria.

>Academy

Academia plays a fundamental role in the production of talent, as well as in AI research and development, since it is there that the understanding of different fields is deepened, generating new knowledge (Government AI Readiness Index, 2019) that contributes to strengthening the foundations necessary to promote the adoption of AI in the service of social good. Likewise, the specialized talent that fosters technological innovation is trained in academia.

In the academic environment, made up of universities, research centres and training institutes, it is important to explore how to ensure that AI learning is accessible to the population of a country, which will depend on the way in which opportunities are distributed throughout the territory and the significant presence of public universities, among other factors. On the other hand, it is necessary to determine the type of knowledge produced by higher education institutions and whether or not they have the capacity to carry out experiments in AI laboratories. From there, in the sections relating to "Academy" in each country, the offer of study programmes related to AI, the existence of postgraduate courses and research on it, the presence or not of AI or technological innovation laboratories, the public or private nature of the training centres and the geographical location of their headquarters within the country were recorded. The description of the academic sector is complemented with additional information on other universities and research centres by country that also deal with these areas of knowledge.

The universities profiled in this report are those ranked at the top for undergraduate level according to the QS World University Rankings (2019). This ranking results from a "comparative analysis of performance across metrics critical to each institution's mission: teaching, research impact, reputation, student employability and internationalisation" (Quacquarelli Symonds, 2020). Here, 40% of the score is decided by a survey of academics from around the world, so it is largely derived from the reputation of the educational institutions.

To complete the academic picture regarding AI programs, we indicate which of the universities listed in the QS are also in the top five of the Times Higher Education (THE) rankings, which measure other factors and use different weightings. The THE is based on "a range of data that provides detailed information on performance across all core areas of academic activity, allowing comparison and benchmarking with other institutions – whether competitors or collaborators – across regions, subjects and other key criteria" (THE, 2020). The QS and THE are considered to be among the best rankings internationally.

>Efforts from the entrepreneurial ecosystem and civil society

As indicated in the study *The impact of artificial intelligence on entrepreneurship* (Endeavor, 2018), AI has been key in shaping and driving the entrepreneurial ecosystem, in addition to empowering new business models. The state of development of the ecosystem is a determining factor in the implementation and evolution of AI in a country. In LAC, one of the main characteristics of AI entrepreneurship is that although it is incipient, the development outlook for the industry is promising.

Given that there is a large amount of material on the subject, and in order not to duplicate efforts, this work does not include a detailed analysis of the use of AI by the entrepreneurial ecosystem and the *BigTech* (companies such as tech giants like Apple, Google, Amazon (Microsoft) in the countries studied. Instead, examples are presented of initiatives and ventures that leverage AI to achieve a greater impact on social and environmental issues, which is precisely the use on which this report focuses.

On the other hand, civil society organizations (CSOs) and groups dedicated to social issues, human rights (including digital rights) and reducing technological gaps play a fundamental role.

essential in guiding the development of guidelines and standards for the responsible use of human-centered AI, within the framework of the IDB Group-Civil Society Engagement Strategy[171]In this sense, some examples of social organizations and initiatives from each country that promote the responsible use of AI and/or play a relevant role in its study, development and/or promotion are included.

It should be noted that, throughout this report, the authors refer to impact entrepreneurs or social entrepreneurs as those who are part of the AI ecosystem and seek, through the development of technological tools based on it - or through its use as a central part of disruptive business models - to influence the solution of social challenges or promote the achievement of social objectives.

Use cases

One of the objectives of this report is to document initiatives, advances and relevant cases of AI serving the social good in the region. To do so, use cases that are beginning to explore or use AI as part of their strategies to solve social and environmental challenges were mapped. This was done on the basis of research of secondary documentary sources conducted by C Minds and the IDB Group, recommendations from various experts and the participation of companies such as Microsoft, Google, and Opinno/MIT35, and other collaborators from public private institutions such as AGESIC. This exercise resulted in 31 documented cases that are already being implemented and that make up a diverse sample of applications involving various topics, sectors, implementing entities and geographic locations.

These use cases are part of the first stage of the IDB's fAIr LAC Observatory, a space in continuous evolution that also records other examples from the region that were not included in this report, as well as new initiatives.[172].

The use cases shared in this report reflect a use of AI to advance the Sustainable Development Goals. The selection of these cases did not include a technical assessment of ethical issues in the use of data including privacy, bias, transparency, algorithmic explainability, or other unintended consequences that the autonomous and intelligent AI system could have throughout its lifecycle.

In this sense, the report, as one of the first exercises of fAIr LAC, aims only to exemplify the various ways in which this technology can contribute to issues of social development and environmental care. Subsequent exercises of this initiative will focus on creating tools, guides and evaluation frameworks to facilitate the ethical and responsible development and adoption of AI systems, seeking to contribute to strengthening the AI ecosystem for social good in the region.

171 For more information, seehttps://www.iadb.org/es/civil-society/home

172 For more information, seehttps://fairlac.iadb.org/es/observatorio

Appendix C. Summary of the 31 use cases

Country	Case name	Issue	Implementers	Page
Argentina	Amanda Care	Health	Startup company	44
	Dymaxion Labs	Agriculture	Startup company	45
	Kilimo	Agriculture and environment	Startup company	46
	Laura	Justice	Government	46
	Promethea	Justice	Government	47
Brazil	LAURA	Health	Startup company	54
	Livox	Education	Startup company	54
	Portal Telemedicine	Health	Company	55
	R1T1	Health	Company	55
	Traive	Job	Startup company	56
Chili	Larch	Education	University	64
	DART	Health	University and Government	65
	NotCo	Environment and feeding	Company	65
	Prediction of crime scene	Security	Government	66
	U-Planner	Education	Startup company	66
Colombia	1DOC3	Health	Startup company	73
	Peace agreements	Justice	Startup company	73
	SISBEN	Social inclusion	Government	74
Costa Rica	PARMA	Health	University	80
Ecuador	SpeakLiz	Social inclusion and education	NGO	86
Mexico	Help for workers and migrants	Work and inclusion social	University	93
	I YIELD	Climate change	NGO	94
	Doc.com	Health	Company	95
	Unima	Health	Startup company	95
Paraguay	Layers - Terrains intelligent	Agriculture	Startup company	101
	ForEmployment	Job	Government	102

Peru	AYNI Lab	Health	Government	107
	IRBin	Environment	Startup company	108
Uruguay	Bot Detection	Justice	Consolidated company	124
	Decrease of violence domestic	Justice and equality gender	Multilateral project	124
	PAM	Education	Government	125

The selection criteria were as follows:

- Project implemented (not in ideation phase)
- Implementation or incorporation of autonomous and intelligent systems
- The goal is social good in the context of the SDGs
- Developers and implementers were able to fill out a detailed use case sheet within the available time frame.

REFERENCES

AI Index Stanford.*Artificial Intelligence Index Report 2019.*California: Stanford, 2019.https://hai.stanford. edu/sites/default/files/ai_index_2019_report.pdf

Country Agenda. 2019.*Chile Could Be The First Country In South America To Implement 5G.*Chile: The Counter. https://www.elmostrador.cl/agenda-pais/2019/03/20/chile-podria-ser-el-primer-pais-en-sudamerica-enimplementar-el-5g/ .

AGESIC. 2018.*Uruguay assumed the presidency of the Digital. (*nd).https://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-knowledge/comunicacion/noticias/uruguay-asumio-presidencia-del-digital-9

Albrieu, R., Rapetti, M., Brest Lopez, C., Larroulet, P., & Sorrentino, A. (2019).*Artificial intelligence and economic growth: Opportunities and challenges for Costa Rica.*Costa Rica: CIPPEC.

NGO Alliance. 2018.*SMEs and Entrepreneurs.*Uruguay: Ministry of Industry, Energy and Mining.https://www.miem.gub.uy/mipymes-y-emprendedores

Anderson, J. and Rainie, L. 2018*Artificial intelligence and the future of humans.*Washington DC: Pew Research Center: Internet, Science & Tech.https://www.pewresearch.org/internet/2018/12/10/artificial-intelligence-and-the-future-of-humans/ .

Azevedo, Mary Ann. 2019. Latin America Has 'Arrived' Among Global. USA: CrunchBaseNews https://news.crunchbase.com/news/latin-america-has-arrived-among-global-vcs/

Alfonso Costa. Analysis of AI startups in Latin America (Argentina: 2019) https://pochocosta.com/podcast/analisis-de-los-emprenmientos-de-ia-en-latinoamerica/

Harnessing the economic and social potential of responsible AI in Europe (Applied Intelligence, Rep.). (nd). Accenture.

United Argentina. 2019.*Unconference on artificial intelligence.*Argentina: Ministry of Science, Technology and Innovation. hhttp://www.argentina.gob.ar/ciencia/desconferencia-sobre-inteligencia-artificial

Argentina.gob. 2019.*The Government presented the new Digital Agenda 2030*Argentina: United Argentina https://www.argentina.gob.ar/noticias/el-gobierno-presento-la-nueva-agenda-digital-2030

2019. *STEM and the Gender Gap in Latin America.*Mexico: Col. San Luis Magazine. http://www.scielo.org.mx/scielo. php?script=sci_arttext&pid=S1665-899X2019000100137

Inter-American Development Bank. 2017.*Laboratory of Innovation and Territorial Intelligence for Dominican Cities.*Dominican Republic: Inter-American Development Bank.https://www.iadb.org/es/project/DR-T1160

Inter-American Development Bank. 2018.*Digital Agenda Support Program.*(nd).https://www.iadb. org/es/project/PR-L1153

Inter-American Development Bank (A), 2019. IDB launches fAIr LAC initiative to promote the ethical use of artificial intelligence. (nd).https://www.iadb.org/es/noticias/bid-lanza-iniciativa-fair-lac-para-promover-el-uso-etico-de-la-inteligencia-artificial

Inter-American Development Bank (B), 2019.*IDB Group-Civil Society Relationship Strategy (Rep.).*(nd).https://www.iadb.org/en/civil-society-v3/strategy%2C20951.html

Inter-American Development Bank. 2020*. Broadband Development Index: IADB*. (nd).https://mydata.iadb.org/Science-and-Technology/-ndice-de-Desarrollo-de-la-Banda-Ancha/9bsb-i99n

World Bank. 2016*. Digital adoption index. (nd).*https://www.worldbank.org/en/publication/wdr2016/Digital-Adoption-Index

World Bank, Gini Index, 2019https://datos.bancomundial.org/indicador/SI.POV.GINI

Bernard, J. 2017.*The vital role of government in helping people prosper.*Oregon: e.Republichttps://www.governing.com/commentary/col-government-vital-role-helping-people-thrive-systems-thinking.html

Official Gazette of the Argentine Republic.2018.*Argentine Digital Agenda.*(nd).https://www.boletinoficial.gob.ar/detailNotice/first/195154/20181105 .

Bosma, N., & Kelley, D. 2018. GEM GLOBAL REPORT 2018/2019. United States: GEM- Global Entrepreneurship Monitor.

Cabrol, M., N. González, C. Pombo, and R. Sánchez. 2020. Adoption and ethics and responsibility of artificial intelligence in Latin America and the Caribbean. IDB Technical Note.

Center for Environmental and Social Studies.2016.*Ceamso.Org.Py.*(nd).http://www.ceamso.org.py/ .

National High Technology Centre. 2017.*PRIAS Laboratory.*Costa Rica: CeNAT-CONAREhttp://www.cenat.ac.cr/es/prias/

ECLAC. 2019.*Artificial Intelligence Summit in Latin America*Santiago: United Nations Economic Commission for Latin America and the Caribbean (ECLAC)https://www.cepal.org/es/notas/cumbre-inteligencia-artificial-america-latina

CHAMBER*TT. T&T CHAMBER ANNOUNCES 2017 CHAMPIONS OF BUSINESS AWARDEES & FINALISTS.* Port of Spain: Chamber, 2017.https://chamber.org.tt/media-releases/tt-chamber-announces-2017-champions-business-awardees-finalists

CIVICUS. 2019.*Dominican Republic: Great Opportunities But Greater Challenges for Domestic Resource Mobilization.*(nd).https://www.civicus.org/index.php/es/medios-y-recursos/noticias/entrevistas/3750-republica-dominicana-grandes-oportunidades-pero-mayores-retos-para-la-mobilacion-de-recursos-domesticos

CKAN, the world's leading open source data portal platform.(2020).*CKAN.*(nd).https://ckan.org/

Ministry of Information and Communications Technology. 2019*Colombia joins OECD artificial intelligence agreement.*Bogotá, Colombia: MinTIC.https://www.mintic.gov.co/portal/604/w3-article-100826.html?_noredirect=1

CONCYTEC,*The number of women dedicated to science, technology and innovation increases by 50%*. CONCYTEC, 2015.https://portal.concytec.gob.pe/index.php/noticias/964-aumenta-en-50-el-numero-de-mujeres-dedicadas-a-la-ciencia-tecnologia-e-innovacion

Coast, Alfonso.*Analysis of AI startups in Latin America.*Buenos Aires: PONCHO COSTA, 2019.https://pochocosta.com/podcast/analisis-de-los-emprendimientos-de-ia-en-latinoamerica/

Conacyt. (nd). Asuncion:Conacyt.https://www.conacyt.gov.py/

Connected Society: Digital inclusion in Latin America and the Caribbean (Rep.).2016.*Argentina is the country with the largest artificial intelligence startups in Latin America.*London: GSMA Intelligence.https://ia-latam.com/2018/11/23/argentina-is-the-country-with-the-largest-emerging-artificial-intelligence-companies-in-latam

Data Argentina. (nd).https://datos.gob.ar/

Davis, N., Head of Society and Innovation, Executive Committee and World Economic Forum Geneva. 2016. What is the fourth industrial revolution? .(nd)https://www.weforum.org/agenda/2016/01/what-is-the-fourth-industrial-revolution/

Densen, Peter.*Managed Healthcare Executive, Challenges and opportunities facing medical education.* IOWA: TRANSACTIONS OF THE AMERICAN CLINICAL AND CLIMATOLOGICAL ASSOCIATION, 2011.https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3116346/pdf/tacca122000048.pdf

Doing Business 2019 (16th ed., Training for Reform, Rep.). 2019. Doing Business. Washington DC: World Bank Group.

EFE. 2014.*Persistence is Key to Having a Successful Business.*Peru: AmericaEconomyhttps://www.americaeconomia.com/negocios-industrias/la-persistencia-es-clave-para-tener-un-emprendimiento-exitoso

The American Economist. 2019.*OECD Highlights Advances in Digital Government in Peru.*Peru: The Economist. https://www.eleconomistaamerica.com/economia-eAm-peru/noticias/9965458/06/19/OCDE-destaca-avances-del-gobierno-digital-en-el-Peru.html

THE IMPACT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING ON THE LEGAL COMMUNITY. 2017. (nd).https://chamber.org.tt/event/impact-artificial-intelligence-machine-learning-legal-community

The Global Information Technology Report.2016.*Uruguay: Network Readiness Index in detail (Rep.).*

The Country of Costa Rica.*Persistence is key to successful entrepreneurship, says expert.*Bogota: The Country, 2014https://www.elpais.cr/2014/12/31/la-persistencia-es-clave-para-tener-un-emprendimiento-exitoso-dice-experto/

Endeavor Mexico. 2019.*Santander Presents "Fintech Thermometer: The Challenges of Regulation".* Mexico: Endeavor.https://www.endeavor.org.mx/sala-de-prensa/santander-presenta-el-termometro-fintech-los-retos-de-la-regulation

Endeavor. 2018.*The Impact of Artificial Intelligence on Entrepreneurship*(AI Latin America, Rep.).*(nd).*

Endeavor: Peru. 2020.*About Us.*(nd).https://endeavor.org.pe/sobre-nosotros/

Estevadeordal, A., Beliz, G., Estevez, E., Ovanessoff, A., Plastino, E., Rao, A.,Gillam, M. 2018.*Integration & Trade Magazine: Year 22: No. 44: July, 2018: Algoritmolandia: artificial intelligence for a predictive and inclusive integration of Latin America.*doi:10.18235/000128

Brazilian digital transformation strategy (E-Digital). 2018.*Brazilian Digital Transformation Strategy (E-Digital ed., Rep.).* Brasilia: Department of Digital Transformation Policy.

Digital Transformation Strategy towards Bicentennial Costa Rica 4.0(2018 ed., Rep.). (2018-2020). Costa Rica: Ministry of Science, Technology and Telecommunications.

National Digital Strategy: We transform Mexico. 2018.*Monitoring the Digital Agenda for Latin America and the Caribbean eLAC 2018 (Rep.).* Mexico: ECLAC.https://www.gob.mx/mexicodigital/articulos/estrategia-digital-nacional-transformamos-mexico

EUTIC,*EUTIC 2019 preliminary results.*Montevideo: Electronic Government and Information and Knowledge Society Agency, 2019.https://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-knowledge/comunicacion/noticias/resultados-preliminares-eutic-2019

Evans, V. (nd).*Latin America Region Report (Rep.).* Indiana University.

FIUNA. .2018.*First International Workshop on Advanced Computing and Artificial Intelligence.*Paraguay: Faculty of Engineering of the National University of Asuncion.http://www.ing.una.py/?p=32318

FIUNA. 2018.*They designed an automatic detection system for facial expressions of pain using convolutional neural networks.*Paraguay: Faculty of Engineering of the National University of Asuncion. http://www.ing.una.py/?p=29428

FIUNA. 2019.*Mechatronics Engineering Students from Fiuna Presented "Fi-bot" and "Mechatronic Mobile" as Projects in the Robotics 2 Course.*Paraguay: Faculty of Engineering of the National University of Asuncion.http://www.ing.una.py/?p=38561

Forbes.Antel takes the lead and launches Latin America's first 5G network in Uruguay. Montevideo: Forbes, 2019. https://www.forbes.com.mx/antel-se-adelanta-y-lanza-la-primera-red-5g-de-america-latina-en-uruguay/

International Monetary Fund. 2019.*WESTERN HEMISPHERE REGION Regional economic outlook: stunted by uncertainty.*https://www.imf.org/en/Publications/REO/WH/Issues/2019/10/22/wreo1019

World Economic Forum on Latin America. (nd).https://www.weforum.org/events/world-economic-forum-on-latin-america-2020

World Economic Forum. 2016. Network Readiness Index. (nd).http://reports.weforum.org/global-information-technology-report-2016/networked-readiness-index/

Electronic Government Ecuador. 2020. Co-creation of the National Open Data Policy. Ecuador: Open Data http://www.datosabiertos.gob.ec/co-creacion-de-la-politica-nacional-de-datos-abiertos/

World Bank Group. 2019. World Bank Open Data. (nd).https://datos.bancomundial. org/country/argentina .

GSMA.*Digital inclusion in Latin America and the Caribbean*. USA: Connected Society, 2016.https://www.gsma.com/latinamerica/wp-content/uploads/2016/05/report-digital_inclusion-4-ES.pdf

GSMA Latin America. 2020. Digital Inclusion in Latin America. (nd).https://www.gsma.com/latinamerica/sociedad-connected/?lang=es

Gustavo Eduardo, Patricia Gutti and Néstor Le Clech. Technological capabilities indicators in Latin America. (Mexico: ECLAC, 2007).https://repositorio.cepal.org/bitstream/handle/11362/5014/1/S0700876_es.pdf

Gutierrez. 2018.*Civil Society Organizations in Mexico.*Mexico: Mexican Council of Social Sciences. https://www.comecso.com/publicaciones/organizaciones-sociedad-civil-mexico

Gómez-Mont, Constanta and Martinez Pinto, Cristina.*Artificial intelligence: a look from Mexico.*Mexico City: Nexos, 2020.https://www.nexos.com.mx/?p=46682

Hernandez Armenta, Mauricio. 2019.*Antel Takes the Lead and Launches Latin America's First 5G Network in Uruguay.*Mexico: Forbes.https://www.forbes.com.mx/antel-se-adelanta-y-lanza-la-primera-red-5g-deamerica-latina-en-uruguay/

- Hurtado, D., M. Lugones and S. Surtayeva.*General-purpose technologies and technological policies in the semi-periphery: the case of nanotechnology in Argentina*(Argentina: National University of San Martin. 2014) www.revistacts.net/files/Volumen_12_Numero_34/HurtadoEDITADO.pdf

Ia2030. 2019.*National Survey on Artificial Intelligence*(Rep.). Mexico: Ia2030

IA LATAM,*41% of fintechs are betting on the use of Artificial Intelligence.*Chile: IA LATAM, 2019.https:// ia-latam.com/2019/07/08/el-41-de-las-fintech-apuesta-por-el-uso-de-inteligencia-artificial/

ICD. (nd).*Civil society in Colombia: A georeferenced mapping.*http://www.lasociedadcivil.org/noticia/sociedad-civil-en-colombia-un-mapping-georreferenciado/

Implementation of the SICA Emprende Strategy. 2014.*Progress Report to August 2014, Rep*. San Salvador: Cenpromype.

Global Philanthropy Indices. 2018.*Latin America.*(nd).https://globalindices.iupui.edu/environment/regions/latin-america/index.html

Report: Ecuadorian breach reveals sensitive personal data. 2019. (nd).https://www.vpnmentor.com/blog/report-ecuador-leak/

Human Development Reports. 2019. *Human development indicators.*Argentina: United Nations Development Programmehttp://hdr.undp.org/en/countries/profiles/ARG

UNESCO Institute for Statistics UIS. 2020.*How much does your country invest in R&D?*(nd).http://uis.unesco.org/apps/visualisations/research-and-development-spending/

Argentine Artificial Intelligence.(nd).https://iaar.site/

IBM Research. 2019.*Red Horizons AI*(nd).https://www.research.ibm.com/artificial-intelligence/horizons-network/#partnerships .

ITU Publications. 2018. Global Cybersecurity Index (GCI) 2018. (nd).https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-GCI.01-2018-PDF-E.pdf .

ITU. 2019.*Individuals using the Internet, 2005-2019. (*nd).https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx

IUPUI. 2018. Global Philanthropy Indices. United States: LILLY FAMILY SCHOOL OF PHILANTHROPY.

IUPUI. 2018. Global Philanthropy Indices: Latin America. United States: LILLY FAMILY SCHOOL OF PHILANTHROPYhttps://globalindices.iupui.edu/environment/regions/latin-america/index.html

Jaimovich, D. 2019.*When will 5G arrive in Latin America, the telephone network that promises a connection up to 100 times faster?*(nd)https://www.infobae.com/america/tecno/2019/04/05/when-llegarael-5g-a-america-latina-la-red-de-telefonia-que-promete-una-conexion-hasta-100-veces-mas-rapida/

KapAITech.2019. Research and Innovation in Artificial Intelligence. Peru: KapAITechhttps://kapaitech.com/ Kunan.

2018.*Kunan Challenge*.Peru: Kunan.http://www.kunan.com.pe/premio/

LAVCA,*2019 LAVCA Industry Data & Analysis*.Buenos Aires: LAVCA, 2019.https://lavca.org/downloads/2019-lavca-industry-data-analysis/

*The Mobile Economy in Latin America and the Caribbean 2018 (2018 ed., Rep.).*2018. London: GSMA Intelligence.

Linares, AM, Pires, JC, Sembler, JI, Maciel, O., Fernández, C., Fernández, BA, Putic, M. 2018.*Approach Paper: Country Programme Evaluation: Brazil 2015-2018*.doi:10.18235/0001635

López, Zyanya. Emi Labs, the robot that hires your employees. CDMX: Exhibition, 2019.https://expansion.mx/emprendedores/2019/10/04/emi-labs-the-robot-that-hires-your-employees

Makwela. 2019..*Brazil: We are in a fragile moment for civil society*.Brazil.CIVICUS Monitor .https://www.civicus.org/index.php/es/medios-y-recursos/noticias/entrevistas/3838-brasil-estamos-en-un-momento-fragil-de-la-sociedad-civil

Martinho-Truswell, Miller, Asare, Petheram, Stirling, Gómez Mont, & Martínez. 2018.*Towards an AI STRATEGY in Mexico: Taking Advantage of the AI Revolution (Rep.).*Mexico City, Mexico: British Embassy in Mexico.

Mazzucato, M. 2015. What is the role of government in generating innovation? (nd)https://www.weforum.org/agenda/2015/04/what-is-governments-role-in-sparking-innovation/

Mecon. 2016.*Ministry of Economy and Public Finance - Argentina*.(nd)http://servicios.infoleg.gob.ar/infolegInternet/anexos/255000-259999/259082/norma.htm

Membership: NGO Alliance, Inc. (nd).http://alianzaong.org.do/memberesia/

Table, Pia.*The most common profile of the Uruguayan entrepreneur: male and high income*.Montevideo: El País Uruguay, 2019.https://negocios.elpais.com.uy/noticias/perfil-comun-emprendedor-uruguayo-mujer-altos-ingresos.html

MIEM-DGS.*Incubacoop*. 2019. Uruguay: Ministry of Industry, Energy and Mining.https://www.miem.gub.uy/cooperativas/incubacoop

Miller, H., & Stirling, R. 2019.*Government AI Readiness Index 2019 - Oxford Insights*. London: Oxford Insights. https://www.oxfordinsights.com/ai-readiness2019

Ministry of Information and Communications Technologies. 2019.*Colombia Joins Artificial Intelligence Agreement With OECD*. Bogotá: El Tiempo.https://www.mintic.gov.co/portal/604/w3-article-100826.html?_noredirect=1

MINTEL. 2019.*Ecuador Digital*(MINTEL ed., Rep.*)*.Ecuador: Ministry of Telecommunications and Information Society.

*Monitor: Tracking Civic Space- Brazil.*2019. (nd).https://monitor.civicus.org/country/brazil/

*Monitor: Tracking Civic Space- Peru.*2019. (nd).https://monitor.civicus.org/country/peru/

*Monitor: Tracking Civic Space- Trinidad and Tobago.*2017. (nd).https://monitor.civicus.org/country/trinidad-and-tobago/

Navarro, J.C. 2018*The imperative of digital transformation: an IDB business science and innovation agenda for the new industrial revolution.*doi:10.18235/0001293

NESTA, Gender Diversity in AI Research, California: Nesta, 2019.https://media.nesta.org.uk/documents/Gender_Diversity_in_AI_Research.pdf

OECD. 2019.*"Argentina", in Education at a Glance 2019: OECD Indicators*. Paris: OECD Publishing. https://doi.org/10.1787/f7d8f931-en

OAS - Organization of American States: Democracy for Peace, Security and Development. 2009. Guide to Mechanisms for the Promotion of Transparency and Integrity in the Americas.https:// www.oas.org/es/sap/dgpe/guia_sociedad_civil.asp

ILO Argentina. 2016.*Future of work in Argentina.*Argentina: International Labour Organization. https://www.ilo.org/buenosaires/temas/futuro-del-trabajo/lang--es/index.htm

UN,*Global Human Development Indicators.*2019.hdr.undp.org/en/countries

Social Panorama of Latin America. 2018.*Social Panorama of Latin America*. doi:10.18356/d0938e4f-es

Parker, C..2017.*Chile: Civil society in motion against the neoliberal model.*Chile: CETRI Center tricontinental.https://www.cetri.be/Chile-la-sociedad-civil-en?lang=fr

Parodi Luna, M. 2018. Peru (The Global Environmental Philanthropy Index ed., Rep.). *Latin American*

Economic Outlook 2019(Development in Transition, Rep.). (nd). OECD iLibrary. National Executive

Branch Data Opening Plan. (nd).https://datosgobar.github.io/pad/

Pombo, C., Gupta, R., & Stankovic, M. 2018.*Social services for digital citizens: Opportunities for Latin America and the Caribbean.*doi:10.18235/0001105

Portal of the Federal Government of Brazil. 2016.*Good Practice Contest.*(nd). Brazil: gov.br https://www.gov.br/cgu/pt-br/acesso-a-informacao/institucional/concursos/concurso-de-boas-praticas

Uruguay National Plan,*National Plan.*Montevideo: National System for Productive Transformation and Competitiveness, 2019https://www.transformauruguay.gub.uy/es/plan-nacional

*everis Utec Awards.*2019. Peru: Everis Foundationhttps://www.premioseveris.pe/

First National Entrepreneurship Competition "Tourism and Technology" (Rep.). (nd).*Terms and Conditions*.

Quacquarelli Symonds,*QS Rankings 2020*. 2020https://www.topuniversities.com/subject-rankings/2020

QS World University Rankings 2019. (nd).https://www.topuniversities.com/university-rankings/world-university-rankings/2019

Raymond Perrault, Yoav Shoham, Erik Brynjolfsson, Jack Clark, John Etchemendy, Barbara Grosz, Terah Lyons, James Manyika, Saurabh Mishra and Juan Carlos Niebles. 2019.*Annual Report of the Artificial Intelligence Index*

Accountability. 2016.*Fourth Collective Accountability Report 2015-2016*(Ecuadorian Confederation of CSOs, Rep. Ecuador: Civil Society Organizations.

Rodriguez Vargas, F. (nd). Civil Society and the State in Colombia (Rep.). Gestion.

Rodriguez, A., Sanchez, J., & Sanchez, A. 2002.*Micro, Small and Medium Enterprises in Mexico. Evolution, Operation and Problems (Rep.).*Mexico: Institute of Legislative Research of the Senate of the Republic.

Santander Trade.2019.*BRAZIL: POLITICS AND ECONOMY.*(nd).https://santandertrade.com/es/portal/analizar-mercados/brasil/politica-y-economia .

Schwab, K. 2019. The Global Competitiveness Report 2019 (Rep.). Geneva, Switzerland: World Economic Forum.

Scrolini, Fabrizio.*Automate with caution: Data and AI in Latin America*. Buenos Aires: ILDA, 2018. https://idatosabiertos.org/automatizar-con-cautela-datos-e-inteligencia-artificial-en-america-latina/

Senate of the Republic. 2019.*They propose to incorporate the open parliament in matters of regulation of the Pacific Alliance.*Mexico: Senate of the Republichttp://comunicacion.senado.gob.mx/index.php/informacion/boletines/46281-plantean-incorporar-el-parlamento-abierto-en-temas-de-regulation-de-la-alianza-pacifico.html

Sibaja, E. 2019.*National High Technology Centre: 20 years transforming knowledge into development.* (nd).https://delfino.cr/2019/04/centro-nacional-de-alta-tecnologia-20-anos-transformando-knowledge-en-desarrollo

Smart Nation and Digital Government Office. 2020.*National AI Strategy: The Next Key Frontier of Singapore's Smart Nation Journey2020.*Singapore: Smart Nationhttps://www.smartnation.sg/why-Smart-Nation/NationalAIStrategy

Stanford University. 2019. AI Index Steering Committee, Stanford Institute for Human-Centered Artificial Intelligence.https://hai.stanford.edu/sites/g/files/sbiybj10986/f/ai_index_2019_report.pdf

Sundblad, W. 2018.*Data is the foundation of artificial intelligence and machine learning*.https://www.forbes.com/sites/willemsundbladeurope/2018/10/18/data-is-the-foundation-for-artificial-intelligence-and-machine-learning/

Takenaka, H., Gast, A., Parker, C., Yendamuri, P., Ingilizian, Z., Rejón, R., BBC Mundo · BBC Mundo. (n.d.). Archive.https://es.weforum.org/agenda/archive/fourth-industrial-revolution/

THE,*World University Ranking.*Times, 2020.https://www.timeshighereducation.com/world-university-rankings/2020/world-ranking#!/page/0/length/25/sort_by/rank/sort_order/asc/cols/stats

UNESCO. 2019.*Greater Civil Society Participation in Peru Inspires Better Cultural Policies.*(nd). http://www.unesco.org/new/es/lima/work-areas/unidad-informacion-publica/office-activities/una-mayor-participacion-de-la-sociedad-civil-en-peru-inspirara-mejores-politicas-culturales/

International Telecommunication Union, World Telecommunication/ICT Development Report and Database. 2018.*People using the Internet (% of population)*. (nd).https://datos.bancomundial.org/indicador/IT.NET.USER.ZS

Uruguay Digital. (nd).https://uruguaydigital.gub.uy/ Uruguay

Entrepreneur. (nd).https://uruguayemprendedor.uy/

Uruguay Presidency. Uruguay's technological development makes it possible to face the challenges of the new digital era with expectations. Montevideo: Uruguay Presidency, 2019https://www.presidencia.gub.uy/comunicacion/comunicacionnoticias/vazquez-foro-convergencia-empresarial-iberoamericano

WEF,*World Economic Forum on Latin America*.n,d. 2017.https://www.weforum.org/events/world-economic-forum-on-latin-america-2017

Wömpner, Fredy H. 2019.*Entrepreneurship: An Activity That Gains Supporters in Chile*.Chile: ASECH. https://home.asech.cl/opinion/detalle/5065/el-emprendimiento-una-activity-que-gana-partidarios-en-chile