COLOMBIA

Scientific ecosystems and enablers of artificial intelligence

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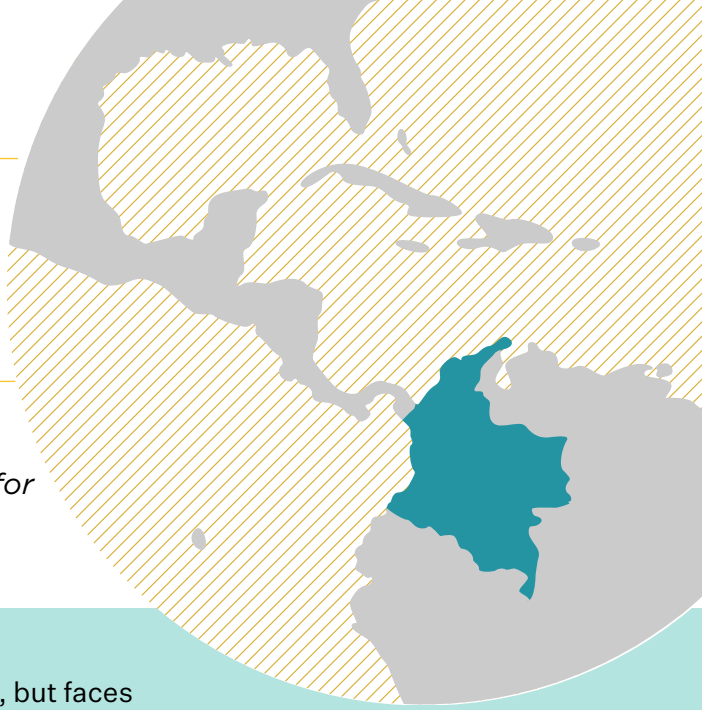

Key takeaways

- Colombia is a regional leader in AI in Latin America, but faces significant challenges in developing appropriate infrastructure, data availability and digital skills.
- The Government of Colombia envisions AI as a key tool in tackling the country's most pressing challenges.
- Multiple programmes and initiatives are underway to expand connectivity, improve digital literacy and advance the development of AI with a social impact.

In Latin America, Colombia is gaining prominence in the field of artificial intelligence (AI) through its efforts to establish governance and regulations for AI systems and implement programmes that prepare its citizens and the public and private sectors to harness the benefits of AI. Colombia sees AI as a crucial tool for driving socio-economic development, placing a strong emphasis on ensuring responsible, sustainable and ethical use in line with the principles set by the OECD (OECD, 2024) and UNESCO (UNESCO, n.d.). Despite its progress, Colombia faces significant challenges in developing its AI systems, particularly in the areas of infrastructure, data availability and digital skills.

Strengthening Colombia's science and research sector

With approximately 4,500 science, technology, engineering and mathematics (STEM) researchers, Colombia lags behind other nations in terms of research and development (R&D). By comparison, Chile has nearly 10,000 researchers, Argentina over 56,000 and the United States 1.6 million. Moreover, while Colombia has the third-largest R&D budget in Latin America (after Brazil and Argentina), it allocates the lowest percentage of GDP to it (0.29 percent), trailing behind Brazil (1.21 percent), Uruguay (0.48 percent), Argentina (0.46 percent) and Chile (0.34 percent) (Tortoise Media, 2024). This lack of a robust R&D ecosystem hinders Colombia's ability to fully leverage AI for societal and economic growth. The Colombian government has therefore introduced programmes aimed at fostering the necessary skills to strengthen its science and research ecosystems.

Building on existing foundations to strengthen R&D

Between 2009 and 2011, Foros Semana, the knowledge unit of Colombia's leading political magazine, played a key role in consolidating the elements of an innovation ecosystem. It

fostered trust and established relationships between scientists, academics and the public and private sectors. This project began with Colombia's National Planning Department (DNP) and subsequently included the university and business ecosystem in Bogotá. As a result, institutions such as Connect Bogotá and Ruta N were established, working to apply science for the country's economic development. Through Ruta N, the World Economic Forum's Centre for the Fourth Industrial Revolution has been set up in Medellín (World Economic Forum, 2024).

In August 2024, Colombia hosted both a national summit and the Latin American and Caribbean Ministerial Summit on Artificial Intelligence – ColombIA in Cartagena (ColombIA, 2024), which was attended by more than 22 ministers of education, science and technology from Latin America (MinTIC, 2024a). A declaration was adopted promoting digital education, innovation ecosystems and shared AI infrastructure in the region.

Also, in recent years, Colombia has trained and welcomed professionals who have studied and researched AI topics globally, building a network of international cooperation and positioning the country as a regional leader in Latin America.

These intellectual capabilities are continually being refined, becoming a crucial factor in Colombia's technological development. For instance, during the COVID-19 pandemic, Colombia developed a vulnerability interactive geographical viewer (Espinosa et al., 2021). This tool facilitated the identification of vulnerable populations that could benefit from state programmes, including cash transfers and other forms of support. Additionally, the initiative helped energize Colombia's research ecosystem as it created a unique database that was accessible for other developments.

Another example is Project Guacamaya, a joint effort between several Colombian research institutions and Planet Labs PBC and Microsoft AI for Good to monitor deforestation and protect biodiversity in the Amazon rainforest through satellite imagery, camera traps and bioacoustics (Smith, 2023).

R&D for innovation through AI

The Colombian Ministry of Science, Technology and Innovation (MinCiencias), in collaboration with the DNP and the Ministry of Information and Communication Technologies (MinTIC), is leading efforts to promote R&D that better understands how AI can support local government agendas and businesses, while enhancing social and economic development with sustainability at the core. The primary focus is currently on solutions for food security, agriculture and climate change.

In response, discussions with the United States government have identified a need to prioritize USAID resources to fund AI-based projects addressing agriculture and climate change issues in Colombia. Additionally, as president of the Executive Committee of the Inter-American Telecommunication Commission, Colombia took the lead in two key decisions approved by the 13 member countries, one of which emphasizes moving towards interoperability and supranational infrastructure for open data, focusing on climate and agriculture as common global challenges. This initiative will be supported by three

Colombian universities: Los Andes, Externado and the National University. Colombia also played a key role in the World Telecommunication Standardization Assembly in India in October 2024, pushing for the creation of a framework supporting states to report how they impact biodiversity and develop standards around energy and electromagnetic impact within the AI value chain (Government of Colombia, 2024a).

Moreover, in early 2024, MinTIC launched the ColombIA Inteligente programme, which supports applied research, technological development and innovation projects in AI and aerospace technologies to contribute to the social, economic and environmental development of different regions across the country (Innovamos, 2024). With a budget of COP 9,400 million (approximately USD 2.4 million), the programme addresses critical areas such as food security, energy transition, healthcare sovereignty and science for peace (MinCiencias, 2023). This demonstrates how the government envisions AI as a tool to tackle Colombia's most pressing challenges.

Challenges in enhancing AI systems in Colombia

Despite these initiatives, Colombia faces significant challenges in building the infrastructure and digital skills needed for robust, sustainable and autonomous AI systems. According to the World Bank, less than 13 percent of Colombia's rural population has Internet access (Blanco and Román, 2023), and there is a 40 percent national digital divide, primarily due to a lack of digital skills and Internet access (MinTIC, 2023). This digital divide has been attributed to economic factors, with many households unable to afford Internet, and digital illiteracy, with many people believing they do not need or would not use the Internet at home (Universidad Externado de Colombia, 2024). Furthermore, in 2021, 37.1 percent of households with Internet access had speeds below 10 Mbps (DANE, 2022).

As explained by Oxford Insights in its Government AI Readiness Index for 2023, one of the pillars underpinning AI systems is 'Data and infrastructure'. AI tools and systems require large amounts of high-quality data (data availability), which, to avoid bias, should reflect the diversity of the population (data representativeness). The full potential of this data can only be unlocked with the right infrastructure to support and deliver AI tools to the public. Colombia's score of 63.3 in the data and infrastructure pillar of the AI Readiness Index underscores the need to improve connectivity, broadband quality, access to supercomputers, and data availability and governance (Oxford Insights, 2023).

As such, the government has announced plans to expand connectivity in 2024, aiming to ensure 85 percent of the population has Internet access (MinTIC, 2024b). Additionally, Colombia recently accessed BELLA II, a transcontinental fibreoptic cable between Portugal and Brazil that connects Latin America with the European Union, thus helping to increase computing capacity in Colombia and activate AI projects through cooperation between academia, industry and the state.

On the digital skills front, the Colombian government has prioritized programmes aimed at improving digital literacy. MinTIC is setting up 75 Centros PotencIA across the country – public centres offering high-speed Internet access; gaming and virtual reality spaces; co-working spaces; and free courses in AI, cybersecurity and data analytics, both online and

in-person (MinTIC, 2024c). This initiative is backed by a COP 200,000 million investment (approximately USD 47.4 million) and is supported by local universities across the different regions. Other programmes, such as Avanza Tech, Talento Tech and SENATIC, seek to build digital skills among professionals and entrepreneurs (Universidad Externado de Colombia, 2024). Colombia's National Development Plan sets a goal of enhancing the digital skills of 1 million citizens between 2022 and 2026 (Government of Colombia, 2023).

The role of the private sector in enhancing AI

With the support of FEDESOFT, the national software development union, the Digital Economy Directorate at MinTIC has established working groups to collaborate with companies that have Large Language Model prototypes. These efforts aim to ensure that university scientists and PhD students can work with local public officials and business associations through the public procurement office to capitalize on AI tools like ChatGPT and Gemini. FEDESOFT and the National Spectrum Agency have also worked intensively to secure national AI software for the government's Colombia Compra Eficiente (Colombia Buys Efficiently) initiative, which aims to link the national software industry with the public office to facilitate the purchase of technology for the public sector through AI.

Additionally, through the Center for Innovation, Research and Technology (CENISOFT), the national software and IT sector works to strengthen the national technology industry through programmes and projects to promote digital transformation of the private sector.

Internationally, Colombia, as president of the International Telecommunication Union's Study Group 5, has launched an initiative for Latin American technology companies, researchers and countries to create AI-based solutions to tackle the climate crisis (Government of Colombia, 2024b). Colombia is also leading research on the impact of AI on the environment and biodiversity, contributing to the framework for COP16, which the country hosted in October 2024.

Final remarks

Colombia has laid the groundwork to advance the development of AI with a social impact and is seeking to strengthen the enabling factors needed to maximize the potential of AI. As such, the government aims to create a positive feedback loop, where advancements in science reinforce AI development and vice versa. While the Colombian AI ecosystem is consolidating, with talent, knowledge networks and political will in place, digital skills, scientific research and financial investments must continue to grow, with the private sector playing a crucial role.

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