URUGUAY

Following a roadmap to prepare national science systems for artificial intelligence

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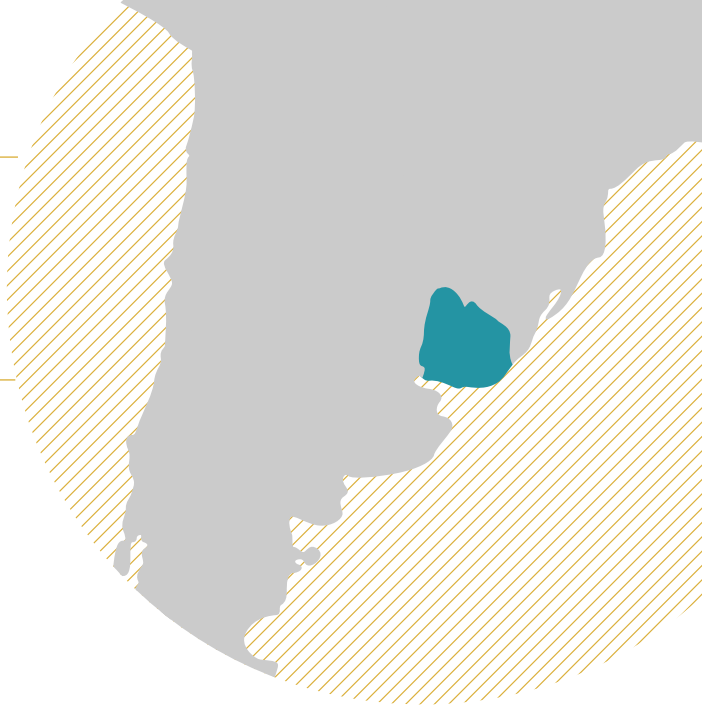

Key takeaways:

- The Roadmap for Data Science and Machine Learning developed in Uruguay in 2019 highlights the role of universities, public-private partnerships and civil society. National and international investment have supported AI projects in the country since 2017.
- Uruguay is leading regional events and initiatives on AI placing it as a leader in the region.
- Among the immediate next steps in the country are capacity building and upskilling and AI education.

Nearly a decade ago, Uruguay initiated a strategic effort to integrate data science and AI into various aspects of its societal fabric. The resultant Data Science and Machine Learning Roadmap, published in 2019, is a testament to Uruguay's commitment (TransformaUruguay, 2019). Aligned with the National Development Strategy 2050 (Isabella, 2019), the roadmap envisioned Uruguay as a leader in AI solutions application by 2030. It delineated two main dimensions: creating an enabling environment and exploring opportunities in national strategic sectors. The roadmap underscored critical elements essential for fostering AI development in Uruguay, including enhancing education and training in data science and machine learning, attracting talent, improving research and innovation capabilities, updating regulations and fostering international collaboration. The document also identified capacities and opportunities for applying AI in crucial national sectors.

As part of the roadmap, Uruguay conducted a review to identify international experiences conducive to local AI development. The compiled report showcased successful global and regional initiatives, highlighting common characteristics that attract talent and cultivate thriving research and development ecosystems (Etcheverry and Fariello, 2020). After this review, the change in government in 2020 and the onset of the COVID-19 pandemic prompted the suspension or postponement of some roadmap actions. Yet despite these challenges, Uruguay has demonstrated resilience by resuming and continuing key actions and lines of work (AGESIC, 2023).

A regional snapshot

The Latin American AI Index (CENIA, 2023) offers an insightful analysis of AI landscapes across twelve Latin American countries, including Uruguay. This index, structured into three axes – enabling factors; research, development and adoption; and governance – provides a comprehensive perspective on the maturity of the region's research, development and adoption ecosystems. Uruguay stands out for having high scores in several dimensions assessed in the index, ranking third in the region (55 percent) after Chile (73 percent) and Brazil (65 percent).

There are still opportunities for improvement in many areas to further strengthen the ecosystem's development across Latin America. As Uruguay already leads regional initiatives and partnerships on AI, thus understanding the needs and differences across the region, it is well placed to lead effective and cohesive interactions towards common AI goals.

Artificial intelligence infrastructure

Uruguay boasts a robust connectivity infrastructure, surpassing the Latin American average in Internet usage and download speed (CENIA, 2023). The country excels in device accessibility, with high indicators – particularly in households owning computers and mobile device subscriptions – exceeding regional averages.

More local computing infrastructure is needed, however. A computing platform called the National Supercomputing Centre (ClusterUY) was created for use by scientists and researchers in the country by the National Agency for Research and Innovation and the Sectoral Commission for Scientific Research. Accessibility and use of ClusterUY is however limited to experienced coders. Universidad de la República (UdelaR) is working on facilitating access to the platform but this remains an ongoing challenge. A large part of cloud computing services comes from the private sector. Google, for example, is set to establish a Google Data Centre in Uruguay with the aim of serving the whole region.

Academic initiatives

Within the academic sphere, UdelaR, the country's leading research institution, plays a pivotal role. Several initiatives, notably Centro Interdisciplinario en Ciencia de Datos y Aprendizaje Automático (CICADA), aim to develop research, innovation capabilities and multidisciplinary education in AI-related fields (CICADA, no date). Several research lines at UdelaR explore diverse domains, such as genomics, bioinformatics, medical image processing, epidemiology, ecology, neurosciences and education, using AI methods and tools.

The Data Science and Machine Learning Roadmap highlights the role of universities in AI teaching and training as well as for development and research, even though the role of universities is not necessarily distinguished. The research and science ecosystem in Uruguay is limited, with only three main universities creating a tight community. Partnerships between the private sector and public sector are happening naturally or de facto depending on cases and needs.

The roadmap also outlines institutional arrangements involving collaboration between the government, national academic institutions like UdelaR, and the private sector. The national science and research community actively contributes to developing and implementing the response. In collaboration with other local organizations, CICADA actively engages with civil society, fostering discussions on ethical considerations in data science and AI (ANEP, 2023). This initiative is a platform for building knowledge and exchange between researchers, students, professionals and the broader community.

Talent and research challenges

The Latin American AI Index (CENIA, 2023) recognizes Uruguay's data capabilities and governance excellence. However, challenges persist in talent development, with a noted gap in professional AI training and a scarcity of relevant programs in regional QS-ranked universities. Improving data literacy and upskilling students and educators are integral to Uruguay's plans (Ceibal, no date). Building on the country's prominent position in AI research and innovation, the next steps will involve addressing challenges, particularly in formal AI education, to ensure a sustainable and comprehensive approach to AI adoption in the scientific sector.

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Uruguay emerges as a regional leader in research and development, showcasing high productivity and quality in open-source development. While patent registration remains low, the Latin American AI Index suggests aligning Uruguay's innovation landscape with its impressive open-source achievements (CENIA, 2023).

Investment and innovation

Uruguay boasts the highest normalized averages of inward investment and total estimated investment value in Latin America (CENIA, 2023). Although research on AI topics receives support from institutions like the National Agency for Research and Innovation and UdelaR, there's a noticeable absence of specific AI-oriented funding initiatives. Some exceptions are the Sectoral Fund for Open Data Research (ANII, 2018), which was discontinued, and the Call for R&D Projects in Artificial Intelligence (ANII, 2022), carried out jointly with the International Development Research Centre (IDRC). The two calls for the Sectoral Fund in 2017 and 2018 totalled USD 1 million, which was distributed among 38 projects (approximately USD 26,000 per project). With the specific calls for AI projects funded by IDRC, seven projects were supported with approximately USD 30,000 per project.

Alongside active investment, Uruguay also emphasizes algorithmic governance (AGESIC, 2023). Transparency in algorithmic systems is a cornerstone of this approach, aligning with global best practices and ensuring ethical considerations in the adoption of AI technology (Rahim, 2023).

Building bridges

The potential role of Uruguay in bridging academic and enterprise efforts in AI research is exemplified by the KHIPU events (KHIPU, no date). These meetings in Montevideo in 2019 and 2023 brought together top AI researchers from around the world with a strong presence of researchers from UdelaR in the KHIPU committee, and sponsored by international entities. The events culminated in the Montevideo Declaration on Artificial Intelligence and its Impact on Latin America, signed by almost 500 researchers (various authors, 2023).

Uruguay's approach to AI within its scientific system is characterized by a strategic approach under the 2019 roadmap; active collaboration between government, academia and the private sector; and a commitment to ethical and responsible AI practices. Ongoing initiatives and achievements position Uruguay as a regional leader in AI research, development and application, and the country is now focusing on building capacity, fostering transparency and addressing challenges for a sustainable future in AI development.

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