KHIPU

Strengthening Artificial Intelligence in Latin America

Outcomes of **KHIPU 2023**
Latin American Meeting in Artificial Intelligence

Table of Contents

Introduction

The second edition of KHIPU Latin American Meeting in Artificial Intelligence took place on March 6th-10th of 2023 at the Facultad de Ingeniería, Universidad de la República, in Montevideo, Uruguay. The primary goals of the event were:

- To offer training in advanced machine learning topics, such as deep learning and reinforcement learning.
- To strengthen the machine learning community by fostering collaborations between Latin American researchers, and creating opportunities for connections and knowledge exchange with the broader international community.
- To grow awareness around how AI may be used for the benefit of Latin America.

These aims were informed by our knowledge of the state of AI in Latin America and the inspiration provided to us by our friends at the Deep Learning Indaba who showed us what is possible from such an event.

This report presents the key outcomes of KHIPU 2023.

Introduction

Aims of KHIPU

Unlocking Latin American talent through advanced training in machine learning.

Latin America has a strong university system, and many students are interested in AI. However, much of the foundational research in AI today is new and a large proportion of these advances have their epicenter in the developed world. With KHIPU we sought to bring the best of Latin American and international talent in AI together to hold five days of intensive lectures in advanced AI topics for participants. We also recorded the lectures, and provided a live-stream on YouTube. This has implications not just for Latin America, but has a global impact, with students from across all continents participating via available lecture materials and videos.

Fostering AI research in Latin America by building an AI community.

Latin America is a vast region and research institutions are spread across thousands of miles. Yet, collaboration is a key ingredient for quality research. At KHIPU, we heard many Latin Americans panelists say "we (the Latin research community) just don't know each other. We need more events like KHIPU where we can meet". Our hope is to build an event which would also spark many new AI-driven collaborations across Latin America. In this second in person edition of KHIPU we were able to gather again a group of Latin American researchers who also participated in the first edition in 2019. This allowed us to strengthen the ties and collaborations that originated in these years thanks to KHIPU.

Driving adoption of AI-driven solutions through increasing awareness.

It almost goes without saying that the more opportunities a student, researcher or entrepreneur has to find support for their work, the more likely they are to succeed. In general, the infrastructure to support work in AI - access to venture capital, investment from local companies, research institutions well-funded by governments - is lacking in Latin America when compared with the major AI hubs around the world. Our hope was that by hosting an event such as KHIPU, and in particular bringing several high profile speakers to the region, we would spark a conversation in Latin America that might inspire governments and businesses to invest more in AI.

KHIPU as it happened

KHIPU as it happened

KHIPU's general program was designed to inspire learning, provoke thought, and excite the next generation of AI researchers of Latin America. The goal was to spark enthusiasm among participants about research in AI and Machine Learning, and for them to learn about the different career opportunities and local capacity in the field. We created a structured curriculum from foundational material to real-world applications and advanced topics at the state-of-the-art. Activities were organized around groups: Fundamentals, Advanced topics, hands-on practicals, AI applications, Parallel sessions, Discussion, and finally the closing event.

Fundamentals

The week started with a series of lectures covering the fundamental aspects of current AI technologies. Each lecture was linked to a practical coding session for participants to get hands-on experience.Prof. Luciana Ferrer (Universidad de Buenos Aires) covered Machine Learning fundamentals focusing on evaluation practices and calibration in particular, a key concept to estimate the generalization accuracy on unseen data.

- Prof. Joan Bruna (New York University) talked about Deep Learning fundamentals. In this talk he described some of the main questions of the field, such as approximation, optimization and generalization properties, with emphasis in the high-dimensional regime.
- Prof. Jorge A. Sánchez (Univ. Nac. de Córdoba) described the foundations of Computer Vision, introducing convolutional and transformer-based architectures and how they are used in the different vision problems.
- Prof. Kyunghyun Cho (New York University) explained in detail the basics of modern Natural Language Processing, with an emphasis on language modeling, transformers, and how they relate to previous concepts such as contrastive learning of word vectors and PCA.
- Dr. Ruben Villegas (Google) introduced modern Generative Modeling and gave an in-detail overview of diffusion models and how they are applied in the day to day to generate images.
- Prof. Alejandro Ribeiro (University of Pennsylvania) described the foundations of Graph Neural Networks and how they're used, including their relationships to convolutions and their transferability to new graphs.
- Dr. Pablo Castro (Google) provided an overview of Reinforcement Learning, describing the different methods used in learning value functions and policies and the exploration/exploitation dilemma.
- Sara Hooker (Cohere AI), gave an in-depth overview of the different topics on ethics and fairness in artificial intelligence, in particular focusing on how one model performing well for one population or task may not be so for an underrepresented one.
- Dr. Nando de Freitas (DeepMind) gave a talk on Large Visual-Language models, where he described in depth how transformers work, and how they can be adapted to work with multimodal inputs.


The "Foundation Models" Era
GPT-3 / ChatGPT [Brown at al, OpenAI] 175B Parameters
Self-supervised learning (predict next word token)
If messi is picasso and maradona is van gogh, who is cristiano ronaldo? explain your logic
Comparing soccer players to famous artists is an interesting analogy, but it's important to keep in mind that each player has their own unique style and contributions to the sport. That being said, if we were to make a comparison between Cristiano Ronaldo and an artist, I might suggest that he is like Salvador Dali.
Dali was known for his eccentricity and showmanship, often using surrealism and unexpected elements in his art to captivate his audience. Similarly, Ronaldo is known for his flashy style on the field, including his signature celebration and penchant for performing tricks and fancy footwork.
Both Dali and Ronaldo also had a strong sense of individualism and a desire to be the center of attention. Dali famously declared himself to be the greatest artist in the world, while Ronaldo has often been criticized for his perceived arrogance and showboating.
Overall, the comparison between Ronaldo and Dali may not be a perfect match, but there are certainly similarities in terms of their style, personality, and impact on their respective fields.
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Advanced topics

On top of the Fundamental lectures, we had more advanced research talks and lectures. The goal was to give a sense of the current state-of-the-art describing challenging open problems and potential research directions, as well as providing a more in-depth exposure to the topics presented in the foundational lectures.

- Dr. Marco Cuturi (Apple) gave an overview of Optimal Transport theory, and how it can be used in biology to predict single-cell interactions.
- Prof. Doina Precup (McGill University and DeepMind) gave a more in-detail overview of Deep Reinforcement Learning, building on Pablo Castro's talk and explaining how those methods pair with neural networks, and what are the different advantages and disadvantages of each one.
- Prof. Rachel Ward (University of Texas) discussed the theoretical basis for Stochastic Gradient Descent and how its properties relate to other understood optimization algorithms and the practical observations we see in deep learning.
- Prof. Helena Caseli (Universidade Federal de São Carlos) gave a talk on the different problems that women in NLP are working on, and a social overview of the research landscape of this group.
- Dr. Samy Bengio (Apple) discussed several of the latest innovations in foundational research done at Apple, from self-supervised learning to pseudo-labeling to learning to reason.


The Apple Watch Standing Notification
• The Apple Watch will encourage its users to stand if they have been idling for the first 50 minutes of the hour.
• Prolonged sitting is associated with many risks.
• premature mortality, diabetes, cardiovascular mortality
• A few minutes of standing per hour limit these risks.
• In Human Behavioral Analysis, a nudge is "a choice architecture that alters behavior without forbidding options".
6:50
STAND
Time to stand!
Stand up and move a little for one minute.
Dismiss
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marvik IDATHA Ceibal
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AI Applications

In addition to the advanced research lectures, we had several talks on applications of AI research in different problems.

- Prof. Guillermo Sapiro (Apple and Duke University) gave a talk about the use of regression discontinuity in Apple watches to estimate the causal effect of nudging on people's fitness habits.
- Prof. Gonzalo Mateos (University of Pennsylvania) focused on advanced topics in Graph Neural Networks, in particular random walks and encoder-decoder approaches, and their applications on biology, recommender systems, and traffic prediction.
- Dr. Nayat Sanchez-Pi (INRIA Chile) gave a talk on how AI is applied to the modeling and mitigation of climate change, with a particular focus on the ocean.

Discussions

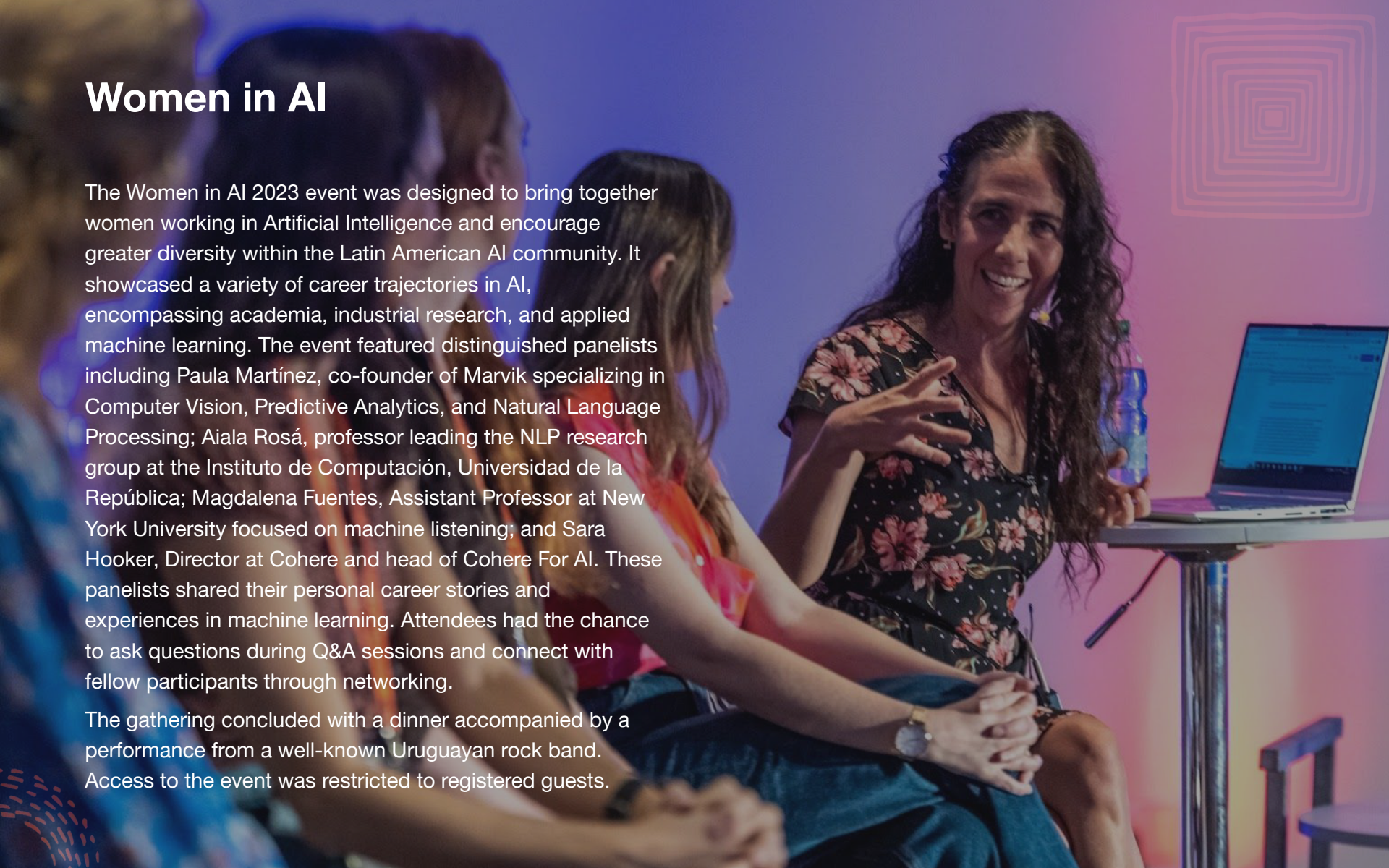
We had a discussion session on "How to write a great research paper" with Joan Bruna, Sara Hooker, and Kyunghyun Cho. Here, the members of the panel shared their personal tips on writing, reviewing, and the process of academic research. Furthermore, about half of the session was devoted to a Q&A where the students and attendees could ask questions to the panelists on these or other topics.


WOMEN IN AI
at Khipu Reception hosted by Google

Women in AI

The Women in AI 2023 event was designed to bring together women working in Artificial Intelligence and encourage greater diversity within the Latin American AI community. It showcased a variety of career trajectories in AI, encompassing academia, industrial research, and applied machine learning. The event featured distinguished panelists including Paula Martínez, co-founder of Marvik specializing in Computer Vision, Predictive Analytics, and Natural Language Processing; Aiala Rosá, professor leading the NLP research group at the Instituto de Computación, Universidad de la República; Magdalena Fuentes, Assistant Professor at New York University focused on machine listening; and Sara Hooker, Director at Cohere and head of Cohere For AI. These panelists shared their personal career stories and experiences in machine learning. Attendees had the chance to ask questions during Q&A sessions and connect with fellow participants through networking.

The gathering concluded with a dinner accompanied by a performance from a well-known Uruguayan rock band. Access to the event was restricted to registered guests.



Closing Event

The Khipu 2023 Closing Event occurred at Teatro Solís on Friday, March 10th, from 14:00 to 20:00. This free event, open to the public, academia, press, industry, and collaborators, focused on recent Artificial Intelligence applications and fostering regional collaboration. The program featured several sessions: "AI stories from Latin America" with speakers Nina da Hora, Ivan Vladimir Meza Ruiz, and Martín Rocamora; "AI stories from abroad" presented by Nando de Freitas, Sara Hooker, and Kyunghyun Cho; and a Keynote address delivered by Peter Norvig. Additionally, a Round Table discussion titled "How and Why We Should be Fostering AI in Latin America" included panelists Fabrizio Scrollini, Jocelyn Dunstan, Sebastian Barrios, and Peter Norvig, moderated by Luciana Benotti.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Diversity, Equity and Inclusion

Diversity, Equity and Inclusion

KHIPU is committed to ensuring that diverse groups of people benefit from the opportunities and knowledge available in the machine-learning community. We aspire to establish a conference that grows responsibly by realizing the characteristics of a diverse and multicultural audience in Latin America. Considering many factors that may challenge the fair participation of different groups at KHIPU, we leverage good practices from previous efforts, including the ACM FAccT Strategic Plan, to define five fundamental guiding principles for promoting diversity and inclusion in the conference.

- Geographic: People from different countries are often not equally represented in AI academic events.
- Disciplinary: Computer Science versus not Computer Science as well as within Computer Science.
- Demographics: People representing different minority demographics should be able to attend the event considering gender and ethnic identity.
- Economic: People doing excellent work in this space or with high potential should be able to attend regardless of their financial situation.
- Virtual access: People who cannot attend the conference in person should be able to access KHIPU's online content.

We organize the rest of this section in the first three principles, the economic aspect is covered in the section “Financing”, and the last one is covered in the section “Website and streaming stats”. We finish this section with insights from the diversity survey that we did to our participants on why our Latin American cultural diversity is important for AI and a very brief description and reference to the “Montevideo Declaration on Artificial Intelligence and its Impact in Latin America” that participants of KHIPU wrote and signed.

Geographic

Figure 1 depicts the country of residence of the participants who were accepted at KHIPU. The percentage of Argentina, Brazil, and Uruguay is very close to the percentage of applicants from those countries. The percentage of participants from Colombia, Chile, Perú, and México that were selected is considerably higher than the percentage of applicants from those countries because the participation of applicants resident in the region was prioritized.

There are three aspects that we recommend to take into account and try to improve in future editions. One is to increase the participation of other countries in Latin America that are currently underrepresented. Second, to analyze whether the accepted applicants live in a big city or a smaller city, we noticed that a large majority of KHIPU applicants come from big cities. Finally, the Diversity, Equity and Inclusion committee recommends considering using not only English but also Spanish and Portuguese in future editions of KHIPU since language barriers might be limiting the diversity of the applicants, the participants and also how much the participants can profit from the event.

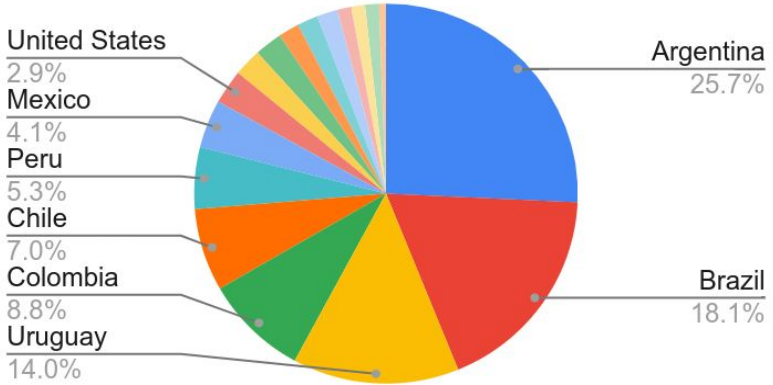


Figure 1. Country of residence of the accepted participants at KHIPU 2023.

Disciplinary

Regarding the applicants' fields of study, reviewers were asked to identify any applicant coming from a field that is a bit different or not directly related to computer science and machine learning. We considered 'encouraged' fields to be philosophy, ethics, linguistics, law, quantum mechanics, physics, sociology, chemical engineering, molecular biology, etc. These got a boost in their ranking. We consider 'common' fields to be engineering, computer science, data science, statistics, machine learning, etc. These would typically get no boost due to the diversity of their field. Reviewers were also asked to identify industry professionals from under-represented areas from startups and small companies.

Demographic

The following graph shows the autoreported ethnic distribution of the participants accepted to KHIPU 2023. To compare to those that applied we notice that the percentage of applicants that were white was 44% and decreased to 35% in the accepted participants. Meanwhile, the percentage of coloured/mixed increased from 19 to 24%. It is important to notice that what people understand as ethnicity in Latin America might be constructed differently than in English-speaking countries. This might be a reason why there is a considerable percentage of participants that either respond “I do not know” or “prefer not to say” to this question.

The last graph of this section shows that the accepted participants were 52% male and 41% female. The other categories were: prefer not to say, questioning and not binary. The applicants were 68% male and 28% female.

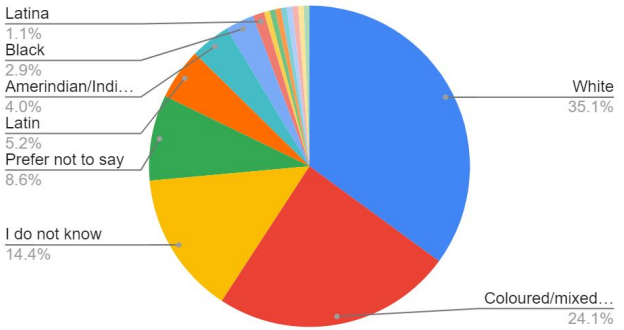


Figure 2. Autoreported ethnic distribution of the participants accepted to KHIPU 2023

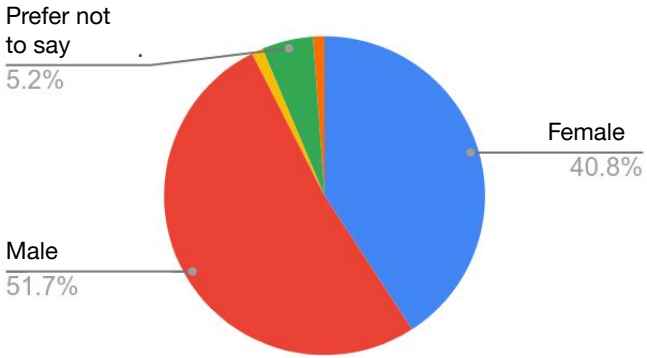
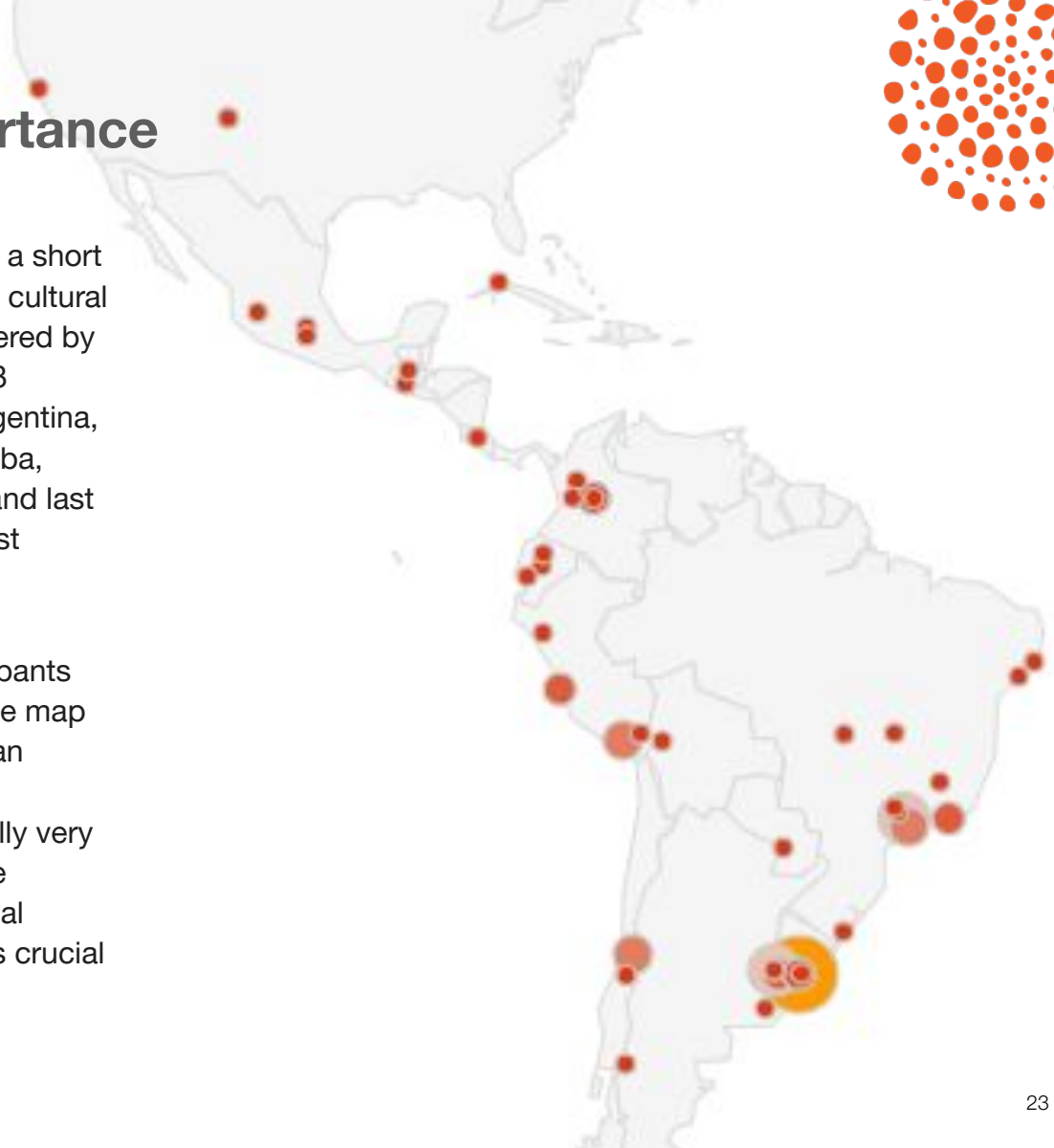


Figure 3. Genre distribution of the participants accepted to KHIPU 2023

Survey on Diversity Importance

A few days before KHIPU, we sent participants a short survey about the importance of Latin American cultural diversity for fostering AI. The survey was answered by participants from 44 different cities and from 13 different Latin American countries including Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, Guatemala, Mexico, Paraguay, Peru and last but not least, Uruguay. These include the largest countries in Latin America, over 90% of Latin Americans live in these countries.

The survey was also answered by a few participants from Europe, Africa and the US, as shown in the map below. The survey asked “Why is Latin American cultural diversity important for AI?” Most of the responses stressed the fact that we are culturally very diverse, that we generate data for AI but we are underrepresented in the development of Artificial Intelligence and that diversity, including ours, is crucial for fairness.



Montevideo Declaration on Artificial Intelligence

During KHIPU and motivated by the diversity survey, the Montevideo Declaration on Artificial Intelligence was presented at the KHIPU closing ceremony to urge governments and companies to make AI developments put at the service of the people, reflecting the particularities and problems of Latin America. This letter, written and signed by over 200 KHIPU participants, calls for artificial intelligence technologies to serve the common good, improving people's quality of life and aligning with democratic principles and human rights. We highlight here three of its main points.

An improvement in productivity due to AI should have a direct correlation with an improvement in working conditions and job quality, with special attention to the most vulnerable populations.

The creation of AI for Latin Americans must be carried out with Latin Americans, valuing their participation in research and development, and not only as mere producers of raw data or manual annotations.

It is essential to strengthen the sovereignty of Latin American countries with respect to the strategic and regulatory issues of AI.

Efforts to train people at the highest level and develop critical thinking, like KHIPU, are crucial to that goal.

The full letter can be found here: https://doi.org/10.5281/zenodo.8208793

Chicas TIC: How does Artificial Intelligence systems discriminate us?

The "Chicas TIC" event, part of the KHIPU event series, aimed to encourage young women between 12 and 14 years old to explore Artificial Intelligence. Held on March 6, 2023, at the Facultad de Ingeniería, UdelaR in Montevideo, this free event focused on how word embeddings function and the potential biases within language processing technologies. It represented an effort by the Facultad de Ingeniería to tackle the gender gap in STEM fields by offering opportunities for women in engineering and technology, connecting to broader initiatives like "Women in AI" within KHIPU.

During this event the participants try to get an answer for the following questions: How do Artificial Intelligence systems discriminate us? What about these applications and their impact on our lives? Are these tools biased? Can they be discriminatory? Is it the same in Spanish as in other languages such as English?

Financing

Financing

KHIPU financing comes completely from our generous set of sponsors. The sponsorship categories were allocated in four tiers: Platinum, Gold, Silver and Bronze. KHIPU 2023 had 20 sponsors (see Appendix Sponsors for a full list): 3 Platinum sponsors, 2 Gold sponsors, 6 Silver sponsors and 11 Bronze sponsors. KHIPU 2023 total expenses were USD 266,835.00 distributed as shown in Table 1.

Thanks to our generous sponsors and the fact that several speakers covered their own travel and accommodation expenses, we were able to cover transportations and accommodation for everyone who asked for it. We covered travel for 115 participants (81 students and 34 researchers and lecturers) and accommodation for 126 participants (94 students and 32 researchers and lecturers), all of them from Latin America. Registration was free for all participants including students, academics, members of non-profit organisations, and industry professionals.

We operate in a cash conscious manner and will be reinvesting the surplus money into scaling next KHIPU events.

Categories	Budget	Notes
Events and catering	45.02%	All catering, networking events.
Participants support	35.27%	Travel and hotel support for students and speakers.
Materials and facilities	5.75%	Facility maintenance, poster boards, transportation. The venue was sponsored.
Teaching support	2.44%	Facilities AV assistance and tech support.
Community and programmes	2.16%	Community support, web design and maintenance, photography and videos.
Administration	8.44%	Secretary, legal, finance, risk, comms, etc.

Table 1: Distribution of budget allocation across different categories

Conclusions

Conclusions

KHIPU 2023 demonstrated significant strides in strengthening Latin American AI and building a vibrant, inclusive community. The event successfully delivered advanced training in machine learning, fostering collaboration among Latin American researchers and creating valuable connections with the international AI community. It sparked enthusiasm for AI and machine learning, showcasing diverse career opportunities and local capacity in the field. Furthermore, KHIPU 2023 facilitated crucial conversations around the responsible development and application of AI in Latin America, highlighted by the Montevideo Declaration.

Looking ahead, KHIPU is poised for continued growth and impact. To further enhance its influence, future editions should focus on increasing participation from underrepresented countries within Latin America; analyzing participant representation from both large and smaller cities to ensure broader reach; and expanding on diversity and inclusion efforts, providing more comprehensive data and analysis.

With ongoing support from sponsors and a commitment to reinvesting surplus funds, KHIPU is well-positioned to scale its initiatives, host more distributed events (KHIPUx), and continue driving the advancement of AI in Latin America. Stay tuned!

Appendices

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Website and streaming stats

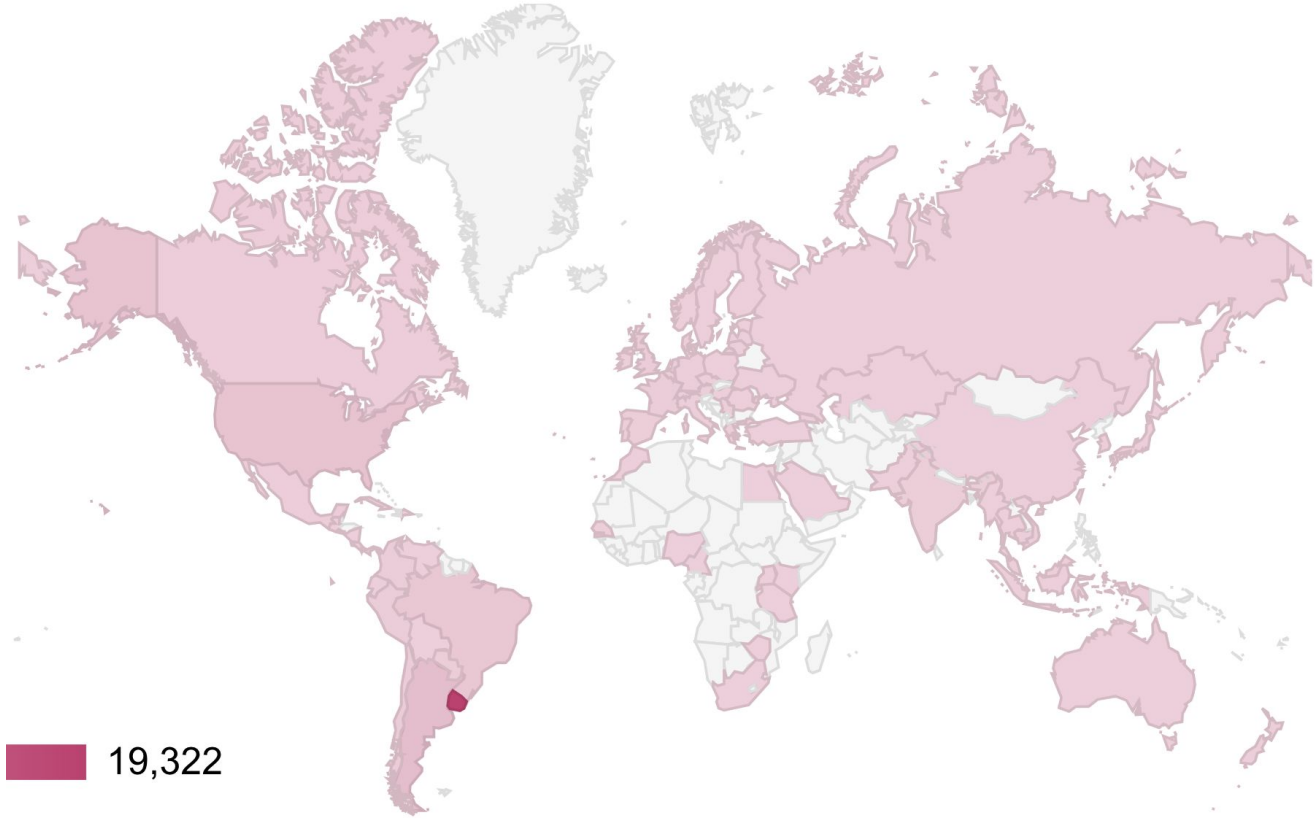

Figure A1. Visit statistics for the https://khipu.ai/ website during the event (see Table 2 in next page).

Website and streaming stats

Country	Views
Uruguay	19322
Argentina	2235
United States	1496
Brazil	1039
United Kingdom	422
Chile	399
Colombia	260
France	244
Peru	237
Canada	199
Mexico	194
Spain	182
Costa Rica	112
Paraguay	95
India	93
Germany	72
Switzerland	63
Hong Kong SAR China	46

Country	Views
Ecuador	43
Netherlands	37
Morocco	36
Bolivia	34
Belgium	30
Japan, Portugal	29
Ireland	28
Austria, Italy	27
South Korea	25
Australia, Guatemala	23
Pakistan	21
Panama	19
Singapore	17
ChinaM, New Zealand, Sweden	14
Cameroon	13
Saudi Arabia	12
Kenya, Taiwan	11
Finland, Poland, South Africa	10

Country	Views
Denmark, Egypt	9
Cuba, Turkey	7
Israel, Romania, Serbia, Venezuela	6
El Salvador, Qatar, Vietnam	5
Indonesia, Latvia, Luxembourg, Nigeria, Thailand	4
Dominican Republic, Norway, Rwanda	3
Estonia, Ukraine, St. Vincent & Grenadines, Kazakhstan, Nicaragua, Greece, Myanmar (Burma)	2
Cambodia, Czechia, Georgia, Hungary, Lithuania, Malaysia, Russia, Senegal, Tanzania, Uganda, Zimbabwe	1

Table 2. Streaming stats per country.

YouTube streaming statistics

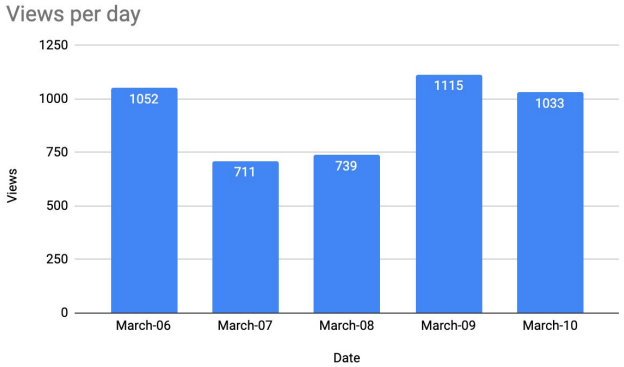

Figure A2. YouTube channel views per day.

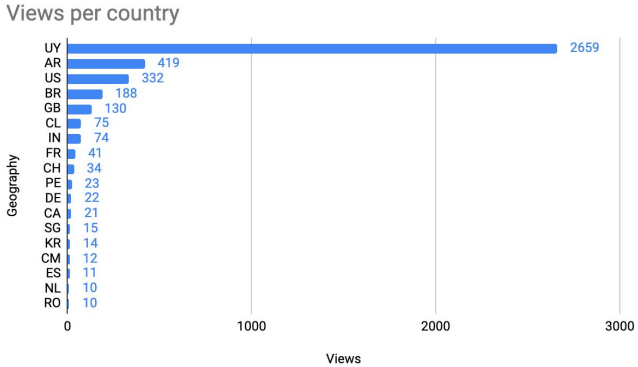

Figure A3. YouTube channel views per country (top 18).

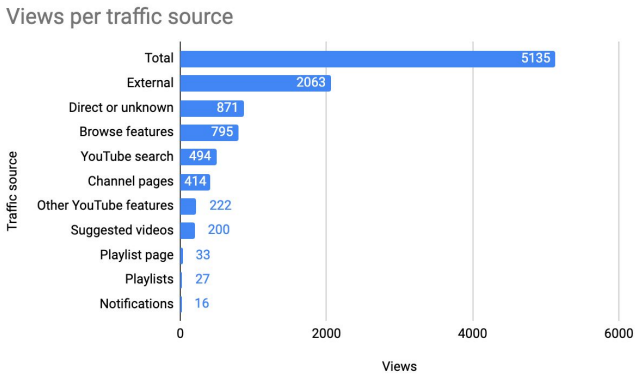

Figure A4. YouTube traffic per source.

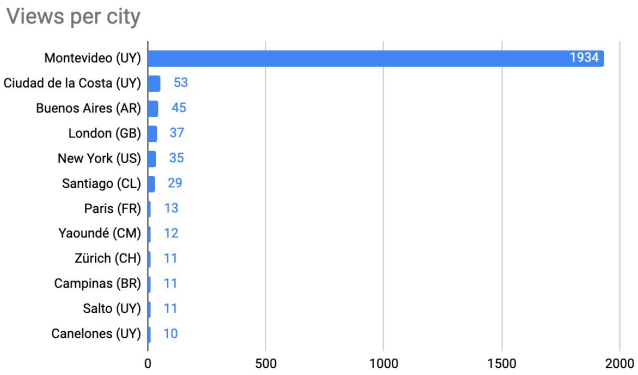

Figure A5. YouTube views per city.


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José Lezama
Mauricio Delbracio

KHIPU 2023 Secretary

We thank Easy Planners for their assistance in the event's organization.

KHIPU 2023 Designers

Another Monday were the graphic designers for KHIPU 2023.

KHIPU's logo created by
Ernesto Barriola