# CURRICULUM VITAE

Dr. Matías Bilkis

## Personal Information


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| **Full Name:** | Matías Bilkis |
| **Date of Birth:** | April 7, 1995 |
| **Nationality:** | Argentine |
| **Place of Residence:** | La Plata, Argentina |
| **Phone:** | +54 221 6003027 |
| **E-mail(s):** | matiasbilkis@gmail.com<br>mbilkis@cvc.uab.cat<br>matias@qutsur.com |
| **Personal website:** | matibilkis.github.io |
| **Affiliations:** | QML-CVC (Barcelona) & QutSur (Argentina) |
| **Google Scholar:** | M. Bilkis |
| **Languages (professional)** | Spanish, English, Catalan |


## Summary of Capabilities

My experience is based on executing projects related to quantum technologies, artificial intelligence and their application to industry, with strong participation in knowledge transfer. I have worked on more than 20 research and/or technology transfer projects, including software development and implementation in HPC systems, prototype development, and consulting on disruptive technologies.

My ability to communicate complex ideas extends from technical audiences (CERN, National Labs, scientific conferences) to non-specialized audiences, and I intensely seek to bring technical-scientific knowledge outside traditional spheres, catalyzing social impact and the development of technological ecosystems with concrete actions in Latin America, Europe and the United States.

## Academic Background

**Doctor of Physics** 2018–2023
*Universitat Autònoma de Barcelona (UAB), Spain*
Grup d'Informació Quàntica (GIQ), Department of Physics
Thesis: *Decision-making in quantum environments*
Advisor: Prof. Dr. John Calsamiglia
Grade: Excellent (10/10) – Cum Laude Distinction

**Bachelor of Physics** 2013–2018
*Universidad Nacional de La Plata (UNLP), Argentina*
Faculty of Exact Sciences, Department of Physics
Thesis: *Conditional Entropy and quantum correlations*
Advisors: Prof. Dr. Raúl Rossignoli and Prof. Dr. Norma Canosa
Thesis defense grade: Excellent (10/10)
Overall GPA: 9.51/10 (3.98/4)

## Current Position

**External Researcher QML-CVC group** 2025–present
*Quantum Machine Learning Group (QML-CVC)*

*Responsibilities:*

- Organization of quantum computing seminars
- Strategic advisor in research projects, partnerships with companies and collaborations at South American, North American and European level.
- Training, retention and recruitment of talent in human resources focused on quantum artificial intelligence.

**Associate Researcher** 2023–2025
*Cátedra UAB-Cruilla*
Public-private initiative to catalyze the impact of AI in the music industry.

**Founder QutSur** 2025–present
*Quantum Technology Surveillance (QutSur) Group*
Consulting group focused on the development and adoption of disruptive technologies

- Artificial Intelligence and its social impact
- Software development and projects linked to machine learning
- Organization of events and consulting in quantum technologies

We operate in the United States, Spain and Argentina, with a strong emphasis on strengthening long-term public-private policies for the responsible development of technological ecosystems.

## Academic Career

**Co-founder and director of the QML-CVC Group** 2023–2025
*Computer Vision Center (CVC), Barcelona, Spain*
*Responsibilities:*

- Co-founding and direction of the Quantum Machine Learning research group
- Development of research lines in quantum machine learning applied to computer vision
- Supervision of doctoral, master's and undergraduate students
- Management of research projects funded with public funds and KTT with private companies.
- Development of the *Quantónoma* ecosystem at Universitat Autònoma de Barcelona level.

**Visiting Researcher** 2023–2025
*Universidad Nacional De La Plata*
Instituto de Física La Plata, Instituto de Informática LIFIA

**Associate Professor** 2023–2025
*Universitat Autònoma de Barcelona*

## Research Lines

In the following I detail four main research lines, reflected in the structure of the *Quantum Machine Learning* group at the Computer Vision Center, and channeled through several collaborations I maintain active with different groups or companies globally. For a general perspective of my research interests, I recommend listening to (or summarizing with some machine learning tool) my talk "Three quantum problems, QML-CVC and many challenges". On the other hand, for an introductory and general perspective on quantum artificial intelligence, I recommend my talk AI + Quantum Computing: cases, opportunities and limitations of a promising alliance.

### 1. Quantum Machine Learning

Development of quantum architectures for machine learning, hybrid classical-quantum optimization methods, development of applications to classical information processing (audio, images). Development of machine learning algorithms for the advancement of quantum technology, with a focus on quantum control. Active collaborations with QML-CVC group.

### 2. Statistical Inference and Quantum Protocols

Optimal protocols for decision-making in quantum environments, including real-time calibration of quantum devices, sequential hypothesis testing and statistical inference complemented with machine learning post-processing algorithms, and quantum reinforcement learning. Active collaborations with Ciop Argentina and Swabian, GiQ-UAB, PiC - UAB.

### 3. Quantum Information and Correlations

Study of correlation measures, classicality and distinguishability of quantum systems. Characterization of quantum correlations beyond entanglement. Study of fundamental models of classicality, simulability and state-of-the-art techniques with GPUs (Cuda-Q). Active collaborations with IFLP - Conicet and University of Siegen,GiQ-UAB. References and advisors: NVIDIA, RiSe

### 4. Knowledge Transfer & Social Impact of AI

*(a)* Development of quantum computing applications to computer vision problems, hybrid classical-quantum architectures, quantum generative models, development of low-latency machine learning models for implementation on real quantum hardware and combinatorial optimizers. Collaboration with EureCat, GMV, Practia and Swabian Instruments.

*(b)* Strengthening of the ecosystem and link between society and technology both at the Catalan and Buenos Aires level. Organization of scientific events, presentations and debate talks on the responsible use and development of technology (AI and/or quantum). Participation in government working groups on quantum computing. Collaborators: ICFO, Fura dels Baus, Gonna Go productions, Cátedra UAB-Cruilla.

## Research Metrics

**Google Scholar** (October 2025):

- **Total citations:** 110+
- **H-index:** 5
- **i10-index:** 3
- **Publications:** 9 (6 published in peer-reviewed journals, 3 preprints)

## Scientific Publications

**Doctoral Thesis:** "Decision-making in quantum environments: from model-free to model-aware learning of quantum controls". Universitat Autònoma de Barcelona (2023)

- Defended on June 13, 2023 before the committee composed of Dr. Roberta Zambrini (IFISC), Dr. Zoe Holmes (EPFL) and Dr. Gael Sentís (GIQ-UAB)
- Available at: TDX Repository or at this link

**Bachelor's Thesis:** "Conditional entropy and quantum correlations". Universidad Nacional de La Plata (2018).

- Defended on March 18, 2018 before the committee composed of Dr. Alejandro Mariano (IFLP) and Dr. Fernando Montani (IFLYSIB).
- Available in UNLP repository Sedici.

### Articles in International Peer-Reviewed Journals

1. **M. Bilkis**, M. Cerezo, G. Verdon, P. J. Coles, L. Cincio. "A semi-agnostic ansatz with variable structure for quantum machine learning". *Quantum Machine Intelligence*, Vol. 5, Article 43 (2023). DOI: 10.1007/s42484-023-00132-1.
2. G. Gasbarri, **M. Bilkis**, E. Roda-Salichs, J. Calsamiglia. "Sequential hypothesis testing for continuously-monitored quantum systems". *Quantum*, Vol. 8, 1289 (2024). DOI: 10.22331/q-2024-03-20-1289.
3. **M. Bilkis**, J. M. Kohler, F. Vilariño. "Challenge-Device-Synthesis: A multi-disciplinary approach for the development of social innovation competences for students of Artificial Intelligence". *EDULEARN24 Proceedings - 16th International Conference on Education and New Learning Technologies* (2024). DOI: 10.21125/edulearn.2024.
4. **M. Bilkis**, M. Rosati, J. Calsamiglia. "Reinforcement-learning calibration of coherent-state receivers on variable-loss optical channels". *2021 IEEE Information Theory Workshop (ITW)*, pp. 1-6 (2021). DOI: 10.1109/ITW48936.2021.9611443. [**10 citations**]
5. **M. Bilkis**, M. Rosati, R. Morral Yepes, J. Calsamiglia. "Real-time calibration of coherent-state receivers: Learning by trial and error". *Physical Review Research*, Vol. 2, 033295 (2020). DOI: 10.1103/PhysRevResearch.2.033295. [**22 citations**]
6. **M. Bilkis**, N. Canosa, R. Rossignoli, N. Gigena. "Conditional states and entropy in qudit-qubit systems". *Physical Review A*, Vol. 99, 062119 (2019). DOI: 10.1103/PhysRevA.99.062119. [**1 citation**]

### Preprints and Manuscripts Under Review

7. Y. Cordero, S. Biswas, F. Vilariño, **M. Bilkis**. "Hybrid Classical-Quantum architecture for vectorised image classification of hand-written sketches". *arXiv:2407.06416* [quant-ph, cs.AI, cs.CV] (2024).
8. T. Crosta, L. Rebón, F. Vilariño, J. M. Matera, **M. Bilkis**. "Automatic re-calibration of quantum devices by reinforcement learning". *arXiv:2404.10726* [quant-ph] (2024).
9. M. Delgado, M. Llopart, E. Sarabia, S. Taboada, P. Vierge, F. Vilariño, J. M. Kohler, J. Grimberg Golijov, **M. Bilkis**. "Music-triggered fashion design: from songs to the metaverse". *arXiv:2410.04921* [cs.HC, cs.CY, cs.SI] (2024).

## Research Projects (granted and executed)

The following is a non-exhaustive list of funded research projects in which I have been involved in recent years, and which have allowed the development of my scientific work. The vast majority of my scientific visits, publications and conference trips have been funded through these projects.

**Re-TECH Project** 2025–2026
*Funding:* 150,000 EUR
Computer Vision Center, EureCAT & QutSur
Strategic consulting for the advancement of quantum machine learning

**INVESTIGO Project** 2023–2025
*Funding:* 80,000 EUR
Computer Vision Center, Barcelona
Development of Quantum Machine Learning methodologies for Computer Vision problems *Role:* post-doctoral researcher

**Ethics, AI, Art and Society (FCT-23-19711)** 2024–2025
*Funding:* 25,000 EUR
Universitat Autònoma de Barcelona
Social innovation and ethical dimension of artificial intelligence

**GRAIL Project (Graph Reasoning for Automatic Interpretation and Learning)**
2021–present
*Funding:* 150,000 EUR (total project)
Computer Vision Center
*Role:* Co-investigator in the development of quantum architectures for graph processing

**Misiones Collaboration - GMV-Rovimática** 2024–2025
*Funding:* 2,000,000 EUR (consortium project)
Development of quantum technology applications for the aerospace sector
*Role:* Co-investigator, knowledge transfer with GMV for hyperparameter optimization

**COMMUNICITY (Horizon Europe)** 2023–2025
Computer Vision Center
European project on generative models for audiovisual processing and event coordination *Role:* Co-investigator, conference organizer on the social impact of AI with experts from different fields

## Research Projects (not funded due to lack of funds)

The following is a list of research proposals, all approved and positively evaluated, but not granted due to lack of budget from the different entities. By making this list public, my intention is to extend an invitation to the development of these projects or related ideas.

- **Emergents Barcelona** 2024
  *Call: Emerging Leaders Researchers Program Barcelona 2024 (Barcelona, Spain)*
  Integration of citizens in quantum AI research, promoting co-creation and discussion of social impacts of quantum technologies in the Barcelona urban environment.

- **Llavors Q-Sens** 2024
  *Call: Knowledge Industry Program (Catalonia, Spain)*
  Research on the extraction of fundamental dynamic laws from quantum sensor data through explainable AI algorithms, with potential impact in medicine and soil science.
- **Llavors Q-Agro** 2025
  *Call: Knowledge Industry Program (Catalonia, Spain)*
  Development of hybrid quantum sensors for real-time detection of pesticides in the air, combining UV, electrochemical sensors and AI algorithms, applicable to the agri-food sector.
- **Llavors Q-RayTracing** 2025
  *Call: Knowledge Industry Program (Catalonia, Spain)*

Research on quantum algorithms for rendering and ray tracing, with the aim of accelerating computationally intensive processes in computer graphics and simulation applications.

- **Cisco Research Proposal** 2023
  *Call: RFP-21-05 (Cisco Research Funding)*
  Study on quantum control transferred through reinforcement learning and its application to signal detection and pattern recognition, in the context of optoelectronics and quantum communications.
- **CONICET Career Entry** 2025
  *Call: Researcher Career Entry Call (Argentina)*
  Plan to establish in the field of quantum AI in Argentina (CONICET), addressing from theoretical foundations to social applications, with emphasis on human resource training and the development of technological ecosystems.
- **CONICET Postdoc Plan** 2023
  *Call: CONICET Internal Postdoctoral Fellowships Call (Argentina)*
  Development of quantum AI algorithms and evaluation of their applicability in experimental environments, with interdisciplinary approach between physics and computer science.

### Fellowships, awards and research support

**Investigo Postdoctoral Fellowship** 2023-2025
*Funding:* 80,000 EUR
Computer Vision Center
This postdoctoral fellowship constituted a salary base during the years I worked at CVC; my salary as QML-CVC group leader was duly supplemented with other mechanisms.

**Los Alamos National Laboratory Research Fellowship** 2020
*Funding:* 20,000 EUR
Research stay in Theoretical Division, Los Alamos, USA
Collaboration with the group of Patrick Coles, Lukasz Cincio, Marco Cerezo and Guillaume Verdon (Alphabet X, Google)

**FPI Fellowship - Training of Research Personnel** 2017–2021
*Funding:* 100,000 EUR (4 years)
Ministry of Science and Innovation, Spain
Doctoral fellowship for thesis completion at UAB

**CONICET Doctoral Fellowship** 2017 (declined)
National Council for Scientific and Technical Research, Argentina
Doctoral fellowship declined due to relocation to Spain

**AI + music Hackathon Winner** 2021
Sonar Festival, Barcelona

## Human Resources Training

**Doctoral Thesis Co-supervision Oriol Balló** 2024–present
*Topic:* Quantum graph neural networks
*Institution:* Universitat Autònoma de Barcelona - CVC

**Master's Thesis Supervision**

**Tomás Crosta** 2023–2024
*Thesis:* "Automatic re-calibration of quantum devices by reinforcement learning"
*Institution:* Universidad Nacional de La Plata

*Grade:* 10/10 (Honors)
*Award:* **Masperi AFA 2024 Mention** – Best master's thesis in Physics in Argentina
*Publication:* arXiv:2404.10726

**Yeray Cordero** 2024–2025
*Topic:* Hybrid classical-quantum architectures for image classification
*Institution:* Master in Computer Vision, Universitat Autònoma de Barcelona
*Publication:* arXiv:2407.06416

**Miruna Jarda** 2024–2025
*Topic:* Quantum diffusion models
*Institution:* Master in Computer Vision, Universitat Autònoma de Barcelona

### Undergraduate Final Project Supervision

- **Yeray Cordero** (2024): "Quantum image encoding methods". Grade: 10/10. Degree in Computer Engineering, UAB.
- **Maiol Sabater** (2023): "Quantum beat generation for making music with quantum computers". Grade: 9/10. Degree in Artificial Intelligence, UAB.
- **José Aguilera** (2023): "Quantum image encodings". Grade: 9/10. Degree in Computer Engineering, UAB.
- **Adrián Vargas** (2022): "Quantum generative adversarial networks: a first approach". Grade: 8/10. Degree in Computer Engineering, UAB.
- **José Esté** (2020): "Reinforcement learning and quantum information protocols". Grade: 9/10. Degree in Physics, UAB.

#### Summary of HR Training

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| PhD Co-students: | 1 (ongoing) |
| Master's Theses: | 3 (2 with honors), |
| Undergraduate Final Projects: | 5 (completed) |
| **Total:** | **9 students supervised** |

## Teaching Experience

### Undergraduate University Teaching

**Associate Professor - Social Innovation in Artificial Intelligence** 2023–2025
*Universitat Autònoma de Barcelona*
Degree in Artificial Intelligence, 6th semester (6 ECTS)
*Responsibilities:* Course design, delivery of theoretical and practical classes, development of Challenge-Device-Synthesis methodology, evaluation of interdisciplinary projects
*Students:* 40 students per year
*Innovation:* Publication of pedagogical methodology in EDULEARN24

**Head of Practical Work - Quantum Physics II** 2020–2022
*Universitat Autònoma de Barcelona*
Degree in Physics, 4th semester
*Responsibilities:* Problem classes, tutoring, exam grading
*Students:* 60 students per year

**Head of Practical Work - Introduction to Physics** 2018–2020
*Universitat Autònoma de Barcelona*

Degree in Physics, 1st semester
*Responsibilities:* Problem classes, laboratories, tutoring
*Students:* 80 students per year

**Student Assistant - Theoretical and Experimental Physics I & II** 2015–2018
*Universidad Nacional de La Plata*
Faculty of Exact Sciences
*Responsibilities:* Problem classes, laboratories
*Students:* 50 students per year

### Specialized Courses and Seminars

**"Variational Quantum Circuits: a practical introduction"** July 2025
*LIFIA - Faculty of Computer Science, UNLP*
Intensive 8-hour course for graduate students and researchers
Available at: LIFIA

**Organization and coordination of QML-CVC seminars** 2023–present
*Computer Vision Center, Barcelona*
Open seminar series on quantum machine learning
Available at: YouTube QML-CVC

### Teaching Experience Summary

- **10 years of teaching experience** (2015–present)
- **6 different courses** taught at two universities
- **Levels:** Undergraduate (introductory, intermediate, advanced) and Graduate
- **Approximately 400+ hours of direct teaching**
- **More than 300 total students**

## Participation in Events

The following is a (non-exhaustive, consult my website for an updated and complete list) of talks, events, seminars and public interventions I have made in recent years.

### International Congresses and Conferences (as speaker)

- **IEEE Quantum Week 2025** (September 2025) – Albuquerque, USA. Creator and moderator of *Panel:* "Expanding the quantum toolkit: transdisciplinary catalysis for application discovery". Participation of Dr. Alberto Rojo (Michigan University), Anila Mjeda (Munster University), Reiko Yamada (ICFO), Francisco Iglesias (Fura dels Baus).
- **1st Ibero-American Congress on Quantum Computing** (October 2025) – Mexico City, Mexico. *Invited talk:* "Quantum Machine Learning: State of the art and perspectives in Ibero-America".
- **Quantum Techniques in Machine Learning (QTML) 2023** (November 2023) – CERN, Geneva, Switzerland. *Poster presentation:* "Semi-agnostic ansätze for quantum machine learning".
- **Como Lake School on Quantum Technologies** (September 2022) – Como, Italy. *Contribution:* Participation and poster presentation.
- **IEEE Information Theory Workshop (ITW) 2021** (October 2021) – Online. *Oral talk:* "Reinforcement-learning calibration of coherent-state receivers on variable-loss optical channels".
- **Fermilab Quantum Institute Seminar** (March 2021) – Fermilab, USA (online). *Invited talk:* "Learning quantum controls through trial and error".

- **Max Planck Institute Seminar** (June 2020) – Max Planck Institute for the Science of Light, Erlangen, Germany. *Invited talk:* "Real-time calibration of quantum measurements".

### Recent Outreach and Extension Activities

- **Practia Global** (July-October 2025): The impact of quantum computing on industry. This is the initial seminar, available online: AI + Quantum Computing: cases, opportunities and limitations of a promising alliance.
- **Universidad de San Andrés** (March 2025): "Three quantum problems: QML, CVC and many challenges". Talk for the Engineering Faculty.
- **CUANTOS 7** (April 2025): Organization of round table "Quantum Technologies and Cooperation Opportunities between the private sector and the public S&T system in Argentina". National quantum technologies event.
- **Quantum Technologies Event RAFA** (September 2024): Argentine Physical Association. Talk on the quantum ecosystem in Argentina and South America.
- **Ministry of Economic Development** (2025): Participation as expert advisor in working group on quantum computing for public S&T policies.
- **CIITI - XXIII International Congress on Technological Innovation in Computer Science** (August 2024): Universidad Abierta Interamericana. Talk "Artificial Intelligence and Quantum Computing: challenges and opportunities".
- **UBA 0+infinito** (July 2024): University of Buenos Aires, Faculty of Exact Sciences. Talk "Quantum Machine Learning: What is it and what is it for?".
- **UADE** (October 2024): Universidad Argentina de la Empresa. Talk "The impact of AI on the music industry: from streaming to generative composition".
- **Hospital de Niños La Plata** (November 2024): Talk "AI applied to children's mental health: opportunities and ethical challenges". Digital Health Conference.

### Organization of Scientific Events

**Organizer and moderator - QML-CVC Seminar Series** 2023–present
Computer Vision Center, Barcelona
Monthly seminar series with international researchers in quantum machine learning
More than 10 seminars organized, available on YouTube

**Co-organizer - CUANTOS 7** April 2025
Seventh national meeting on quantum technologies in Argentina
Round table on public-private sector cooperation in quantum technologies

**Organizer - RAFA quantum technologies satellite event** September 2025
Meeting of the Argentine Physical Association
Event dedicated to the advancement of quantum technologies in Argentina and the articulation between public-private sector in quantum technologies

## Technology Transfer and Links with the Production Sector

### Company Collaborations

**Practia Global - Publicis Sapiens** 2025
*Project:* Internal and external literacy on quantum computing. Delivery of seminars on the impact of quantum computing in different industries

**GMV Innovating Solutions** 2024–2025

*Project:* Development of algorithms for quantum hyperparameter tuning
*Role:* Principal co-investigator

**Anyverse** 2025
*Project:* Implementation of quantum solutions for rendering
*Role:* Technical advisor

**EURECAT - Centre Tecnològic de Catalunya** 2023–2025
*Project:* Knowledge transfer in quantum computing
*Activity:* Technical consulting and proof-of-concept development

### Open Source Software and Tools Development

**Personal GitHub Repository** 2018–present
Development of open-source libraries and tutorials for implementing machine learning and quantum computing algorithms

**Resources available on the QML-CVC website** 2018–present
Some tutorials supervised by me can be found, access to some talks and GitHub repositories of the group (website not maintained by Matías Bilkis)

## Services to the Scientific Community

### Review Activities

**Scientific journal reviewer:**

- *Quantum Journal*
- *AVS Quantum Science*
- *Physical Review A* (APS)
- *Quantum Machine Intelligence* (Springer)
- *Nature Machine Intelligence* (Nature Portfolio)

**Conference reviewer:**

- IEEE Quantum Week (2023, 2024, 2025)
- Quantum Techniques in Machine Learning (QTML) (2024, 2025)
- NeurIPS Creative AI track

### Advisory to Institutions

**Ministry of Economic Development - Argentina** 2025
*Role:* Expert advisor in working group on quantum computing
*Activity:* Contribution to the development of public policies in quantum science and technology

**Argentine quantum technology research groups (informal consulting)** 2024–present
Advisory to various institutions for the development of graduate programs and research groups in quantum technologies

## Development of the Quantum Ecosystem in Argentina and Latin America

### Community Building Activities

**Support and coordination of researchers networks in quantum technologies** 2024–present

Articulation between research groups from Argentina and Spain, in line with the RIPAISC network, for:

- Development of regional collaborative projects
- Management of student and researcher mobility
- Advocacy in regional S&T public policies

**Participation in quantum technology promotion events**
More than 10 talks and presentations at Argentine and Latin American institutions during 2024–2025, including public and private universities, ministries, companies and research centers.

## Additional Information

**Programming:** Python (expert), Mathematica (intermediate)

**Quantum Computing Frameworks:** Qiskit, PennyLane, Cirq, QuTiP, and my own :-)

**Machine Learning:** TensorFlow, PyTorch, scikit-learn, JAX

**Development tools:** Git, Jupyter, LaTeX

### Languages - Detailed Level

- **Spanish:** Native
- **English:** Fluent (C2) – Teaching, publications, international conferences
- **Catalan:** Fluent – 7 years residence in Barcelona
- **French:** Basic (A2)
- **Yiddish:** Basic (conversational), student at IWO

## References

Available upon request. Include references from:

- Doctoral thesis advisor (Prof. John Calsamiglia, UAB)
- Bachelor's thesis advisors (Prof. Norma Canosa, Prof. Raúl Rossignoli UNLP)
- Collaborators at Los Alamos National Laboratory (Dr. Marco Cerezo, Dr. Lukasz Cincio)
- Collaborators at CONICET (Dr. Juan Pablo Paz, Dr. Diego Golombeck, Dr. Pablo Groisman, Dr. Juan Mauricio Matera)
- Director of Computer Vision Center (Prof. Fernando Vilariño, UAB-CVC)
- If you're interested in me directing your thesis, the best thing is to ask my students what it's like to work with me! :)

*Curriculum Vitae updated as of October 31, 2025*