

# Francisco Vásquez Leiva

Ph.D. Student in Mathematical Modeling, University of Chile

@ francisco.vasquez@ug.uchile.cl  
in in/francisco-vasquez-leiva

@ francisco@vasquezl.com  
francisco.vasquezl.com

+569 8444 7513

Santiago, Chile

## Profile

Ph.D. student in Engineering Sciences in Mathematical Modeling. Holds a Master in Engineering Sciences (minor Applied Mathematics) and a Mathematical Engineering degree, both from the University of Chile. Tenacious, optimistic, and structured. Passionate about learning, teaching, and sharing knowledge. Strong command of mathematical theory, programming, and their applications. Main interests lie in mathematical modeling and applied mathematics, in both research and industry. Avid programmer, fluent in several languages. Extensive teamwork experience, ranging from leadership and project management to delegated tasks. Solid expertise in Machine Learning and Data Science, with 8 years of experience in these fields. International experience and language acquisition gained through a 6-month internship at the French National Institute for Research in Digital Science and Technology (INRIA), Paris, France.

## Education

Ph.D. Student, Engineering Sciences in Mathematical Modeling

Faculty of Physical and Mathematical Sciences, University of Chile

August 2024 - Present

Santiago, Chile

- Advisor: Joaquín Fontbona.
- Funded by the ANID National Doctoral Scholarship 2025.
- Doctoral research:** Mathematical representation of entities and relations in knowledge graphs with heterogeneous information. The proposed framework lets each information source (relational topology, categorical, numerical, and textual attributes) induce a representation space with its own structure, and seeks a unified representation that coherently integrates these factors, preserves their complementarity, and enables inference and generalization to unseen entities.

Master in Engineering Sciences, minor Applied Mathematics

Faculty of Physical and Mathematical Sciences, University of Chile

March 2021 - May 2023

Santiago, Chile

- GPA: 6.9/7.0. Graduated with Highest Distinction. Dual degree with Mathematical Engineering.
- Advisor: Servet Martínez, National Prize in Exact Sciences.
- Thesis:** "Study and modeling of infectious diseases: COVID-19". Mathematical modeling of infectious diseases applied to COVID-19: detection of epidemic waves; estimation of hospital admission probabilities and length-of-stay distributions from public data; development of the CMM Agent-Based Simulator covering 34 communes of the Santiago Metropolitan Region; and design of methodologies for territorial quarantine policies.

Mathematical Engineering

Faculty of Physical and Mathematical Sciences, University of Chile

March 2015 - May 2023

Santiago, Chile

- GPA: 7.0/7.0. Graduated with Highest Distinction. Dual degree with Master in Applied Mathematics.

## Research Interests

- Mathematical Modeling.
- Statistics.
- Stochastic Processes.
- Machine Learning.
- Deep Learning.
- Data Science.
- Knowledge Graphs.

## Skills

Languages:

- English: B2, 81/120 pts TOEFL IBT (2021).
- French: A2.

Programming:

- Advanced: Python, R, C++, SQL, Excel.
- Intermediate: MATLAB, Julia, Git.
- [Datacamp Profile](#) (520+ hours of coursework).

Frameworks & Tools:

- PyTorch, TensorFlow, HuggingFace, LangChain, Neo4j, Docker.

## Research Experience

Master's Thesis Researcher

Center for Mathematical Modeling (CMM)

March 2021 - May 2023

Chile

- Master's thesis "Study and modeling of infectious diseases: COVID-19". Use of the Guacolda-Leftraru supercomputer for simulations. Application of Branching Processes, Queueing Theory, Markov Processes, and Machine Learning.

Visiting Associate Researcher

École nationale de la statistique et de l'administration économique (ENSAE)

June - December 2022

Paris, France

Research on Global Drivers of COVID-19

Center for Mathematical Modeling (CMM)

March - August 2020

- Machine Learning applied to the study of relevant variables of COVID-19.

Research Support

Pontifical Catholic University of Chile

April - June 2021

- Training in pure and applied mathematics, statistics and stochastic processes, computer science, operations research, and optimization.

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## International Virtual Student Exchange

### Tsinghua University

📅 September 2021 - January 2022 📍 Online, China

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## Bachelor of Engineering Science in Mathematics

### Faculty of Physical and Mathematical Sciences, University of Chile

📅 March 2015 - December 2020 📍 Santiago, Chile

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## Professional Experience

### Senior AI Advisor

#### Center for Mathematical Modeling, University of Chile

📅 June 2023 - Present 📍 Chile

- Lead developer of ChatSP, a generative-AI assistant specialized in the SumoPrimer textbook collection (CMM Educación). QA architecture based on agentic GraphRAG with tools.
- 3,000+ users, 9,900+ queries. 20% frequent users (active 20+ days). 90.7% autonomous usage outside training sessions.
- Presence in all regions of Chile and 79.2% of the country's communes. 9.1% of Chilean schools have at least one teacher using the tool.

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### Project Engineer

#### Center for Mathematical Modeling, University of Chile

📅 June 2023 - Present 📍 Chile

- Working in the CMM Data Science line. Responsibilities related to strategy, growth, and expansion of the CMM Data Science group.

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### Product Owner

#### Cleo

📅 March 2023 - March 2024 📍 Chile

- Fintech. Expansion, consolidation, and diversification of the company's products. Risk, credit, and fraud models. Working language: English.

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### Machine Learning Engineer

#### Institut national de recherche en sciences et technologies du numérique (INRIA)

📅 May 2022 - October 2022 📍 Paris, France

- French M2 Master's internship. Joint work with the Laboratoire Interdisciplinaire des Sciences du Numérique (LISN), the Centre national de la recherche scientifique (CNRS), Université Paris-Saclay (#1 worldwide in Mathematics, Shanghai Ranking 2021, 2022), and CentraleSupélec. Research in Recommender Systems, Optimal Transport, Causal Inference, and Natural Language Processing.

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### Business Intelligence Analyst Intern

#### Applied Analytics Sub-Department, BICE Bank

📅 December 2019 - December 2020 📍 Santiago, Chile

- Built models for consumption propensity, product-use prediction, and clustering for customer segmentation, mainly in Python. Created bank-side databases of model results, automating daily and monthly loads, mainly in SQL + Python.

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## Teaching Experience

### Lecturer, Machine Learning Course

#### Master of Data Science, FCFM, University of Chile

📅 August 2024 - Present

📍 Santiago, Chile

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### Teaching Assistant

#### Department of Engineering, University of O'Higgins

📅 January 2023

📍 Rancagua, Chile

- Course taught: Differential Equations, Summer Semester.

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### Course Coordinator, Department of Mathematics

#### Faculty of Physical and Mathematical Sciences, University of Chile

📅 August 2021 - January 2022

- Coordination of 3 courses of the Engineering Common Core.

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### Tutor, Taller Los Dos Relojes

#### Faculty of Physical and Mathematical Sciences, University of Chile

📅 2018, 2021

- Tutor on 3 occasions. Workshop where students from any year and major can come for study consultations on mathematics courses.

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### Teaching Assistant

#### Faculty of Physical and Mathematical Sciences, University of Chile

📅 2017 - 2021

📍 Santiago, Chile Course (times). Total: 18 times as Teaching Assistant.

- Statistics (3). Restructuring and revision of course lecture notes. Creation of video lectures and tutorials.
- Probability and Statistics (3).

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## Job Fair Director

### Redes Beauchef, University of Chile

📅 March 2018 - December 2020    📍 Santiago, Chile

- Organization of the Job Fair Project, which brings the working world closer to students and graduates by setting up venues where institutions offer internships and jobs through interviews (2020).
- Logistics Area Director (2019) and Logistics Executive (2018).

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## Research Area Intern

### LVA Indices

📅 December 2017 - January 2018    📍 Santiago, Chile

- Designed comparison algorithms across mutual funds, providing the best switching option among different fund managers. Construction and recommendation of investment portfolios.

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## Other Activities

### Vice President, ShARE Team UChile

#### ShARE Organization

📅 October 2020 - October 2022

- ShARE is an international organization that teaches consulting and leadership skills.

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### Coordination Team, Freshman Orientation

#### FCFM, University of Chile

📅 January 2016 - July 2020

- Participation in the management and coordination of the welcome program for incoming students at the faculty.

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### President, Mathematical Engineering Students Council

#### FCFM, University of Chile

📅 2018 - 2020

- President (2019, 2020) and Vice President (2018) of the Mathematical Engineering Students Council (CEIMAT).

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## References

### PhD. Servet Martinez

✉ smartine@dim.uchile.cl

Researcher, Center for Mathematical Modeling. Full Professor, Department of Mathematical Engineering. National Prize in Exact Sciences.

### PhD. Joaquín Fontbona

✉ fontbona@dim.uchile.cl

Associate Professor, University of Chile. Coordinator, Data Group at the Center for Mathematical Modeling.

### PhD. Felipe Tobar

✉ ftobar@dim.uchile.cl

Full Professor, Data & AI Initiative, University of Chile. Coordinator, Master in Data Science, University of Chile.

### Natalia Alvarez

✉ natalia@cleo.cl

Chief Operating Officer (COO), Cleo.

- Probability and Statistics in Data Analysis (2). Creation of video lectures and tutorials.
- Machine Learning (1). Coordination and revision of course lecture notes; creation of study materials.
- Introduction to Calculus (3).
- Introduction to Algebra (1).
- Differential and Integral Calculus (1).
- Multivariable Calculus (1).
- Advanced Calculus (2).
- Linear Algebra (1).

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## Supervisor

### Faculty of Physical and Mathematical Sciences, University of Chile

📅 2019 - 2021

📍 Santiago, Chile

- Supervisor of 8 Common Core courses over 5 semesters. Review and oversight of student grading to ensure standardization across the course.

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## Awards

- ANID National Doctoral Scholarship 2025: 6th nationally, score 5.076/5.0.
- Academic Excellence Award, Mathematical Engineering, University of Chile, 2020.
- Top National Score in Mathematics, PSU university entrance exam, 2015.
- Academic Excellence Award and Highest Distinction for Integrity, Nahuelcura School, 2014.

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## Committees

- Member of the founding committee for the Master in Artificial Intelligence (professional track), FCFM, University of Chile.

# Events

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## Talks & Presentations:

- Talk at CIAE 2025: *“ChatSP: A Generative-AI Tool Supporting Teachers in the Preparation and Use of the Sumo Primero Textbooks for Mathematics Teaching in 1st–6th Grade in Chile”*. Francisco Vásquez; Paula Olguín; Salomé Martínez; Lorena Inostroza. CMM, University of Chile. CIAE 2025, Tandil, Argentina, 12–14 November 2025.
- Outreach talk: *“The Language of Machines: How Mathematics Shapes Artificial Intelligence”*, Mathematics Olympiad 2025, Colegio La Cruz, October 2025.
- ChatSP Webinar, July 29, 2025.
- Poster presentation: *“CMM Agent-Based Simulator”* at the 1st Conference on Data Science and Public Health, Santiago, Chile. January 2024.

## Attendance:

- XVII CLAPEM, Latin American Congress of Probability and Mathematical Statistics, March 2–6, 2026, Montevideo, Uruguay.
- 2nd Workshop Probability in South America (PISA), January 12–16, 2026, PUC Chile, Santiago.
- Topological Phase Transition and Localization of Random Fields (CPP2025), December 1–12, 2025, CMM, University of Chile.
- CIAE 2025, 2nd International Congress on AI and Education, November 12–14, 2025, Tandil, Argentina.

- EVIC 2025, Summer School in Computational Intelligence (20th edition), November 26–28, 2025, U. de los Andes, Santiago.
- VII Summer School in Probability and Stochastic Processes (PPE 2025), January 6–10, 2025, CMM, University of Chile.
- *“Blockchains and Ledgers: What They Are and Their Possible Applications Beyond Cryptocurrencies”*, April 3–10, 2024, CMM, University of Chile.
- VI Summer School in Probability and Stochastic Processes, University of Chile, January 8–12, 2024.
- EMIC 2023: Latin American Meeting of Doctoral Students in Modeling, Engineering, and Sciences, University of Chile.
- MCA 2021: Mathematical Congress of the Americas, Online.
- Latin American Congress of Mathematicians (CLAM), 2021.
- FLACAM 2019: French–Latin American Conference on New Trends in Applied Mathematics, University of Chile, Santiago, Chile.
- National Meeting of Mathematical Engineering 2018, Santiago.
- Various workshops, seminars, and talks on Machine Learning and Data Science.

## Organization:

- National Meeting of Mathematical Engineering 2017, University of Chile, Santiago.

# Courses & Certifications

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- **Introduction to Quantum Machine Learning and Quantum Optimization**, University of Deusto (online), 36 hrs. QML, QSVM, QNN, QGAN, QUBO, QAOA, VQE with PennyLane/Qiskit.
- **Introduction to Quantum Computing**, University of Deusto (online), Faculty of Engineering. Fundamentals, quantum circuits, quantum algorithms, ISC, quantum security.
- **Gender Studies Courses**, Programa Prevenir (April–May 2024). Fundamentals of Gender (8 hours). Public Policy with a Gender Lens (8 hours).
- **Artificial Intelligence Courses**, Structuralia, OAS (January–May 2024). Impact of AI on Business (40 hours). Artificial Intelligence (40 hours). Technology Ecosystems: Introduction to New Disruptive Technologies (40 hours). Data Mining, Machine Learning, and Deep Learning (40 hours).
- **Internet Governance and International Relations**, Institute of International Studies (IEI) (January 2024). 25-hour specialization course. Regimes, trade agreements, and global outlook.
- **International Commercial Intelligence Courses**, PROCHILE: Virtual Classroom (September–November 2023). Market Commercial Intelligence (35 hours). International Business Plan (35 hours). Differentiation for Internationalization (35 hours).
- **Advanced Seminar in Financial Derivatives**, University of Chile (2018). Study of financial derivatives via Martingales and Stochastic Partial Differential Equations.
- **Mastering in English**, Lormax Institute (2013–2014). 180-hour specialization course in spoken and technical English.