

CRISTÓBAL LUIS VIVAR VARGAS

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 Khris-VI

 Raleigh, NC, U.S.

Mathematical Civil Engineer and Master of Science in Mathematics of Universidad Técnica Federico Santa María with computing skills, qualities of commitment, and enthusiasm for science and education. Experience in collaborative work, scientific investigation, and teaching at the university level.

EDUCATION

Electrical Civil Engineer (Unfinished)

Universidad Técnica Federico Santa María

 March 2017 - July 2019

 San Joaquín Campus, Santiago, Chile

Mathematical Civil Engineer

Universidad Técnica Federico Santa María

 August 2019 - December 2023

 San Joaquín Campus, Santiago, Chile

Master of Science in Mathematics


Universidad Técnica Federico Santa María

 March 2023 - December 2023

 Central Campus, Valparaíso, Chile

Ph.D in Mathematics

North Carolina State University

 August 2025 - Ongoing

 Raleigh, North Carolina, U.S.

EXPERIENCE

Teaching Experience

Assistant Professor ¹

Universidad Técnica Federico Santa María

Department of Mathematics

 March 2024 - July 2024

 Santiago, Chile

- MAT021 - Matemática I (2024-S1).
Foundations of mathematical language, real numbers, basic analytic geometry, functions, trigonometry, limits and continuity, derivatives in real variables, induction and applications, complex numbers, and polynomials.
- MAT022 - Matemática II (2024-S1).
Differential and Integral calculus, linear algebra.
- MAT051 - Matemática II Para Arquitectura (2024-S1).
Linear Transformations, geometric transformations, functions of one variable, limits and continuity of functions of one variable, differentiation of one variable and applications, primitive functions.
- MATE08 - Complementos de Álgebra y Cálculo (2024-S1).
Algebraic expressions, simplifying algebraic expressions, linear equations, quadratic equations, real numbers, order axioms, inequalities, absolute value, intervals, linear and quadratic inequalities, more general inequalities, basic analytic geometry, trigonometry, natural numbers, and real functions.

Teaching

Communication

Mathematics

¹S: Semester

Senior Tutor

Universidad de Santiago

PAIEP - Mathematics

📅 April 2025 - July 2025

📍 Santiago, Chile

- Professional responsible of creating material, making workshops and lectures related to mathematics for first and second year college students, specially for those with special needs.

Teaching

Communication

Mathematics

Teaching Assistant²

Universidad Técnica Federico Santa María

Department of Mathematics

📅 March 2018 - July 2024

📍 Santiago, Chile

- FIS100 - Introducción a la Física (2018-S1).
Time and distance, measurements, rate of change, vectors, description of motion, mass and density, forces.
- FIS119 - Física Básica II (2019-S1),(2019-S2),(2020-S1),(2020-S2),(2021-S1),(2021-S2).
Thermodynamics and Electromagnetism.
- FIS120 - Física General II (2019-S1),(2019-S2),(2020-S1),(2020-S2),(2021-S1),(2021-S2).
Advanced Electromagnetism.
- MAT022 - Matemática II (2022-S1).
Differential and Integral calculus, linear algebra.
- MAT023 - Matemáticas III (2022-S1),(2023-S1).
Linear algebra, multivariable calculus, ordinary differential equations, Fourier series.
- MAT024 - Matemáticas IV (2019-S1),(2020-S1),(2022-S2).
Vector calculus and partial differential equations
- MAT225 - Análisis 1 (2021-S1).
Metric spaces, normed vector spaces, differential calculus in Banach spaces, and topological spaces.
- MAT410 - Análisis Convexo (2023-S1),(2025-S1).
Properties of Convex sets: Convexity and topology, relative interior, Hahn-Banach separation Theorems, Mazur's Theorem, recession cone, Krein-Milman Theorem. Convex Functions: Continuity and lower semi-continuity, Weierstrass-Hilbert-Tonelli's Theorem, Fenchel-Legendre's Conjugate, subdifferential, subdifferential calculus, optimality conditions, recession function, Moreau-Yosida's approximation, Differential Inclusions. Duality in Convex optimization: Perturbation functions, strong duality Theorem, Fenchel-Rockafellar's Theorem, Lagrangian duality, Fritz John's Theorem, Minmax Theorem.
- MAT279 - Optimización no Lineal (2023-S2).
Introduction to abstract optimization, convex optimization, smooth and non smooth convex optimization, unconstrained and constrained nonlinear optimization.
- MAT043 - Teoría de Probabilidad y Aplicaciones (2023-S2).
Elements of probability theory, random variables, discrete and continuous random variables useful in the analysis of electronic systems, continuous random variables in multiple dimensions, moment generating function, notions of stochastic processes.
- MAT227 - Análisis 3 (2024-S1).
Hahn-Banach, Banach-Steinhaus, and open mapping theorems; Unbounded operators, adjoint operator, and orthogonality relations; Weak topologies, reflexive spaces, separable spaces; Hilbert spaces; Stampacchia's theorem; Lax-Milgram theorem; Riesz-Fredholm theory and spectral decomposition of compact operators.
- MAT425 - Álgebra II(2024-S2).
Field and extensions: Finite and Algebraic extensions. Transcendental extensions and transcendence degree. Algebraic closure: splitting field and normal extensions. Separable extensions and finite fields. Inseparable extensions. Galois extensions: Fundamental theorem of Galois theory. Solvable and radical extensions. Complements of commutative algebra. Module theory. Valuations, local fields. Exterior algebra. Dedekind rings in algebraic number theory.
- MAT403 - Topología (2024-S2).
Topological spaces. Topologies. Sub-bases. Bases. Open and closed sets, interior, closure, boundary. Equivalence of topologies. Continuity. Open maps. Closed maps. Homomorphisms. Subspaces. Relative topologies. Product topology. Identification topology. Quotient topology. Connectedness. Local connectedness, path connectedness. Separation. T_0 , T_1 , T_2 , Hausdorff spaces, regular spaces. Normal and completely regular spaces. Urysohn's and Tietze's theorems. Metric spaces. Second-countable spaces. Separable spaces. Compactness. Tychonoff's theorem. Compact metric spaces. Sequential compactness. Fréchet spaces. Locally compact spaces. Compactifications. Homotopy. Fundamental group of the circle. Covering spaces. Van Kampen's theorem.

Teaching

Communication

Mathematics

Physics

²S: Semester

Teaching Assistant³

Universidad Diego Portales

📅 March 2021 - July 2021

Faculty of Science and Engineering

📍 Santiago, Chile

- Electricidad y Magnetismo (2021-S1).
Advanced Electromagnetism.

Teaching

Communication

Physics

Administrative Experience

President

Universidad Técnica Federico Santa María

📅 July 2023 - December 2023

Mathematical Civil Engineering Student Council

📍 Santiago, Chile

Leadership

Teamwork

Communication

Academic Experience

Research Assistant in Research Project

Universidad Técnica Federico Santa María

Department of Mathematics

📅 August 2022 - December 2022

📍 Santiago, Chile

- Research assistant of mathematical research project: FONDECYT 1190871, Fast primal-dual splitting algorithms for solving coupled inclusions. Responsible of project: Luis M. Briceño-Arias.
- Study of Perspective Functions and their epigraphs using standard techniques from Convex Analysis and the Theory of Monotone Operators on Hilbert spaces.

Mathematics

Convex Analysis

Nonlinear Optimization

Thesis student in Research Project

Universidad Técnica Federico Santa María

Department of Mathematics

📅 August 2022 - December 2023

📍 Santiago, Chile

- Thesis student of mathematical research project: FONDECYT 1230257, Fast primal-dual algorithms splitting linear and nonlinear compositions in monotone inclusions. Responsible of project: Luis M. Briceño-Arias.
- Study of Perspective Functions and their epigraphs using standard techniques from Convex Analysis and the Theory of Monotone Operators on Hilbert spaces.

Mathematics

Convex Analysis

Nonlinear Optimization

PUBLICATIONS

- **Scientific Article:** Briceño Arias, L.M., Vivar-Vargas, C.: Enhanced computation of the proximity operator for perspective functions. *J. Optim. Theory Appl.* **200**(3), 1078–1099 (2024). <https://doi.org/10.1007/s10957-023-02361-7>
- **Scientific Article:** Briceño Arias, L.M., Vivar-Vargas, C.: Projection onto cones generated by epigraphs of perspective functions. Preprint. <https://arxiv.org/abs/2411.08000>

³S: Semester

PROGRAMMING SKILLS

- Low. C/C++
- Medium. Python Julia MATLAB Wolfram Mathematica Excel
- Advanced. \LaTeX

ACTIVITIES

- 2012-2014. Student of Journalism Academy of Instituto Nacional (APIN), Chile.
- 2014. Secretary of Communications of Instituto Nacional's Student Council, Chile.
- 2015. Participant in the Mathematical School Championship (CMAT). Organized by *Universidad de Santiago*, Chile.
- 2016. Participant in the International Young Physicists' Tournament (IYPT), Chile edition.
- 2019. Voluntary Assistant of Participants in the eight edition of Congreso Futuro, Chile.
- 2022. Participant in V - Encuentro de Optimización. Organized by the *Department of Mathematics of Universidad Técnica Federico Santa María*.
- December 2022. Participant in Integrative Think Tank Chile. Organized by the *Centro de Modelamiento Matemático (CMM)*, *Universidad de Chile* and the *University of Bath, Inglaterra*
- October-November 2022. Participant in Workshop *Comunicación y Divulgación Científica*, Organized by *Department of Mathematics, Universidad Técnica Federico Santa María*.
- April 2023. Participant in Seminar: *Problem Decomposition in Convex Optimization: Advances beyond ADMM*, by Tyrrel Rockafellar. Organized by *Centro de Modelamiento Matemático (CMM)*, *Universidad de Chile*.
- September 2023 Participant in Workshop Second Chile-Japan Workshop on Mathematical Physics and Partial Differential Equations. Organized by *Centro de Estudios de Postgrado y Educación Continua* of the *Universidad de Santiago* and the *University of Tokyo*.
- January 2024 Participant in 3rd International Conference on Variational Analysis and Optimization. Organized by *Centro de Modelamiento Matemático (CMM)*, *Universidad de Chile* and *Universidad de O'Higgins*.
- January 2025 Participant in 4rd International Conference on Variational Analysis and Optimization. Organized by *Centro de Modelamiento Matemático (CMM)*, *Universidad de Chile*.

LANGUAGE PROFICIENCY

Spanish	Native
English	Advanced
French	Basic

OTHER INTERESTS

Music Videogames Tv Series Tabletop Games Physics