

ALONSO JAVIER BUSTOS BARRÍA¹

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Date of birth: 19 February 2002

Nationality: Chilean

Education

2020 – Present Mathematical Civil Engineering, Universidad de Concepción, Chile.

2020 – 2024 Bachelor of Sciences in Engineering Mathematics, Universidad de Concepción, Chile.

I successfully defended my undergraduate thesis on December 11, 2025. I am currently completing the final requirements for the professional degree in Mathematical Civil Engineering.

Scholarships and prizes

2020 Universidad de Concepción scholarship for best national score in University Selection Test of mathematics.

2020 Mathematical engineering scholarship for the best 10 applicants to Mathematical Engineering at Universidad de Concepción.

2019 Awarded for achieving the highest national score in mathematics in the Chilean University Selection Test (PSU).

Academic Experience

2025 **Thesis student of Mathematical Civil Engineering**, UNIVERSIDAD DE CONCEPCIÓN, under the supervision of Professor Sergio Caucao, supported by Fondecyt Project No. 1250937, “Numerical Analysis of Nonlinear Single and Coupled Problems with Biomedical and Geoscience Applications.” The thesis is entitled “*A Banach Space Mixed Formulation for the Unsteady Brinkman Problem with Spatially Varying Porosity.*”

Research Stay, GEORGE MASON UNIVERSITY, FAIRFAX, VIRGINIA, USA: A two-month research stay in February and March under the supervision of Professor Harbir Antil. The main goal was to investigate topics related to Risk measures and Rockafellians in the context of PDE-constrained optimization under uncertainty.

¹Latest update: December 16, 2025

2024 **Research Assistant**, CI²MA and UNIVERSIDAD DEL BÍO-BÍO: Anillo of Computational Mathematics for Desalination Processes, Código ACT210087, under the supervision of Professor Gabriel N. Gatica. In particular, among other tasks, I collaborated closely with Russel Demos, a PhD student from Monash University, during his three-month research stay at Universidad de Concepción.

Research Internship, UNIVERSIDAD CATÓLICA DE LA SANTÍSIMA CONCEPCIÓN: Fondecyt Project No. 11220393, “*Finite Element Methods for Brinkman–Forchheimer and Related Problems*”, under the supervision of Professor Sergio Caucao.

Publications

1. A. J. BUSTOS, S. CAUCAO, G. N. GATICA, B. N. VENEGAS. *New fully mixed finite element methods for the coupled convective Brinkman–Forchheimer and nonlinear transport equations*. J. Sci. Comput. 104, Paper No. 64, 45 pp. (2025). ([Available here](#)).
2. A. J. BUSTOS, S. CAUCAO, G. N. GATICA. *Mixed-primal and fully-mixed formulations for the convection-diffusion-reaction system based upon Brinkman–Forchheimer equations*. Preprint, 2025. ([Available here](#)).
3. A. J. BUSTOS, S. CAUCAO. *A Banach space mixed formulation for the unsteady Brinkman problem with spatially varying porosity*. Preprint, 2025. ([Available here](#)).
4. A. J. BUSTOS, R. DEMOS, G. N. GATICA, R. RUIZ-BAIER, B. N. VENEGAS. *New perturbed threefold saddle-point finite element methods for poroelasticity with reduced symmetry*. In Preparation.
5. H. ANTIL, A. J. BUSTOS, S. P. CARNEY, B. N. VENEGAS. *Rockafellian Relaxation for PDE-Constrained Optimization under Uncertainty in the context of Risk Measures*. In Preparation.

Teaching Experience

2025 **Student Assistant**, UNIVERSIDAD DE CONCEPCIÓN: Functional analysis I and Mixed Finite Element Methods.

2024 **Student Assistant**, UNIVERSIDAD DE CONCEPCIÓN: Functional Analysis I and Mathematical Thinking for Mathematical Engineering students. Ordinary Differential equations for engineering students.

Course Tutoring of Real Analysis I for mathematical engineering students.

- 2023 **Student Assistant**, UNIVERSIDAD DE CONCEPCIÓN: Ordinary Differential Equations, Numerical Analysis I and Complemento de Cálculo (Complex Analysis and Partial Differential Equations) for engineering students. Algebra III: Foundations and Linear Algebra II for Mathematical Engineering students. Discrete Mathematics for Mathematics Pedagogy students.
- 2022 **Student Assistant**, UNIVERSIDAD DE CONCEPCIÓN: Calculus I, Algebra II and Numerical Analysis I for Engineering students.
- Course Tutoring** of Calculus IV for Mathematical Engineering students.
- 2021 **Student Assistant**, UNIVERSIDAD DE CONCEPCIÓN: Algebra I, Algebra II and Calculus I for Engineering students.

Talks

- 2025 Talca Numérica I, at the Universidad Católica del Maule. *Banach Space Mixed Formulations for the Convection-Diffusion-Reaction System Based upon Brinkman–Forchheimer Equations.*
- 2025 Seminar on Numerical Analysis and Mathematical Modeling at the Centro de Investigación en Ingeniería Matemática (CI²MA). *Rockafellian Relaxation for PDE-Constrained Optimization under Uncertainty in the Context of Risk Measures.*
- 2025 Meeting of the Chilean Mathematical Society (SOMACHI), Vicuña, Chile. *A Banach Space Mixed Formulation for the Unsteady Brinkman Problem with Spatially Varying Porosity.*

Conferences and Workshops attended

- 2025 Meeting of the Chilean Mathematical Society (SOMACHI).
- 2025 Talca Numérica I (at the Universidad Católica del Maule).
- 2024 Jornada Matemática de la Zona Sur (at the Universidad Católica de Temuco).
- 2024 Workshop on Numerical Analysis of Partial Differential Equations (WONAPDE 2024).
- 2022 Encuentro Nacional en Ingeniería Matemática (ENIM 2022).

Computer Skills

Programming Languages	Python
Mathematical Software/Libraries	MATLAB, FEniCS, FreeFem++, NGSolve

Languages

Spanish	Native
English	Intermediate (B2)

Other Activities

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| 2025 | Member of the Organizing Committee of the <i>Encuentro Nacional de Ingeniería Matemática 2025</i> (National Meeting of Mathematical Engineering). |
| 2024 | Co-organizer of <i>Seminario de Análisis Numérico y Modelación Matemática</i> (Seminar on Numerical Analysis and Mathematical Modeling) at CI ² MA, Concepción, Chile. |
| 2024 | Member of Election Qualifying Court of Mathematical Engineering at Universidad de Concepción. |