Benjamín Venegas Solís

Curriculum Vitae

Personal Information

Full Name	Benjamín Nicolás Venegas Solís
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Postal Adress	CI^{2}MA, Universidad de Concepción, Casilla 160–C, Concepción, Chile.

Research Interests

Numerical Analysis for PDEs.
- Analysis of Mixed Finite Element discretizations within Hilbert and Banach spaces frameworks for PDEs (mainly continuum flow equations).
- The interface between Differential Geometry and Numerical Analysis. Particularly, preservation of geometric, topological and analytic properties at a discrete level. This leads to structure-preserving discretizations such as those obtained via Finite Element Exterior Calculus and Finite Element Systems.
- Development of Finite element methods for PDEs on manifolds.

Partial Differential Equations.
- Limiting behavior of variational problems arising from the p-Laplacian energy in the Riemannian setting. This is directly related with approximation of the geodesic distance to a target set. Similarly to the mechanism of heat methods.
- Absolutely minimizing Lipschitz extensions (AMLEs) as viscosity solutions of Δ_∞, on Riemannian manifolds.

Education

2020-2025 **Civil Engineering in Mathematics** at Universidad de Concepción, Chile. **Undergraduate thesis:** *"On the discretization of Dirac equations in the framework of Finite Element Systems"*. **Advisor:** Snorre H. Christiansen.

2020 - 2023 **BSc Mathematical Engineering** at Universidad de Concepción, Chile.

Academic Experience

Feb. - Apr., 2025 **Research Stay** at George Mason University, Fairfax, Virginia, United States, under the guidance of Dr. Harbir Antil.
Research on Rockafellian relaxation for PDECO under uncertainty in form of risk measures.

June - Dec. 2024 **Research Assistant** at CI^{2}MA, Universidad de Concepción, Chile, supported by ANID-Chile through the project Anillo of Computational Mathematics for Desalination Processes (ACT210087) under the supervision of Dr. Gabriel N. Gatica.

Feb. - Mar., 2024 **Research Stay** at Simon Fraser University, Vancouver, B.C., Canada, under the guidance of Dr. Razvan C. Fetecau & Dr. Steven Ruuth.
Research on the p-Laplace and ∞-Laplace equations and their associated nonlinear eigenvalue problems in the n-disk and the n-sphere, with focus on the limiting behavior of the first eigenvalue.

Publications

In Journal Bustos A., Caucao S., Gatica G., **Venegas B.**, *New Fully Mixed Finite Element Methods for the Coupled Convective Brinkman-Forchheimer and Nonlinear Transport Equations*. J Sci Comput 104, 64 (2025). doi: s10915-025-02958-2

Submitted Bustos A., Gatica G., Ruiz-Baier R. and **Venegas B.**, *A perturbed three-fold saddle-point formulation yielding new mixed finite element methods for poroelasticity with reduced symmetry*. **Preprint at CI^{2}MA** .

In Preparation Antil H., Bustos A., Carney S., **Venegas B.**, *Rockafellian Relaxation for PDE-Constrained Optimization under Uncertainty in the context of Risk Measures*.

Talks given

May, 2025 DSALT 2025: Segundo workshop sobre métodos computacionales para procesos de desalinización. Workshop on the occasion of the end of the grant Anillo of Computational Mathematics for Desalination Processes (ACT210087).
New fully mixed finite element methods for the coupled convective Brinkman-Forchheimer and nonlinear transport equations, joint work with A. Bustos, S. Caucao and G. Gatica.

July, 2025 Talca Numérica I - 10th meeting on Numerical Analysis and PDEs, Talca, Chile. **Title:** *New fully mixed finite element methods for the coupled convective Brinkman-Forchheimer and nonlinear transport equations*, joint work with A. Bustos, S. Caucao and G. Gatica.

Oct., 2025 SANMoMa at CI^{2}MA, UdeC, Chile. **Title:** *Discretizing Hodge–Dirac Equations in the framework of Finite Element Systems*, joint work with Snorre Christiansen.

Dec., 2025 ENIM 2025 at UdeC, Chile. Yearly meeting for mathematical engineering students from Chile. **Title:** *Discretizing Dirac equations with Finite Element Systems*, joint work with Snorre Christiansen.

Other relevant academical activities

2024 **Co-Organizer** of Seminario de Análisis Numérico y Modelación Matemática de Estudiantes (SANMoMa–Graduados) at CI^{2}MA, UdeC, Chile, which corresponds to weekly seminars, having speakers from different areas of Numerical Analysis.

2025 **Member of the organizing committee** of Encuentro Nacional de Ingeniería Matemática (ENIM) 2025 . In English "National Meeting of Mathematical Engineering", a three-day-long yearly meeting which brings together students of Mathematical Engineering from all the Chilean universities.

2021 - 2025 **Teaching Assistant** at Universidad de Concepción
(3)[1] Calculus I for Engineering students.
(2) Algebra II for Engineering students.
(1) Algebra III: Foundations and Linear Algebra II for Mathematical Engineering students.
(3) Numerical Analysis for Engineering students.
(1) Ordinary Differential Equations for Engineering students.
(2) Functional Analysis and Applications I: Linear functionals and operators for Mathematical Engineering Students.
(1) Finite Element Methods.
(1) Mixed Finite Element Methods.

2024 **Course Tutoring**[2] at Universidad de Concepción
Real Analysis I: Elementary Topology and Metric Spaces.

Conferences and Workshops attended

Jan., 2024 7th Workshop on Numerical Analysis of PDEs (WONAPDE), UdeC, Concepción, Chile.

April, 2024 XXXVI Jornada de Matemática de la Zona Sur (JMZS), UCT, Temuco, Chile.

May, 2025 DSALT 2025: Segundo workshop sobre métodos computacionales para procesos de desalinización. Workshop on the occasion of the end of the project "Anillo of Computational Mathematics for Desalination Processes" (ACT210087).

July, 2025 Talca Numérica I - 10th meeting on Numerical Analysis and PDEs, Talca, Chile.

Computer Skills

Advanced LaTeX

Beginner/Intermediate Python, FEniCS, FreeFEM++, NGSolve, MATLAB, Excel

[1] Indicates the number of times I was a TA in the corresponding course.

[2] Tutoring is complementary to classes and practice sessions, and involves explaining concepts and doing further exercises to help students to learn.

Language Proficiency

Spanish	Native
English	Advanced (C1)