Ignacio Brevis

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About me

I am a researcher with a strong background in scientific computing and applied mathematics, specialising in numerical methods, inverse problems, and machine learning techniques. My work combines advanced computational skills with successful experience in publishing, securing competitive research funding, and supervising students at multiple levels. As a postdoctoral researcher and part-time lecturer, I have built a strong international network of collaborators and developed the ability to lead and motivate teams toward high-quality research outcomes. I have also mentored a diverse range of students, supporting both technical and professional development. I am enthusiastic about inclusive and innovative teaching practices, contributing to the success of programmes, and building an international reputation for excellence in science education.

Experience

Nov 2022-Sep 2025	**Research Fellow**, School of Mathematical Sciences, University of Nottingham, Nottingham, United Kingdom
Apr 2019-Oct 2022	**Postdoctoral Fellow**, Institute of Mathematics, Pontificia Universidad Católica de Valparaíso, Valparaíso, Chile
Jul 2018-Dec 2019	**Part-time Lecturer**, Department of Mathematics, Universidad Técnica Federico Santa María, Valparaíso, Chile
Apr 2017-Jun 2018	**Technical staff**, *Laboratory for Scientific Image Analysis* (SCIAN-Lab), BNI, ICBM, Faculty of Medicine, Universidad de Chile, Santiago, Chile
Nov 2016-Mar 2017	**Project Engineer**, *Center for Mathematical Modeling* (CMM), FCFM, Universidad de Chile, Santiago, Chile
Mar 2014-Dec 2014	**Part-time Lecturer**, Department of Mathematics and Computer Science, Faculty of Sciences, Universidad de Santiago de Chile, Santiago, Chile

Education

Ph.D.	**Universidad de Chile**, Department of Mathematical Engineering **Ph.D. in Engineering Sciences, Mention in Mathematical Modeling** Dissertation: *Source Time Reversal Methods for Acoustic and Elastic Waves* Advisor: Prof. Jaime H. Ortega Co-advisor: Prof. David Pardo (Universidad del País Vasco (UPV/EHU), Spain)	2018
Eng	**Universidad de Santiago de Chile**, Department of Mathematics and Computer Science **Mathematical Engineer** Thesis: *Fractional Fourier Transform in Magnetic Resonance Imaging* (in Spanish) Advisor: Prof. Carlos Lizama	2011
B.S.	**Universidad de Santiago de Chile**, Department of Mathematics and Computer Science **B.S. in Mathematics**	2010

Research Interests

- Deep Learning
- Machine Learning
- Partial Differential Equations
- Numerical Analysis
- Inverse Problems
- Scientific Computing

Grants, Awards, and Fellowships

2025 **Research Bursary:** London Mathematical Society *Undergraduate Research Bursary*, project id: URB-2025-21 (£1,200 - two months).

2024 **Research Grant:** London Mathematical Society *Collaborations with Developing Countries grant*, project id: 52402 (£2,500 - one year).

2020 **Postdoctoral Fellowship:** ANID *Concurso Fondecyt de Postdoctorado* fellowship hosted by Pontificia Universidad Católica de Valparaíso, project id: 3200827 (81,214,000 CLP $\sim$ €93,500 - three years).

2019 **Postdoctoral Grant:** Pontificia Universidad Católica de Valparaíso internal grant, project id: 37.0 / 2019 (13,200,000 CLP $\sim$ €17,400 - 11 months).

2015 **PhD Internship:** Internship allowance from Chilean national scholarship *Beca de Doctorado Nacional* from Conicyt/ANID, project id: 21120646 (€14,139 - 10 months).

2012 **PhD Scholarship:** Chilean national scholarship *Beca de Doctorado Nacional* from Conicyt/ANID, project id: 21120646 ($\sim$ 64,000,000 CLP - four years).

organisational and Leadership skills

2025 **Organiser**: One-month research visit at the University of Nottingham for the collaborator Prof. Cristhian Montoya, from the Universidad EAFIT, Colombia. Funding from the *Collaborations with Developing Countries grant* awarded by the LMS.

2024 **Mentoring**: Participation in two research summer internships (2024 and 2025) for undergraduate students at the University of Nottingham, leading projects and securing funding for the students.

2024 **Organiser**: Bi-weekly internal journal club in neural networks and machine learning at the University of Nottingham.

2023 **Organiser**: One-week research visit at the University of Nottingham for the collaborator Dr Sergio Rojas from the Pontificia Universidad Católica de Valparaíso, Chile.

2023 **Organiser**: Two-month internship at the University of Nottingham for the PhD student Oscar Rodriguez from the Basque Center for Applied Mathematics (BCAM), Spain.

2020 **Website creation**: Participation in the development of the (Web page), as a research member (2019-2022) of the group *IMA Numerics* at the Pontificia Universidad Católica de Valparaíso, Chile.

2019 **Grant and fellowship applications**: Writing proposals, finding mentors, and securing institutional sponsorship (2019 onwards).

Teaching

Lectures

Fall 2022 **Elective: Deep learning for solving PDEs**, Mathematics, Pontificia Universidad Católica de Valparaíso.

2018-2019 **Algebra I**, Engineering, Universidad Técnica Federico Santa maría.

2014 **Vector calculus**, Mathematical Engineering, Universidad de Santiago de Chile.

Teaching Assistant

2018 **Algebra & Calculus**, Engineering, Universidad Técnica Federico Santa maría.

Fall 2008 **Calculus**, Mathematical Engineering, Universidad de Santiago de Chile.

Spring 2006 **Introduction to complex analysis**, Mathematical Engineering, Universidad de Santiago de Chile.

Advising

PhD Level

2024 **Emin Benny-Chacko**, University of Nottingham, UK. (Ongoing co-supervision)
Title: *A deep learning minimal residual framework for damage identification in civil and industrial infrastructures* [**MSCA Doctoral Network**] (Assistant supervisor. Main supervisor: Prof. Kristoffer van der Zee).

2023 **Hamd Alsobhi**, University of Nottingham, UK. (co-supervision 2023-2025)
Title: *Minimal residual finite element methods for first-order partial differential equations: Total variation regularisation and neural-network dual norms* (Co-supervision with Prof. Kristoffer van der Zee and Dr Dante Kalise).

2022 **Tanakorn Udomworarat**, University of Nottingham, UK. (Ongoing co-supervision)
Title: *Neural networks for Perron-Frobenius operator problems and test-space adaptive RVPINNs* (Co-supervision with Prof. Kristoffer van der Zee and Dr Martin Richter).

Master Level

2024 **Sahil Singh**, Mathematics 4th Year Dissertation (6 months), University of Nottingham, UK.
Title: *Solving partial differential equations using deep-learning algorithms* (Co-supervision with Prof. Kristoffer van der Zee).

2023 **David Bolivar**, Mathematics Thesis (one year), Universidad EAFIT, Colombia.
Title: *Inverse source problems for coupled parabolic systems from measurements of one internal component* (Co-supervision with Prof. Cristhian Montoya).

2023 **Max Bradley**, Mathematics 4th Year Dissertation (6 months), University of Nottingham, UK.
Title: *Utilising neural networks to approximate functions and solve differential equations with network enhancement methods* (Co-supervision with Prof. Kristoffer van der Zee).

2023 **Thomas Carruthers**, Mathematics 4th Year Dissertation (6 months), University of Nottingham, UK.
Title: *Using deep learning algorithms and Uzawa iterations to solve weak first-order PDEs* (Co-supervision with Prof. Kristoffer van der Zee).

Undergraduate Level

2025 **Irene Pitsiladi**, Summer internship (two months), University of Nottingham, UK.
Funding body: London Mathematical Society (LMS).
Title: *Deep Learning for Solving Binary Black Holes.* (Co-supervision with Dr Miguel Bezares)

2024 **Yue Wu**, Summer internship (two months), University of Nottingham, UK.
Funding body: Margaret Jackson Award.
Title: *Solving PDEs with PINNs: Integration & adaptivity strategies.*

2024 **Santiago Parra**, Research Internship (6 months), Universidad EAFIT, Colombia.
Title: *Source reconstruction for coupled hyperbolic systems from boundary measurements of one state* (Co-supervision with Prof. Cristhian Montoya).

2024 **Julieth Escobar**, Research Internship (6 months), Universidad EAFIT, Colombia.
Title: *Advancing finite element methods and partial differential equations analysis with neural networks: A computational performance* (Co-supervision with Prof. Cristhian Montoya).

2022 **Carlos Gonzalez**, Mathematics Thesis (6 months), Pontificia Universidad Católica de Valparaíso, Chile.
Title: *Deep learning for solving partial differential equations* (in spanish) (Co-supervision with Dr Paulina Sepúlveda).

Publications

Published

- S. Pandiyan, E. Elsayed, M. A. Khanesar, **I. Brevis**, R. D. Wildman, K. G. van der Zee, S. Piano, and B. Tokay, **Inkjet Printing of ZIF-67 based-polymer composite membranes**, *Separation and Purification Technology*, Vol. 376, 2025, pp. 134040.
- E. Elsayed, **I. Brevis**, S. Pandiyan, R. Wildman, K. G. van der Zee, and B. Tokay, **Controlling ZIF-67 film properties in water-based cathodic electrochemical deposition**, *Journal of Solid State Chemistry*, Vol. 338, 2024, pp. 124820.
- **I. Brevis**, I. Muga, D. Pardo, O. Rodriguez, and K. G. van der Zee, **Learning quantities of interest from parametric PDEs: An efficient neural-weighted Minimal Residual approach**, *Computers and Mathematics with Applications*, Vol. 164, 2024, pp. 139–149.
- **I. Brevis**, I. Muga, and K. G. van der Zee, **Neural control of discrete weak formulations: Galerkin, least-squares & minimal-residual methods with quasi-optimal weights**, *Computer Methods in Applied Mechanics and Engineering*, Vol. 402, 2022, pp. 115716.

- **I. Brevis**, I. Muga, and K. G. van der Zee, **A machine-learning minimal-residual (ML-MRes) framework for goal-oriented finite element discretizations**, *Computers and Mathematics with Applications*, Vol. 95, 2021, pp. 186–199.
- **I. Brevis**, A. Rodríguez-Rozas, J. H. Ortega, and D. Pardo, **Source time reversal (STR) method for linear elasticity**, *Computers and Mathematics with Applications*, Vol. 77, Issue 5, 2019, pp. 1358–1375.
- **R. I. Brevis**, J. H. Ortega, and D. Pardo, **A source time reversal method for seismicity induced by mining**, *Inverse Problems and Imaging*, Vol. 11, Issue 1, 2017, pp. 25–45.

In preparation or Submitted

- C. Montoya, **I. Brevis**, and D. Bolivar, **Source reconstruction algorithms for coupled parabolic systems from internal measurements of one scalar state**. (Submitted)
- T. Udomworarat, **I. Brevis**, M. Richter, S. Rojas, and K. G. van der Zee, **Neural network methods for power series problems of Perron-Frobenius operators**. (Submitted)
- H. Alsobhi, E. Benny-Chacko, **I. Brevis**, and K. G. van der Zee, Neural networks dual norms for minimal residual finite element methods. (Submitted)
- T. Assumpção, **I. Brevis**, and M. Bezares, **Black-hole puncture initial data with physics-informed neural networks**. (In preparation)
- **I. Brevis**, C. Montoya, and S. Parra, **An inverse source problem for linear systems of coupled wave equations from boundary measurements**. (In preparation)
- H. Alsobhi, **I. Brevis**, D. Kalise, and K. G. van der Zee, **TV-regularized least-square FEM for first-order PDEs**. (In preparation)
- S. Rojas, **I. Brevis**, T. Udomworarat, and K. G. van der Zee, **An adaptive strategy for robust variational physics-informed neural networks**. (In preparation)

Research Project Participation

MSCA Doctoral Network 101119556 (2024-2028)
Title *Real-time inversion using self-explainable deep learning driven by expert knowledge (IN-DEEP)*
Role Assistant supervisor at University of Nottingham (Mar 2024-)
P.I. David Pardo

EPSRC Research Grant EP/W010011/1 (2022-2025)
Title *Additive and intelligent manufacturing of multi-functional membranes (AIM3)*
Role Research fellow (Nov 2022-Sep 2025)
P.I. Begum Tokay

Research and Innovation Staff Exchange Project H2020-MSCA-RISE-2017-777778 (2018-2023)
Title *Multiscale Inversion of Porous Rock Physics using High-Performance Simulators: Bridging the Gap between Mathematics and Geophysics (MATHROCKS)*
Role Visiting researcher (Dec 2020-Mar 2021) and (Jul 2021-Jan 2022)
P.I. David Pardo

Postdoctoral Research Fellow FONDECYT-3200827 (2020-2022)
Title *Data-driven methods for solving differential equations using deep learning and goal-oriented finite element spaces*
Role **Principal investigator** (Apr 2020-Nov 2022)
P.I. Ignacio Brevis

Research Grant FONDECYT Iniciación 11161033 (2016-2019)
Title *Breaking the Brightness Constancy Constraint in Optical Flow Methods for in vivo Biomedical Imaging*
Role Technical Staff (Apr 2017-Jul 2018)
P.I. Mauricio Cerda

Research and Innovation Staff Exchange Project H2020-MSCA-RISE-2014-644202 (2015-2017)
Title *Geophysical Exploration using Advanced Galerkin Methods (GEAGAM)*
Role Visiting researcher (Apr 2015-Dec 2015)
P.I. David Pardo

Research Grant FONDECYT-1111012 (2011-2015)
Title *Variational Approach for Image Processing Problems*
Role PhD. thesis Student (Mar 2015-Dec 2015)
P.I. Jaime H. Ortega

Research Grant FONDECYT-1100485 (2010-2014)
Title *Analysis of Continuous, Discrete and Stochastic Evolution Equations in Banach Spaces*
Role Undergraduate thesis Student (Mar 2012-Sep 2012)
P.I. Carlos Lizama

Research Visits

Jan 2024 **Research Stay**, *Collaboration visit to Mathematical Design, Modeling, and Simulations group*, Basque Center for Applied Mathematics (BCAM), Bilbao, Spain (one week)

May 2022 **Research Stay**, *part of the project MATHROCKS*, Basque Center for Applied Mathematics (BCAM), Bilbao, Spain (one month)

Jul 2021 **Research Stay**, *part of the project MATHROCKS*, Universidad del País Vasco (UPV/EHU), Leioa, Spain (six months)

Dec 2020 **Research Stay**, *part of the project MATHROCKS*, Universidad del País Vasco (UPV/EHU), Leioa, Spain (three months)

Apr 2015 **Internship**, *Mathematical Modeling, Simulations, and Industrial Applications* (M2SI) group, Universidad del País Vasco (UPV/EHU), Leioa, Spain (10 months)

Selected Conferences and Seminars

Nov 2025 **Initial Data in Numerical Relativity Workshop**, Queen Mary University of London, London, UK. (Invited speaker)

Jul 2025 **MATHGEO Workshop**, University of Nottingham, Nottingham, UK. (Invited speaker)

Jun 2025 **Learning, Computation, and Control (LC2) Seminar**, Imperial College London, London, UK. (Invited speaker)

Jun 2024 **Minimum Residual & Least-Squares Finite Element Methods 2024 Workshop**, Basque Center for Applied Mathematics (BCAM), Bilbao, Spain. (Invited speaker)

Sep 2023 **2nd IACM Mechanistic Machine Learning and Digital Engineering for Computational Science Engineering and Technology Conference 2023**, Mini-symposium: Deep Learning Residual Minimization Methods
The University of Texas at El Paso, Texas, USA (online attendance) (Invited speaker)

Feb 2023 **SIAM Conference on Computational Science & Engineering (CSE23)**, RAI Congress Centre, Amsterdam, Netherlands.

Jun 2022 **VI ECCOMAS CONGRESS 2022**, Mini-symposium: Deep Learning in Scientific Computing
NOVA Spektrum, Oslo, Norway. (Invited speaker)

Jul 2021 **VI ECCOMAS YOUNG INVESTIGATORS CONFERENCE**, Mini-symposium: Stabilized and unconditionally stable FE methods for challenging problems in engineering and science
Universitat Politècnica de València, Valencia, Spain. (online Conference) (Invited speaker)

Jun 2021 **SIAM Conference on Mathematical & Computational Issues in the Geosciences (GS21)**, Mini-symposium: Enhanced Forward Modelling using Machine Learning Techniques
Politecnico di Milano, Milan, Italy. (online Conference)

Aug 2019 **IX Congreso Internacional de Matemática Aplicada y Computacional**, Universidad Nacional Agraria La Molina, Lima, Perú.

Apr 2019 **XXXII Jornada de Matemática de la Zona Sur**, Universidad de Magallanes, Punta Arenas, Chile.

Jan 2018 **3er MINIWORKSHOP Control y Problemas Inversos de EDP**, Universidad Técnica Federico Santa María, Valparaíso, Chile.

Nov 2016 **X CONGRESS GAFEVOL 2016**, Universidad de Santiago de Chile, Santiago, Chile. (Invited speaker)

Computational Skills

- Python
- PyTorch
- Matlab
- LaTeX
- HPC
- FEniCS
- FreeFEM
- Windows
- Linux
- GitHub

Specialization courses attendance

- **How Students Learn**, *Discovering Teaching: How Students Learn* , PD eLearning at University of Nottingham, Online. Jul 2025.
- **Deep Learning Institute**, *Fundamentals of Deep Learning* , NVIDIA, Online. Sep 2024.
- **Neural Networks**, *Deep Neural Networks with PyTorch*, Instructor Joseph Santarcangelo, IBM, Online. Apr 2023.
- **Machine Learning**, *Convolutional Neural Networks*, Instructor Andrew Ng, DeepLearning.AI, Online. May 2020
- **Machine Learning**, *Structuring Machine Learning Projects*, Instructor Andrew Ng, DeepLearning.AI, Online. May 2020
- **Machine Learning**, *Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization*, Instructor Andrew Ng, DeepLearning.AI, Online. May 2020
- **Machine Learning**, *Neural Networks and Deep Learning*, Instructor Andrew Ng, DeepLearning.AI, Online. Apr 2020
- **Finite element**, *Fast and smooth simulation of space-time problems*, Prof. Maciej Paszynski, Institute of Mathematics (IMA), Pontificia Universidad Católica de Valparaíso, Valparaíso, Chile. Jul 2017
- **Finite element**, *Coding the FEM II*, Prof. David Pardo, Cajón del Maipo, Chile. Jan 2017
- **Finite element**, *Coding the FEM*, Prof. David Pardo, Casablanca, Chile. Sep 2014
- **Summer course**, *Curso Iniciação Científica: Análise na reta* (Real analysis), Prof. Fagner Araruna, Universidade Federal de Pernambuco, Recife, Brasil. Jan 2008-Feb 2008

Editorial Service (Reviewer)

- **National Science Centre Poland** www.ncn.gov.pl (2 proposals since 2021)
- **Computer Methods in Applied Mechanics and Engineering** - Elsevier B.V. (3 articles since 2022)
- **Journal of Computational Science** - Elsevier B.V. (2 articles since 2022)
- **Computers & Mathematics with Applications** - Elsevier Ltd (1 article since 2023)
- **Engineering with Computers** - Springer London (6 articles since 2023)
- **Applied Mathematics in Science and Engineering** - Routledge (1 article since 2025)

Languages

Spanish	Fluent (Native)
English	Fluent

(Current version: October 22, 2025)