PABLO IVÁN ARRATIA LÓPEZ

MSc in Applied Mathematics.

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PROFILE

The main topics of my research lie in partial differential equations, inverse problems and deep learning. I like to deal with problems coming from real applications and solve them with mathematical modelling. I believe that mathematics can contribute to different areas, but my favourite ones are medicine and biotechnology, due to the impact they can cause there. I'm also interested in the computational implementations for solving such problems: the knowledge and use of High-Performance Computing are, nowadays, fundamental. Finally, teaching is a skill I have developed during the last 5 years and I hope to keep doing it. I can say I'm willing to be constantly learning.

CURRENTLY

Young Researcher

Millennium Nucleus for Cardiovascular Magnetic Resonance

September 2020 - present Santiago, Chile

Currently, I'm working on a multidisciplinary project (with mechanical, electrical and mathematical engineers) related to an image registration task of cardiac cine-MRI images sequences. The problem is treated with deep learning algorithms and PDE's that govern the cardiac motion. The objective is to solve the problem with the so-called physics-informed neural networks.

EXPERIENCE

MSc Thesis

Faculty of Physical Sciences and Mathematics, University of Chile

March 2019 – August 2020 Santiago, Chile

In my thesis, I studied an inverse problem arising from a previously established 2D model related to the Light Sheet Fluorescence Microscope, used in the Faculty of Medicine at the University of Chile. A stability result for the inverse problem was established based on heat equation and a numerical reconstruction with neural networks was given as well. Furthermore, the direct model was extended to the 3D case, for which the use of High-Performance Computing was necessary, specifically, I used Guacolda-Leftraru cluster, managed by the National Laboratory for High-Performance Computing, Chile.

Teaching Assistant for Numerical Analysis of Partial Differential Equations: Theory and Laboratory

Faculty of Physical Sciences and Mathematics, University of Chile

March 2019 – August 2019 Santiago, Chile

The responsibilities for this job included performing assistant classes, reviewing on the design of tests, mark assignments, assisting students in each laboratory and coordinating work related to the administrative part of the course.

DEGREES

MSc in Applied Mathematics.

Faculty of Physical Sciences and Mathematics, University of Chile

October 2020 Santiago, Chile

Civil Engineering in Mathematics

Faculty of Physical Sciences and Mathematics, University of Chile

October 2020 Santiago, Chile

Minor in Quantum Physics

Faculty of Physical Sciences and Mathematics, University of Chile

August 2020 Santiago, Chile

BSc in Engineering with specialization in Mathematics

Faculty of Physical Sciences and Mathematics, University of Chile

December 2018 Santiago, Chile

SUBMITTED ARTICLES

- P. Arratia, M. Courdurier, E. Cueva, A. Osses & B. Palacios. "Lipschitz stability for backward heat equation and application on fluorescence microscopy".

Teaching Assistant for Inverse and Control Problems of Partial Differential Equations

Faculty of Physical Sciences and Mathematics, University of Chile

March 2019 – July 2019 Santiago, Chile

Same as the previous instance.

Teaching Assistant for Multivariate Calculus

Faculty of Physical Sciences and Mathematics, University of Chile

March 2017 – December 2017 Santiago, Chile

Same as the previous instance.

Laboratory Assistant for Optimal Control: Theory and Laboratory

Faculty of Physical Sciences and Mathematics, University of Chile

August 2018 – December 2018 Santiago, Chile

Assisting students in each laboratory as well as answering questions and helping them with issues they face after while redacting the report and also when doing the weekly assignments. Grading laboratory reports and assignments.

Grading Assistant

Faculty of Physical Sciences and Mathematics, University of Chile

March 2015 – December 2016 Santiago, Chile

Mark assignment on tests for the courses Multivariate Calculus (March 2015 – July 2015) and Advanced Calculus and Applications (March 2016 – December 2016).

Tutor at Taller los Dos Relojes

Faculty of Physical Sciences and Mathematics, University of Chile

October 2018 – December 2019 Santiago, Chile

Taller los Dos Relojes is an instance where first and second-year students of engineering look for help in a study room. My job there consisted of assisting all student's doubts related to mathematical courses.

External Consultant

Ministerio del Interior y Seguridad Pública, Subsecretaría de Desarrollo Regional y Administrativo

May 2018 – December 2018 Santiago, Chile

Consultation on the creation of typology for the 345 communes of Chile, from the modelling and use of mathematical tools related to the creation of clusters. Implementation of different strategies with Python and consultation on different techniques such as K-means, decision tree classification and Support Vector Machine.

AWARDS

Outstanding Student

Faculty of Physical Sciences and Mathematics, University of Chile

This acknowledgement is given every year if the mean of marks is greater or equal than 5.7. Got this recognition in years 2013, 2014, 2017 and 2018.

APTITUDES

Responsible | Organized | Compromised | Persistent | Proactive | Creative

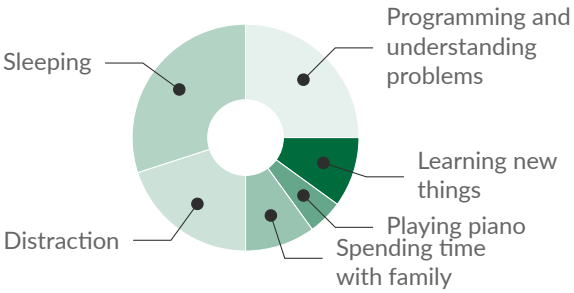
LANGUAGES

Spanish
English

KNOWLEDGE

Partial Differential Equations | Deep Learning | Mathematical modelling | Inverse Problems | Convolutional Neural Networks | Machine Learning | LaTeX | MATLAB | Julia | Python | TensorFlow

A DAY OF MY LIFE



Professional practice

Centro de Investigación Avanzada en Educación (CIAE)

January 2016 — Santiago, Chile

Statistical analysis on poll answers with SPSS for measuring the impact of some courses oriented to develop a better learning method for school teachers.

Professional practice

Center for Mathematical modelling (CMM)

January 2017 — Santiago, Chile

Analysis of genetic networks with graph theory for the study of bioleaching.

Professional practice

Department of Astronomy, Faculty of Physical Sciences and Mathematics, University of Chile

January 2018 — Santiago, Chile

Application of combinatorial, statistics and stochastic models for the detection and determination orbits of minor objects in the Solar System.

OTHERS

First director of CEIMAT (Mathematical Engineering Students Center)

Department of Mathematical Engineering, Faculty of Physical Sciences and Mathematics, University of Chile

April 2017 – May 2018 — Santiago, Chile

Member of CEIMAT. My specific work consisted of organizing a baby football tournament and seminars with teachers to show their different research areas.

REFERENCES

Axel Osses
@ axosses@dim.uchile.cl
Researcher at Center for Mathematical modelling. Professor at Department of Mathematical Engineering, University of Chile.

Matías Courdurier
@ mcourdurier@mat.uc.cl
Researcher and professor at Faculty of Mathematics, Pontificia Universidad Católica de Chile.

Francisco Sahli
@ fsc@ing.puc.cl
Researcher and professor at Department Mechanical Engineering and Metallurgical and Institute for Biological and Medical Engineering, Pontificia Universidad Católica de Chile