

Ioannis P. A. Papadopoulos

Weierstrass Institute

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EMPLOYMENT

BMS Dirichlet Postdoctoral Fellow, *Weierstrass Institute*

Nov. 2023 – date

- Hosted by Prof. Dr. Michael Hintermüller at WIAS.
- Research interests: Numerical analysis, spectral & finite element methods, fractional & nonlinear PDEs, topology optimization.

Research Associate, *Imperial College London*

Jul. 2021 – Nov. 2023

- EPSRC Grant: *Spectral element methods for fractional differential equations, with applications in applied analysis and medical imaging.*
- Leverhulme Trust Research Project Grant: *Constructive approximation theory on and inside algebraic curves and surfaces.*

The MathWorks, Inc., *Cambridge*

2019 – 2020

- Undertook an 8 week placement with the GPU & deep learning group (2020) and an 8 week placement with the parallel toolbox group (2019).
- Generated use cases for higher order automatic differentiation in **deep learning**.
- Developed the framework for a C++ wrapping of cuSOLVER CUDA functions.

NOTABLE PRIZES

- **IMA Leslie Fox Prize in Numerical Analysis**, second place, for the numerical analysis of divergence-free finite element methods for the topology optimization of fluids. 2023
- **Durham Prize**, awarded by Keble College for performance during an MSc. 2017
- **Gerald Whitrow Prize**, awarded for excellence during the final undergraduate examinations. 2016
- **Dean's List**, awarded to the top 10% of the cohort. 2016
- **London Mathematical Society** undergraduate research bursary 2015

EDUCATION

DPhil in Mathematics, *University of Oxford*, viva date: 24 Sep. 2021

2017 – 2021

- Title: *Computing multiple solutions of topology optimization problems.*
- Supervisors: Prof. Patrick Farrell and Prof. Endre Süli.
- EPSRC Centre for Doctoral Training in Partial Differential Equations.
- **Scholarships:** Obtained a **MathWorks scholarship** for financial support during a PhD.
- **Awards:** Judges' and people's first choice in the departmental three-minute thesis competition.

MSc in Mathematical Modelling and Scientific Computing,
University of Oxford (Distinction)

2016 – 2017

- Dissertation: *Computing and controlling transitions in multi-stable partial differential equations* supervised by Prof. Patrick Farrell.

BSc in Mathematics, *Imperial College London* (First Class Honours)

2013 – 2016

- **Scholarships:** Imperial College London Undergraduate Research Bursary (2014) to undertake research during the summers of my undergraduate degree.

PUBLICATIONS

- [Second place in IMA Leslie Fox Prize] **I. P. A. Papadopoulos**, *Numerical analysis of a discontinuous Galerkin method for the Borrvall-Petersson topology optimization problem*, SIAM Journal on Numerical Analysis, 2022; [link to paper](#).
- **I. P. A. Papadopoulos**, P. E. Farrell, T. M. Surowiec, *Computing multiple solutions of topology optimization problems*, SIAM Journal on Scientific Computing, 2021; [link to paper](#), [link to software](#).
- **I. P. A. Papadopoulos**, E. Süli, *Numerical analysis of a topology optimization problem for Stokes flow*, Journal of Computational and Applied Mathematics, 2022; [link to paper](#).
- **I. P. A. Papadopoulos**, P. E. Farrell, *Preconditioners for computing multiple solutions in three-dimensional fluid topology optimization*, SIAM Journal on Scientific Computing, 2023; [link to paper](#), [link to software](#).
- **I. P. A. Papadopoulos**, S. Olver, *A sparse spectral method for fractional differential equations in one-spatial dimension*, Advances in Computational Mathematics, 2024; [link to paper](#).
- **I. P. A. Papadopoulos**, T. S. Gutleb, R. M. Slevinsky, S. Olver, *Building hierarchies of semiclassical Jacobi polynomials for spectral methods in annuli*, to appear in SISC, 2024; [link to preprint](#).
- **I. P. A. Papadopoulos**, *Numerical analysis of the SIMP model for the topology optimization problem of minimizing compliance in linear elasticity*, submitted, 2023; [link to preprint](#).
- **I. P. A. Papadopoulos**, T. S. Gutleb, J. A. Carrillo, S. Olver, *A frame approach for equations involving the fractional Laplacian*, submitted, 2023; [link to preprint](#).
- T. S. Gutleb, **I. P. A. Papadopoulos**, *Explicit fractional Laplacians and Riesz potentials of classical functions*, submitted, 2023; [link to preprint](#).
- K. Knook, S. Olver, **I. P. A. Papadopoulos**, *Quasi-optimal complexity hp-FEM for Poisson on a rectangle*, submitted, 2024; [link to preprint](#).
- **I. P. A. Papadopoulos**, S. Olver, *A sparse hierarchical hp-finite element method on disks and annuli*, submitted, 2024; [link to preprint](#).
- A. Alphonse, C. Christof, M. Hintermüller, **I. P. A. Papadopoulos**, *A globalized inexact semismooth Newton method for nonsmooth fixed-point equations involving variational inequalities*, submitted, 2024; [link to preprint](#).

TALKS

A semismooth Newton method for obstacle-type quasivariational inequalities

- Firedrake'24 workshop September 2024

A sparse hp-finite element method for the Helmholtz equation posed on disks, annuli, and cylinders

- Bath Numerical Analysis Seminar October 2023
- Oxford Numerical Analysis Internal Seminar October 2023
- Numerical Analysis in the 21st Century August 2023
- Flatiron Institute (New York) July 2023

Sparse spectral methods for fractional PDEs

- ICIAM 2023 August 2023
- 29th Biennial Numerical Analysis Conference July 2023
- SIAM Conference on Computational Science and Engineering (CSE23) April 2023
- University of Leicester CSE Mathematics Seminar October 2022
- Imperial Numerics and Acoustics workshop September 2022
- PDE CDT Reunion Conference July 2022

Numerical analysis of a topology optimization problem for Stokes flow

- IMA Leslie Fox Prize in Numerical Analysis June 2023
- Joint UCL-Imperial College London Numerical Analysis Seminar October 2021

- Numerical analysis internal seminar at the University of Oxford May 2021
- PDE CDT Lunchtime Seminar at the University of Oxford January 2021
- Preconditioners for computing multiple solutions in 3D fluid topology optimization**
- PRISM Workshop January 2022
- Numerical analysis internal seminar at the University of Oxford January 2021
- Computing multiple solutions of topology optimization problems**
- EUCCO 2023 conference - Heidelberg September 2023
- USNCCM17 conference in Albuquerque July 2023
- GAMM 2022 Conference - Young Researcher's minisymposium August 2022
- Oxbridge Applied Mathematics "Woolly Owl" Meeting September 2021
- World Congress of Structural and Multidisciplinary Optimization (WCSMO14) July 2021
- ICOSAHOM 2020/2021 Conference July 2021
- FEniCS 2021 Conference March 2021
- Numerical analysis internal seminar at the University of Oxford January 2021
- PDE CDT Lunchtime Seminar at the University of Oxford January 2021
- Numerical analysis internal seminar at the University of Oxford December 2019
- PDE CDT student seminar at the University of Oxford December 2019
- Junior applied mathematics seminar at the University of Oxford December 2019
- Internal seminar at Universität Bayreuth July 2019

SUPERVISING & TEACHING

Co-supervisor, *Department of Mathematics, Imperial College London* 2021– 2022

- Co-supervised two 4th year undergraduate dissertations.
- Co-supervised a 2nd year group project on deflation who won the **Winton Capital Second Year Project Prize**.

Lecturer, *Department of Mathematics, Imperial College London* 2023

- Two hours in "Finite elements: numerical analysis" (Part 1, MATH60022).

Teaching Assistant/Tutor, *Mathematical Institute, University of Oxford* 2018 – 2021

- Courses: continuous optimization (year 3/4 course), numerical linear algebra (year 3/4 course), functional analysis I (year 3 course), numerical solution of differential equations I (year 3 course), numerical solution of differential equations II (year 3 course), scientific computing and numerical analysis of PDEs (PhD course), further PDEs (MSc course).
- Marking and presenting solutions of problems to students.

Tutor, *Oxford Study Abroad Programme, University of Oxford* 2020 – 2021

- Continuous Optimization - one-on-one tutoring covering the UCLA syllabus in 8 weeks.

MATHEMATICAL ENGAGEMENT

- Organizer of the RG8 Group Seminars at WIAS 2024–date
- Assist in the Imperial-UCL Numerical Analysis Seminar 2022–2023
- Organizer of minisymposiums at CSE23 and Biannual NA conferences 2023
- President of the University of Oxford SIAM Student Chapter 2020–2021
- Active member of the Oxford numerical analysis reading group 2019–date
- Peer reviewer for Foundations of Computational Mathematics, SIAM Journal on Scientific Computing, SIAM Journal on Numerical Analysis, Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales, Optimization Methods and Software, Structural and Multidisciplinary Optimization, Computer Methods in Applied Mechanics and Engineering, and Journal of Scientific Computing 2021–date