Ioannis P. A. Papadopoulos

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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, 2016 – 2017
University of Oxford (Distinction)

- 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.

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 4$^{\text{th}}$ year undergraduate dissertations.
· Co-supervised a 2$^{\text{nd}}$ 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

· 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

ADDITIONAL INFORMATION

Languages English (native), Greek (fluent)
Computing Julia, Python (FEniCS & Firedrake), MATLAB, LaTeX, C, C++