Ioannis P. A. Papadopoulos

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RESEARCH INTERESTS

Numerical analysis, scientific computing, and *hp*-finite element methods for nonlinear partial differential equations, quasi-variational inequalities, and topology optimization.

EMPLOYMENT

Hooke Research Fellow, *University of Oxford* 2026 – date

BMS Dirichlet Fellow, *Weierstrass Institute Berlin* 2023 – 2025

Research Associate, *Imperial College London* 2021 – 2023

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

The MathWorks, Inc., *Cambridge* 2019 – 2020

- Two summer placements, with the GPU & deep learning group and the parallel toolbox group.

EDUCATION

PhD 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 FRS.
- EPSRC Centre for Doctoral Training in Partial Differential Equations.

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

GRANTS AND NOTABLE PRIZES

- **Hooke Research Fellowship**, University of Oxford. 2026–2029
- **Dirichlet Postdoctoral Fellowship**, Berlin Mathematical School. 2023–2025
- **IMA Leslie Fox Prize in Numerical Analysis**, second place, for "mathematical and algorithmic brilliance in tandem with presentational skills". 2023
- **MathWorks PhD scholarship**. 2017–2021
- **Oxford three-minute thesis competition** (first place). 2019
- **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**, Imperial College London, awarded to the top 10% of the cohort. 2016
- **London Mathematical Society** undergraduate research bursary. 2015
- Imperial College London Undergraduate Research Bursary. 2014

SUPERVISING & TEACHING

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

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

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**.

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.

MANAGEMENT AND ADMINISTRATIVE ACTIVITIES

- Organizer of the Research Group 8 Seminars at the Weierstrass Institute. 2024–2025
- Assistant in the Imperial-UCL Numerical Analysis Seminars. 2022–2023
- Organizer of minisymposia at CSE23, Biennial NA conferences (2023, 2025), and ENUMATH 2025. 2023–2025
- President of the University of Oxford SIAM Student Chapter. 2020–2021
- Co-founder 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, SIAM Journal on Optimization, 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.

TALKS

Highlighted talks (selected from over 50 presentations, 8 invited & expensed):

Latent variable proximal point for variational problems with inequality constraints

- Biennial Numerical Analysis Conference in Glasgow, UK. June 2025

Numerical analysis of a topology optimization problem for Stokes flow/linear elasticity

- IMA Leslie Fox Prize Competition (second place). June 2023
- Joint UCL-Imperial College London Numerical Analysis Seminar. November 2022

A sparse *hp*-finite element method for rectangles, disks, annuli, and cylinders

- CSE 2025. March 2025
- Bath Numerical Analysis Seminar. October 2023

Sparse spectral methods for fractional PDEs

- ICOSAHOM 2023 in Tokyo, Japan. August 2023
- University of Leicester CSE Mathematics Seminar. October 2022

Computing multiple solutions of topology optimization problems

- RICAM Special Workshop in Linz, Austria October 2025
- USNCCM17 in Albuquerque, New Mexico. July 2023

PREPRINTS IN REVIEW

[15] A. Alphonse, P. Dvurechensky, **I. P. A. Papadopoulos**, C. Sirotenko, LeAP-SSN: a semismooth Newton method with global convergence rates (2025). https://arxiv.org/abs/2508.16468.

[14] **I. P. A. Papadopoulos**, Hierarchical proximal Galerkin: a fast *hp*-FEM solver for variational problems with pointwise inequality constraints (2024). https://arxiv.org/abs/2412.13733.

[13] T. S. Gutleb, **I. P. A. Papadopoulos**, Explicit fractional Laplacians and Riesz potentials of classical functions (2023). https://arxiv.org/abs/2311.10896.

PUBLICATIONS

[12] K. Knook, S. Olver, **I. P. A. Papadopoulos**, Quasi-optimal complexity *hp*-FEM for the Poisson equation on a rectangle, *IMA Journal of Numerical Analysis* (2025). https://doi.org/10.1093/imanum/draf102.

[11] A. Alphonse, C. Christof, M. Hintermüller, **I. P. A. Papadopoulos**, A globalized inexact semismooth Newton method for nonsmooth fixed-point equations involving variational inequalities, *Computational Optimization and Applications* (2025). https://doi.org/10.1007/s10589-025-00722-8.

[10] **I. P. A. Papadopoulos**, T. S. Gutleb, J. A. Carrillo, S. Olver, A frame approach for equations involving the fractional Laplacian, *IMA Journal of Numerical Analysis* (2025). https://doi.org/10.1093/imanum/draf086.

[9] Jørgen S. Dokken, Patrick E. Farrell, Brendan Keith, **I. P. A. Papadopoulos**, Thomas M. Surowiec, The latent variable proximal point algorithm for variational problems with inequality constraints, *Computer Methods in Applied Mechanics and Engineering* (2025). https://doi.org/10.1016/j.cma.2025.118181.

[8] **I. P. A. Papadopoulos**, S. Olver, A sparse hierarchical *hp*-finite element method on disks and annuli, *Journal of Scientific Computing* (2025). https://doi.org/10.1007/s10915-025-02964-4.

[7] **I. P. A. Papadopoulos**, Numerical analysis of the SIMP model for the topology optimization problem of minimizing compliance in linear elasticity, *Numerische Mathematik* (2024). https://doi.org/10.1007/s00211-024-01438-3.

[6] **I. P. A. Papadopoulos**, T. S. Gutleb, R. M. Slevinsky, S. Olver, Building hierarchies of semiclassical Jacobi polynomials for spectral methods in annuli, *SIAM Journal on Scientific Computing* (2024). https://doi.org/10.1137/23M160846X.

[5] **I. P. A. Papadopoulos**, S. Olver, A sparse spectral method for fractional differential equations in one-spatial dimension, *Advances in Computational Mathematics* (2024). https://doi.org/10.1007/s10444-024-10164-1.

[4] **I. P. A. Papadopoulos**, P. E. Farrell, Preconditioners for computing multiple solutions in three-dimensional fluid topology optimization, *SIAM Journal on Scientific Computing* (2023). https://doi.org/10.1137/22M1478598.

[3] **I. P. A. Papadopoulos**, Numerical analysis of a discontinuous Galerkin method for the Borrvall–Petersson topology optimization problem, *SIAM Journal on Numerical Analysis* (2022). https://doi.org/10.1137/21M1438943.

[2] **I. P. A. Papadopoulos**, E. Süli, Numerical analysis of the topology optimization of Stokes flow, *Journal of Computational and Applied Mathematics* (2022). https://doi.org/10.1016/j.cam.2022.114295.

[1] **I. P. A. Papadopoulos**, P. E. Farrell, T. M. Surowiec, Computing multiple solutions of topology optimization problems, *SIAM Journal on Scientific Computing* (2021). https://doi.org/10.1137/20M1326209.