

# Ioannis P. A. Papadopoulos

*Weierstrass Institute*

papadopoulos@wias-berlin.de

## EMPLOYMENT

---

**BMS Dirichlet Postdoctoral Fellow**, *Weierstrass Institute Berlin*

Nov. 2023 – date

- Hosted by Prof. Dr. Michael Hintermüller at the Weierstrass Institute for Applied Analysis and Stochastics.
- Research interests: nonlinear partial differential equations, quasi-variational inequalities, topology optimization, numerical analysis, scientific computing, finite element methods.

**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

- Two 8 week 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.
- EPSRC Centre for Doctoral Training in Partial Differential Equations.

**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.

## 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
- **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**, awarded to the top 10% of the cohort. 2016
- **London Mathematical Society** undergraduate research bursary 2015

## SUPERVISING & TEACHING

---

**Co-supervisor**, *Department of Mathematics, Imperial College London*

2021–2022

- Co-supervised two 4<sup>th</sup> year undergraduate dissertations.
- Co-supervised a 2<sup>nd</sup> 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
- Assistant in the Imperial-UCL Numerical Analysis Seminars 2022–2023
- Organizer of minisymposiums at CSE23 and Biannual NA conferences 2023
- President of the University of Oxford SIAM Student Chapter 2020–2021
- 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, 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 40 presentations):

**A semismooth Newton method for obstacle-type quasivariational inequalities**

- Firedrake’24 workshop September 2024

**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**

- Bath Numerical Analysis Seminar October 2023
- Flatiron Institute (New York) July 2023

**Sparse spectral methods for fractional PDEs**

- ICOSAHOM 2023 August 2023
- CSE23 in Amsterdam March 2023
- University of Leicester CSE Mathematics Seminar October 2022

**Computing multiple solutions of topology optimization problems**

- USNCCM17 in Albuquerque, New Mexico July 2023
- GAMM 2022 Conference - Young Researcher’s minisymposium August 2022
- Oxbridge Applied Mathematics “Woolly Owl” Meeting September 2021

## PUBLICATIONS

---

- [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, 46(6), pp. A3448-A3476 (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, 50, 69 (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, 45 (2023), pp. B853-B883, <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, 60 (2022), pp. 2538–2564, <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, 12 (2022), p. 114295, <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, 43 (2021), pp. A1555–A1582, <https://doi.org/10.1137/20M1326209>.

## PREPRINTS

---

- [12] A. Alphonse, C. Christof, M. Hintermüller, **I. P. A. Papadopoulos**, *A globalized inexact semismooth Newton method for nonsmooth fixed-point equations involving variational inequalities*, (2024); <https://arxiv.org/abs/2409.19637>.
- [11] **I. P. A. Papadopoulos**, S. Olver, *A sparse hierarchical hp-finite element method on disks and annuli*, (2024); <https://arxiv.org/abs/2402.12831>.
- [10] K. Knook, S. Olver, **I. P. A. Papadopoulos**, *Quasi-optimal complexity hp-FEM for Poisson on a rectangle*, (2024); <https://arxiv.org/abs/2402.11299>.
- [9] T. S. Gutleb, **I. P. A. Papadopoulos**, *Explicit fractional Laplacians and Riesz potentials of classical functions*, (2023); <https://arxiv.org/abs/2311.10896>.
- [8] **I. P. A. Papadopoulos**, T. S. Gutleb, J. A. Carrillo, S. Olver, *A frame approach for equations involving the fractional Laplacian*, (2023); <https://arxiv.org/abs/2311.12451>.