Ioannis P. A. Papadopoulos

Weierstrass Institute, Berlin

EMPLOYMENT

Dirichlet Postdoctoral Fellow, *Weierstrass Institute* Nov. 2023 – date

- Hosted by Prof. Dr. Michael Hintermüller at WIAS.
- Research interests: Numerical analysis, spectral & *hp*-finite element methods, nonlocal & nonlinear PDEs, PDE-constrained optimization and applications, topology optimization

Research Associate, (postdoc) *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.

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:** Obtained an undergraduate research bursary from the **London Mathematical Society** (2015) and an Imperial College London Undergraduate Research Bursary (2014).

SUPERVISING & TEACHING

Co-supervisor, *Department of Mathematics, Imperial College London* 2021– 2023

- 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 a minisymposium at CSE23 on fast spectral methods February 2023
- Co-organizer of a spectral method minisymposium at the Strathclyde NA conference June 2023
- Assistant of the Imperial-UCL Numerical Analysis Seminar 2022–date
- 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 *Computer Methods in Applied Mechanics and Engineering* 2021–date

TALKS

Highlighted talks (selected from over 30 presentations):

Numerical analysis of a topology optimization problem for Stokes flow

- IMA Leslie Fox Prize Competition (second place) June 2023

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 of a topology optimization problem for linear elasticity

- Joint UCL-Imperial College London Numerical Analysis Seminar November 2022

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

- [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*, to appear in SISC, 2023; link to software.
- **I. P. A. Papadopoulos**, S. Olver, *A sparse spectral method for fractional differential equations in one-spacial dimension*, submitted, 2022; link to preprint, link to software.
- **I. P. A. Papadopoulos**, *Numerical analysis of the SIMP model for the topology optimization of minimizing compliance in linear elasticity*, submitted, 2022; link to preprint.
- **I. P. A. Papadopoulos**, T. S. Gutleb, R. M. Slevinsky, S. Olver, *Building hierarchies of semiclassical Jacobi polynomials for spectral methods in annuli*, submitted, 2023; link to preprint.

IN PREPARATION

- **I. P. A. Papadopoulos**, S. Olver, *A sparse hp-finite element method on disks and annuli.*
- **I. P. A. Papadopoulos**, T. S. Gutleb, J. A. Carrillo, S. Olver, *A frame approach for equations involving the fractional Laplacian.*
- **I. P. A. Papadopoulos**, I. Smears, *Convergence of adaptive conforming FEM for a topology optimization problem for Stokes flow.*
- T. S. Gutleb, **I. P. A. Papadopoulos**, *Explicit fractional Laplacians and Riesz potentials of classical functions.*

SOFTWARE

- I. P. A. Papadopoulos, *RadialPiecewisePolynomials.jl: an hp-finite element method for disks and annuli*, (2023), RadialPiecewisePolynomials.jl.
- I. P. A. Papadopoulos, S. Olver, *AnnuliOrthogonalPolynomials.jl: multivariate orthogonal polynomials on the annulus*, (2023), AnnuliOrthogonalPolynomials.jl.
- I. P. A. Papadopoulos, *SumSpaces.jl: a spectral method for solving fractional differential equations*, (2022), SumSpaces.jl.
- I. P. A. Papadopoulos, P. E. Farrell, *deflatedbarrier: software for the computation of multiple solutions of topology optimization problems*, (2021), deflatedbarrier.
- I. P. A. Papadopoulos, P. E. Farrell, *fir3dab: software for the computation of multiple solutions in three dimensions of topology optimization problems*, (2022), fir3dab.

ADDITIONAL INFORMATION

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