Alex Bespalov

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Qualifications

- Postgraduate Certificate in Academic Practice (with distinction), 2016
  University of Birmingham, United Kingdom
- Ph.D. in Computational Mathematics, 1999
  Institute for Computational Mathematics and Mathematical Geophysics, Russian Academy of Sciences, Siberian Branch (Novosibirsk, Russia)
  Ph.D. Thesis: The design and analysis of the *h-p* version of the finite element method for the Dirichlet problem with singularity of solution
  Advisor: Professor V. A. Rukavishnikov
- B.Sc. (with distinction) in Mathematics, 1994
  Additional qualification: Teacher of Mathematics and Computer Science
  Khabarovsk State Pedagogical University (Khabarovsk, Russia)

Current Employment

- *School of Mathematics, University of Birmingham* (Birmingham, United Kingdom)
  Associate Professor in Numerical Analysis (December 2021 – present)
  Senior Lecturer in Applied Mathematics (August 2018 – November 2021)
  Lecturer in Applied Mathematics (May 2013 – July 2018)

Previous Employment

- *School of Mathematics, University of Manchester* (Manchester, United Kingdom)
  Research Associate (August 2010–May 2013)
- *Department of Mathematical Sciences, Brunel University* (Uxbridge, United Kingdom)
  Research Fellow (September 2007–August 2010)
- *Computational Center, Russian Academy of Sciences, Far-Eastern Branch* (Khabarovsk, Russia)
  Senior Researcher (2000–2007), Researcher (1999–2000)
- *Department of Mathematical Analysis and Computer Science, Khabarovsk State Pedagogical University* (Khabarovsk, Russia)
  Docent (Senior Lecturer) (2002–2003), part-time employment

Visiting Appointments and Awards

- *Institute for Computational and Experimental Research in Mathematics* (Brown University, Providence, USA)
  Programme participant for the semester programme "Numerical PDEs: Analysis, Algorithms, and Data Challenges" (April 2024)
- *Erwin Schrödinger International Institute for Mathematics and Physics* (Vienna, Austria)
  Programme participant for the thematic programme "Computational uncertainty quantification: mathematical foundations, methodology & data" (May 2022)
- *The Alan Turing Institute* (London, United Kingdom)
  Turing Fellow (January 2019–January 2021)
- *Isaac Newton Institute for Mathematical Sciences* (Cambridge, United Kingdom)
  Programme participant for the scientific programme "Uncertainty quantification for complex systems: theory and methodologies" (April–May 2018)
- *Institute for Analysis and Scientific Computing, TU Wien* (Vienna, Austria)
  Visiting Researcher (March–April 2017); Guest Professor (2018, 2025)
- *Facultad de Matemáticas, Universidad Católica* (Santiago, Chile)
  Visiting Researcher (March 2009, April 2014)
- *Laboratory of Mathematics and its Applications, Université de Valenciennes* (France)
  Visiting Professor (May–June 2013)
- *School of Mathematical Sciences, Brunel University* (Uxbridge, United Kingdom)
  Visiting Researcher (June 2005, June 2006)
- *Departamento de Ingeniería Matemática, Universidad de Concepción* (Concepción, Chile)
  Visiting Postdoctoral Researcher (June–November 2003)

Brief Summary of Research

- Main research areas: numerical analysis, scientific computing, uncertainty quantification
- Research interests: numerical solution of partial differential and boundary integral equations; numerical methods for PDEs with parametric or uncertain inputs; high order finite element and boundary element methods; adaptive methods; convergence analysis and error estimation; singularities and their approximation; software development; applications to electromagnetics, fluid dynamics, and linear elasticity

List of Publications

Preprints submitted for publication

[1] J. Li, A. Bespalov, and J. Li, Nemytskii neural operator: a nonlinear model reduction method for parametrized partial differential equations. *Preprint*, arXiv:2511.07684, 2026.

[2] A. Bespalov and A. Savinov, Convergence analysis of the adaptive stochastic collocation finite element method. *Preprint*, arXiv: 2401.14894, 2025.

Publications in Refereed Journals

[3] A. Bespalov and R. Bulle, An adaptive multimesh rational approximation scheme for the spectral fractional Laplacian. *SIAM Journal on Scientific Computing* (to appear).

[4] A. Bespalov, D. Praetorius, and M. Ruggeri, Goal-oriented adaptivity for multilevel stochastic Galerkin FEM with nonlinear goal functionals. *SIAM Journal on Scientific Computing*, Vol. 48 (2026), Issue 1, pp. A392–A417.

[5] A. Bespalov, D. Praetorius, T. Round, and A. Savinov, Goal-oriented error estimation and adaptivity for stochastic collocation FEM. *SIAM/ASA Journal on Uncertainty Quantification*, Vol. 13 (2025), Issue 2, pp. 613–638.

[6] A. Bespalov and D. Silvester, Error estimation and adaptivity for stochastic collocation finite elements. Part II: multilevel approximation. *SIAM Journal on Scientific Computing*, Vol. 45 (2023), Issue 2, pp. A781–A797.

[7] A. Bespalov, D. Silvester, and F. Xu, Error estimation and adaptivity for stochastic collocation finite elements. Part I: single-level approximation. *SIAM Journal on Scientific Computing*, Vol. 44 (2022), Issue 5, pp. A3393–A3412.

[8] A. Bespalov, D. Praetorius, and M. Ruggeri, Convergence and rate optimality of adaptive multilevel stochastic Galerkin FEM. *IMA Journal of Numerical Analysis*, Vol. 42 (2022), Issue 3, pp. 2190–2213.

[9] A. Bespalov, D. Praetorius, and M. Ruggeri, Two-level a posteriori error estimation for adaptive multilevel stochastic Galerkin FEM. *SIAM/ASA Journal on Uncertainty Quantification*, Vol. 9 (2021), Issue 3, pp. 1184–1216.

[10] A. Bespalov, D. Loghin, and R. Youngnoi, Truncation preconditioners for stochastic Galerkin finite element discretizations. *SIAM Journal on Scientific Computing*, Vol. 43 (2021), Issue 5, pp. S92–S116.

[11] A. Khan, A. Bespalov, C. E. Powell, and D. J. Silvester, Robust a posteriori error estimation for stochastic Galerkin formulations of parameter-dependent linear elasticity equations. *Mathematics of Computation*, Vol. 90 (2021), no. 328, pp. 613–636.

[12] A. Bespalov, L. Rocchi, and D. Silvester, T-IFISS: a toolbox for adaptive FEM computation. *Computers & Mathematics with Applications*, Vol. 81 (2021), pp. 373–390.

[13] A. Bespalov and F. Xu, A posteriori error estimation and adaptivity in stochastic Galerkin FEM for parametric elliptic PDEs: beyond the affine case. *Computers & Mathematics with Applications*, Vol. 80 (2020), no. 5, pp. 1084–1103.

[14] A. Bespalov, D. Praetorius, L. Rocchi, and M. Ruggeri, Convergence of adaptive stochastic Galerkin FEM. *SIAM Journal on Numerical Analysis*, Vol. 57 (2019), no. 5, pp. 2359–2382.

[15] A. J. Crowder, C. E. Powell, and A. Bespalov, Efficient adaptive multilevel stochastic Galerkin approximation using implicit a posteriori error estimation. *SIAM Journal on Scientific Computing*, Vol. 41 (2019), no. 3, pp. A1681–A1705.

[16] A. Bespalov, T. Betcke, A. Haberl, and D. Praetorius, Adaptive BEM with optimal convergence rates for the Helmholtz equation. *Computer Methods in Applied Mechanics and Engineering*, Vol. 346 (2019), pp. 260–287.

[17] A. Bespalov, D. Praetorius, L. Rocchi, and M. Ruggeri, Goal-oriented error estimation and adaptivity for elliptic PDEs with parametric or uncertain inputs. *Computer Methods in Applied Mechanics and Engineering*, Vol. 345 (2019), pp. 951–982.

[18] A. Bespalov and L. Rocchi, Efficient adaptive algorithms for parametric PDEs with spatial singularities. *SIAM/ASA Journal on Uncertainty Quantification*, Vol. 6 (2018), no. 1, pp. 243–272.

[19] A. Bespalov, A. Haberl, and D. Praetorius, Adaptive FEM with coarse initial mesh guarantees optimal convergence rates for compactly perturbed elliptic problems. *Computer Methods in Applied Mechanics and Engineering*, Vol. 317 (2017), pp. 318–340.

[20] A. Bespalov and D. Silvester, Efficient adaptive stochastic Galerkin methods for parametric operator equations. *SIAM Journal on Scientific Computing*, Vol. 38 (2016), Issue 4, pp. A2118–A2140.

[21] A. Bespalov and S. Nicaise, A priori error analysis of the BEM with graded meshes for the electric field integral equation on polyhedral surfaces. *Computers & Mathematics with Applications*, Vol. 71 (2016), no. 8, pp. 1636–1644.

[22] A. Bespalov and S. Nicaise, The BEM with graded meshes for the electric field integral equation on polyhedral surfaces. *Numerische Mathematik*, Vol. 132 (2016), no. 4, pp. 631–655.

[23] A. Bespalov, C. Powell, and D. Silvester, Energy norm a posteriori error estimation for parametric operator equations. *SIAM Journal on Scientific Computing*, Vol. 36 (2014), Issue 2, pp. A339–A363.

[24] A. Bespalov, C. Powell, and D. Silvester, A priori error analysis of stochastic Galerkin mixed approximations of elliptic PDEs with random data. *SIAM Journal on Numerical Analysis*, Vol. 50 (2012), Issue 4, pp. 2039–2063.

[25] D. Silvester, A. Bespalov, and C. Powell, A framework for the development of implicit solvers for incompressible flow problems. *Discrete and Continuous Dynamical Systems - Series S*, Vol. 5 (2012), Issue 6, pp. 1195–1221.

[26] A. Bespalov and N. Heuer, Natural *hp*-BEM for the electric field integral equation with singular solutions. *Numerical Methods for Partial Differential Equations*, Vol. 28 (2012), Issue 5, pp. 1466–1480.

[27] A. Bespalov and N. Heuer, A new $\mathbf{H}(\mathrm{div})$-conforming p-interpolation operator in two dimensions. *ESAIM: Mathematical Modelling and Numerical Analysis*, Vol. 45 (2011), no. 2, pp. 255–275.

[28] A. Bespalov, N. Heuer, and R. Hiptmair, Convergence of the natural *hp*-BEM for the electric field integral equation on polyhedral surfaces. *SIAM Journal on Numerical Analysis*, Vol. 48 (2010), Issue 4, pp. 1518–1529.

[29] A. Bespalov and N. Heuer, Natural *p*-BEM for the electric field integral equation on screens. *IMA Journal of Numerical Analysis*, Vol. 30 (2010), No. 3, pp. 595–628.

[30] A. Bespalov and N. Heuer, The *hp*-BEM with quasi-uniform meshes for the electric field integral equation on polyhedral surfaces: a priori error analysis. *Applied Numerical Mathematics*, Vol. 60 (2010), Issue 7, pp. 705–718.

[31] A. Bespalov and N. Heuer, The *hp*-version of the boundary element method with quasiuniform meshes for weakly singular operators on surfaces. *IMA Journal of Numerical Analysis*, Vol. 30 (2010), No. 2, pp. 377–400.

[32] A. Bespalov and N. Heuer, Optimal error estimation for $\mathbf{H}$(curl)-conforming p-interpolation in two dimensions. *SIAM Journal on Numerical Analysis*, Vol. 47 (2009), Issue 5, pp. 3977–3989.

[33] A. Bespalov, A note on the polynomial approximation of vertex singularities in boundary element methods in three dimensions. *Journal of Integral Equations and Applications*, Vol. 21 (2009), No. 3, pp. 359–380.

[34] A. Bespalov and N. Heuer, The *hp*-version of the boundary element method with quasiuniform meshes in three dimensions. *ESAIM: Mathematical Modelling and Numerical Analysis*, Vol. 42 (2008), Issue 5, pp. 821–849.

[35] A. Bespalov, The *hp*-version of the BEM with quasi-uniform meshes for a three-dimensional crack problem: the case of a smooth crack having smooth boundary curve. *Numerical Methods for Partial Differential Equations*, Vol. 24 (2008), Issue 4, pp. 1159–1180.

[36] A. Bespalov and N. Heuer, The *p*-version of the boundary element method for weakly singular operators on piecewise plane open surfaces. *Numerische Mathematik*, Vol. 106 (2007), No. 1, pp. 69–97.

[37] D. Arroyo, A. Bespalov, and N. Heuer, On the finite element method for elliptic problems with degenerated and singular coefficients. *Mathematics of Computation*, Vol. 76 (2007), no. 258, pp. 509–537.

[38] A. Bespalov and N. Heuer, The *p*-version of the boundary element method for a three-dimensional crack problem. *Journal of Integral Equations and Applications*, Vol. 17 (2005), No. 3, pp. 243–258.

[39] A. Bespalov and N. Heuer, The *p*-version of the boundary element method for hypersingular operators on piecewise plane open surfaces. *Numerische Mathematik*, Vol. 100 (2005), No. 2, pp. 185–209.

[40] A. Bespalov, Orthogonal systems of singular functions and numerical treatment of problems with degeneration of data. *Advances in Computational Mathematics*, Vol. 19 (2003), pp. 159–182.

[41] A. Yu. Bespalov and V. A. Rukavishnikov, The use of singular functions in the *h-p* version of the finite element method for the Dirichlet problem with degeneration of input data. *Siberian Journal of Numerical Mathematics*, Vol. 4 (2001), no. 3, pp. 201–228.

[42] A. Yu. Bespalov and V. A. Rukavishnikov, The exponential rate of convergence of the finite element method for the Dirichlet problem with singularity of the solution. *Dokl. Russ. Acad. Nauk*, Vol. 374 (2000), no. 6, pp. 727-731. English translation in: *Russian Acad. Sci. Doklady Mathematics*, Vol. 62 (2000), no. 2, pp. 266–270.

[43] V. A. Rukavishnikov and A. Yu. Bespalov, On the *h-p* version of the finite element method for one-dimensional boundary value problem with singularity of solution. *Siberian Journal of Numerical Mathematics*, Vol. 1 (1998), no. 2, pp. 153–170.

Publications in refereed conference proceedings

[44] A. Bespalov and N. Heuer, High-order boundary element method for electromagnetic scattering at non-smooth surfaces. In: "*Proceedings of the 10-th International Conference on the Mathematical and Numerical Aspects of Waves; Vancouver, Canada, July 25–29, 2011*", ed. by N. Nigam, Pacific Institute for the Mathematical Sciences, Canada, 2011, pp. 121–124.

[45] A. Bespalov and N. Heuer, The *p*-version of the boundary element method for mixed boundary value problems on polyhedra. In: "*Advances in Boundary Integral Methods, Proceedings of the 5th UK Conference on Boundary Integral Methods*", ed. by K. Chen, University of Liverpool, UK, 2005, pp. 145–152.

[46] A. Bespalov and N. Heuer, Optimal a priori error estimate for the *p*-version of the BEM on open surfaces. In: "*Proceedings of the International Conference on Computational Mathematics, ICCM-2004. Part II*", ed. by G. A. Mikhailov, V. P. Il'in and Y. M. Laevsky, ICM&MG Publishers, Novosibirsk, Russia, 2004, pp. 794–799.

[47] A. Yu. Bespalov and V. A. Rukavishnikov, An exponential rate of convergence of the finite element method for the Dirichlet problem with singularity of a solution. In: "*ENUMATH-99. Proceedings of the Third European Conference on Numerical Mathematics and Advanced Applications, Jyvaskyla, Finland, July 26–30, 1999*", ed. by P. Neittaanmaki, T. Tiihonen and P. Tarvainen, World Scientific, Singapore, 2000, pp. 681–689.

[48] A. Yu. Bespalov and V. A. Rukavishnikov, On the *h-p* version of the finite element method using singular functions. In: "*The Far-Eastern School-Seminar on Mathematical Modeling and Numerical Analysis. The Proceedings & Abstracts*", ed. by V. A. Rukavishnikov, Khabarovsk, 1999, pp. 6–13.

Research Software

- D. Silvester, A. Bespalov, Q. Liao and L. Rocchi, *Triangular IFISS (T-IFISS)*, version 1.2, February 2019. Available online at `https://www.manchester.ac.uk/ifiss/tifiss.html`
- A. Bespalov and L. Rocchi, *Stochastic T-IFISS*, January 2022. Available online at `https://github.com/albespalov/Stochastic_T-IFISS`
- A. Bespalov, D. Silvester, and F. Xu, *Adaptive ML-SCFEM*, January 2023. Available online at `https://github.com/albespalov/Adaptive_ML-SCFEM`
- D. Silvester, A. Bespalov and C. Powell, *Stochastic IFISS (S-IFISS)*, version 1.04, October 2017. Available online at `https://www.manchester.ac.uk/ifiss/sifiss.html`

Research Funding

- *French National Research Agency (ANR)*
  Grant within the Programme for Junior Researches, 2024–2027.
  Project title: A Posteriori Error Estimates for Wave Equations (APOWA).
  Role: project partner. **Value:** approx. €267,000.
- *London Mathematical Society*
  Research in Pairs Grant (Scheme 4), 2023.
  Project title: Adaptive multi-mesh approximations for the spectral fractional Laplacian.
  Role: grant holder. **Value:** £1,000.
- *Engineering and Physical Sciences Research Council (EPSRC)*
  Mathematical Sciences Small Grant, 2021–2022.
  Project title: Adaptive multilevel stochastic collocation methods for uncertainty quantification (Ref. EP/W010925/1).
  Role: principal investigator. **Value:** £56,461.
- *Engineering and Physical Sciences Research Council (EPSRC)*
  Standard research grant, 2017–2021.
  Project title: Numerical analysis of adaptive UQ algorithms for PDEs with random inputs (Ref. EP/P013791/1).
  Role: principal investigator. **Value:** £329,468.
- *Birmingham–Nottingham Strategic Collaboration Fund*
  Grant to initiate collaborative research, 2018–2019.
  Project title: New solution paradigms for high-dimensional mathematical models using machine-learning algorithms (Ref. FRM279848).
  Role: principal investigator (joint). **Value:** £4,840.
- *The Institute of Mathematics and its Applications (IMA)*
  Travel grant (IMA Small grant scheme) to attend the SIAM Conference on Uncertainty Quantification at EPFL in Lausanne, Switzerland, 2016.
  Role: grant holder. **Value:** £600.
- *London Mathematical Society*
  Conference Grant (Scheme 1) to organise the workshop "Adaptive algorithms for computational PDEs", 2015.
  Role: grant holder. **Value:** £4,720.

- *European Union – INTAS*
  Grant for Young Scientists in the category Post Doctoral Fellowship; 2007–2008.
  Project title: Efficient boundary element approximations of time-harmonic electromagnetic waves with singularities (Ref. 06-1000014-5945).
  Role: fellowship holder and principal investigator. **Value:** €21,400.
- *Russian Science Support Foundation*
  Research Fellowship; 2006-2007.
  Role: fellowship holder. **Value:** $6,000.
- Russian Foundation for Basic Research
  Grant for young scientists and post-graduate students (Ref. 02-01-06291) within the project "Numerical analysis methods for boundary value problems with strong singularities and applications"; 2002.
  Role: principal investigator. **Value:** $1,000.
- *Russian Foundation for Basic Research*
  Individual travel grants to attend international conferences: Pohang, Korea (2001); Toronto, Canada (2002); Uxbridge, UK (2006); Beijing, China (2007).
  Role: grant holder.

Research Communications

Invited talks / participation supported by organisers

- The kick-off workshop of the ANR funded project APOWA (Lille, France; March 2024). Invited talk: *"Goal-oriented error estimation and adaptivity in finite element methods"*. All expenses paid by the organisers.
- 29th Biennial Numerical Analysis Conference (Glasgow, UK; June 2023). Invited mini-symposium talk: *"Approximating nonlinear quantities of interest using adaptive multilevel stochastic Galerkin FEM"*.
- CMAM 2022, Computational Methods in Applied Mathematics (Vienna, Austria; August 2022). Invited mini-symposium talk: *"Adaptive multilevel stochastic collocation FEM for parametric PDEs"*.
- Workshop "Interplay of discretization and algebraic solvers: a posteriori error estimates and adaptivity" (INRIA Paris, France; June, 2022). Invited talk: *"Adaptive multilevel stochastic Galerkin FEM for parametric PDE problems"*. All expenses paid by the organisers.
- Workshop "Approximation of high-dimensional parametric PDEs in forward UQ" (Erwin Schrödinger International Institute for Mathematics and Physics, Vienna, Austria; May, 2022). Invited talk: *"Multilevel and goal-oriented adaptivity for stochastic Galerkin FEM"*. Local expenses paid by the organisers.
- Workshop "Adaptivity, high dimensionality and randomness" (Erwin Schrödinger International Institute for Mathematics and Physics, Vienna, Austria; April, 2022). Invited talk: *"A posteriori error estimation and adaptivity for stochastic collocation FEM"*. Local expenses paid by the organisers.

- Workshop "Numerical Analysis of Stochastic PDEs" (Centre International de Rencontres Mathématiques, Marseille, France; November, 2021). Invited talk: *"Multilevel adaptivity in stochastic Galerkin FEM"*. The talk was delivered online.
- Minisymposium in memory of Francisco-Javier Sayas within the XXVI-th Congress of Differential Equations and Applications / XVI-th Congress of Applied Mathematics (Polytechnic School of Engineering of Gijón, Spain; June 2021). Invited talk: *"Raviart–Thomas interpolation on anisotropic elements with application to the BEM for Maxwell's equations"*. The talk was delivered online.
- FoCM 2020, Foundations of Computational Mathematics (SFU, Vancouver, Canada; June 2020). Invited to speak at the Workshop "Multiresolution and Adaptivity in Numerical PDEs". Cancelled due to the COVID-19 pandemic.
- RMMM 2019, Reliable Methods of Mathematical Modeling (TU Wien, Austria; September 2019). Invited talk: *"Convergence analysis of adaptive stochastic Galerkin FEM"*. All expenses paid by the organisers.
- MAFELAP 2019, Mathematics of Finite Elements and Applications (Uxbridge, UK; June 2019). Invited mini-symposium talk: *"Goal-oriented adaptivity for elliptic PDEs with parametric or uncertain inputs"*.
- 27th Biennial Numerical Analysis Conference (Glasgow, UK; June 2017). Invited mini-symposium talk: *"On the design and performance of adaptive stochastic Galerkin methods"*.
- SIAM Conference on Uncertainty Quantification (EPFL, Lausanne, Switzerland; April 2016). Invited mini-symposium talk: *"Adaptive algorithms driven by a posteriori estimates of error reduction for PDEs with random data"*.
- British Computational PDEs Colloquium: New Trends (International Centre for Mathematical Sciences, Edinburgh, UK; January, 2014). Invited talk: *"A posteriori error estimation for stochastic Galerkin approximations"*. All expenses paid by the organisers.
- MAFELAP 2013, Mathematics of Finite Elements and Applications (Uxbridge, UK; June 2013). Invited mini-symposium talk: *"A posteriori error estimation for stochastic Galerkin FEMs"*.
- Workshop "Numerical Analysis of Stochastic PDEs" (Mathematics Institute, University of Warwick, UK; June, 2012). Invited talk: *"Stochastic Galerkin finite element methods for saddle point problems with random data"*. All local expenses paid by the organisers.
- Workshop "High-Order Numerical Approximation for Partial Differential Equations" (Hausdorff Center for Mathematics, Bonn, Germany; February 2012). Invited talk: *"A priori error analysis of stochastic Galerkin mixed finite element methods"*. All local expenses paid by the organisers.
- Workshop "Linear algebra aspects of solving PDEs with random data" (Manchester, UK; January 2012). Invited talk: *"Numerical analysis of saddle point problems with random data"*.
- MAFELAP 2009, Mathematics of Finite Elements and Applications (Uxbridge, UK; June 2009). Invited mini-symposium talks: *"On the convergence analysis of high-order BEM for electro-magnetic scattering in three dimensions"* and *"Approximations of singularities by boundary element methods"*.

- ICOSAHOM-07, International Conference on Spectral and High Order Methods (Beijing, China; June 2007). Invited mini-symposium talk: *"On the error analysis of the high order boundary element methods in three dimensions"*. All local expenses paid by the organisers.
- MAFELAP 2006, Mathematics of Finite Elements and Applications (Uxbridge, UK; June 2006). Invited mini-symposium talk: *"On the hp-version of the boundary element method with quasi-uniform meshes in three dimensions"*. Registration fee waived by the organisers.
- BICOM Workshop on Boundary Elements (Uxbridge, UK; June 2005). Contributed talk: *"The p-version of the boundary element method for hypersingular operators"*. All local expenses paid by the organisers.
- COMCA 2003, XIII Congreso de Matemáticas Capricornio (Antofagasta,Chile; August 2003). Invited mini-symposium talk: *"On the p-version of the finite element method for boundary value problems with strongly singular solutions"*.

Research seminars

25 invited seminar talks, including those at

- Imperial–UCL Numerics Seminar, Imperial College London (January 2025)
- Computational Mathematics & Applications Seminar, University of Oxford (November 2023)
- Irish Numerical Analysis Forum (online; January 2023)
- Bath Numerical Analysis Seminar, Department of Mathematical Sciences, University of Bath, UK (November 2021)
- School of Mathematics, Cardiff University, UK (October 2016)
- Department of Mathematics, University of Sussex, Brighton, UK (February 2015).
- Facultad de Matemáticas, Universidad Católica, Santiago, Chile (April 2014)
- Laboratory of Mathematics and its Applications, Université de Valenciennes, Valenciennes, France (May 2013)
- Department of Mathematics and Statistics, University of Strathclyde, UK (November 2012)
- Department of Mathematical Sciences, Brunel University, UK (October 2012, May 2021).
- Mathematics Institute, University of Warwick, UK (March 2012)
- School of Mathematics, University of Manchester, UK (October 2010).
- Departamento de Ingeniería Matemática, Universidad de Concepci on, Chile (July, November 2003).

Contributed talks

18 contributed talks at conferences and workshops, including

- The Finite Element Circus (Providence, 2024).
- Chemnitz FEM Symposia (Strobl, 2017; Chemnitz, 2018; Herrsching am Ammersee, 2022).
- European Finite Element Fairs (Coventry, 2010 and Milan, 2017).
- Biennial Numerical Analysis Conferences (Glasgow, 2009, 2011, 2015, 2019).
- International Congress on Industrial and Applied Mathematics, ICIAM (Vancouver, 2011).

- WAVES 2011, 10-th International Conference on Mathematical and Numerical Aspects of Waves (Vancouver, 2011).
- UK Conference on Boundary Integral Methods (Durham, September 2007).
- IMACS Workshop on Adaptive Methods for Partial Differential Equations (Toronto, 2002).
- Com2MaC Conference on Computational Mathematics (Pohang, 2001).

Research Supervision

- Dr Feng Xu (Research Fellow; 2017–2020).

- Mr Thomas Round (PhD student; 2019–2024).
  PhD Thesis: *"Goal-oriented adaptive algorithms for stochastic collocation finite element methods"*.

- Dr Rawin Youngnoi (PhD student; 2016–2021), jointly supervised with Dr Daniel Loghin.
  PhD Thesis: *"Preconditioning techniques for elliptic partial differential equations with random data"*.

- Dr Leonardo Rocchi (PhD student; 2015–2019).
  PhD Thesis: *"Adaptive algorithms for partial differential equations with parametric uncertainty"*.

- Mr Thomas Munn (current PhD student; since September 2025), jointly supervised with Dr David Tourigny.
  Project title: *"Mathematical modelling of metabolism in microbial communities"*.

- Mr Andrey Savinov (current PhD student; since September 2022).
  Project title: *"Design and analysis of adaptive stochastic collocation finite element methods"*.

- Mr Jingye Li (current PhD student; since January 2023), jointly supervised with Professor Jinglai Li.
  Project title: *"Machine-learning techniques for PDE-based reliability analysis problems"*.

- Mr Adam Hayes (MSci project in Mathematics; 2021–22).
  MSci Thesis: *'Solving differential equations using neural networks'*.

- Mr Oliver Hedges (MSci project in Mathematics; 2020–21).
  MSci Thesis: *"Function approximations with feedforward neural networks"*.

- Mr Ryan Sephton (MSc project in Financial Engineering, 2020).
  MSc Thesis: *"Deep artificial neural networks for high-dimensional option pricing"*.

- Mr Matthew Williams (MSci project in Mathematics; 2014–15).
  MSci Thesis: *"Stochastic sampling methods for PDEs with random input data"*.

Teaching Experience

School of Mathematics, University of Birmingham, 2013–present

Courses taught:
Numerical Methods and Numerical Linear Algebra (Year 3/4 and PGT)
Numerical Methods II (Year 3/4)
Advanced Numerical Methods (Year 4/PGT)
Computational Methods and Frontiers (Year 4/PGT)
Computational Methods and Programming (PGT)
Engineering Mathematics 3 (Year 3)
Financial Mathematics (Year 3)

School of Mathematics, University of Manchester, 2010–12

Course taught: service course Engineering Mathematics (Linear Algebra sub-module) for Year 2 Electrical and Electronic Engineering students.

Department of Mathematical Analysis and Computer Science, Khabarovsk State Pedagogical University (Khabarovsk, Russia), 2002–03

Course taught: Mathematical Analysis for 2nd year undergraduate students.

Meeting / Mini-Symposia Organisation

- **Scientific computation using machine-learning algorithms**
  A two-day workshop at the University of Nottingham (April 2019);
  jointly organised with Daniel Loghin and Kris van der Zee.
- **Adaptive algorithms for computational PDEs**
  A two-day LMS funded workshop at the University of Birmingham (January 2016);
  jointly organised with Daniel Loghin.
- **Recent advances in computational PDEs for uncertainty quantification**
  A mini-symposium at the 29th Biennial Numerical Analysis Conference (Glasgow; June 2023);
  jointly organised with Michele Ruggeri (University of Strathclyde).
- **Finite element methods for efficient uncertainty quantification**
  A mini-symposium at the International Conference on Mathematics of Finite Elements and Applications, MAFELAP 2019 (Uxbridge, UK);
  jointly organised with David Silvester (University of Manchester).
- **Finite elements for problems with singularities**
  A mini-symposium at the International Conference on Mathematics of Finite Elements and Applications, MAFELAP 2013 (Uxbridge, UK);
  jointly organised with Serge Nicaise (Université de Valenciennes).

Other Professional and Administrative Experience

- Examiner for PhD Theses:
  Ms Xinyi Wu, University of Birmingham, 2025 (internal examiner)
  Ms Layla Sadeghi Namaghi, Cardiff University, 2024 (external examiner)

Mr Matthew J. Parkinson, University of Bath, 2018 (external examiner)
Mr Alexander Haberl, TU Wien (Vienna, Austria), 2018 (external reviewer);
Ms Manal AlQhtani, University of Birmingham, 2017 (internal examiner)

- Referee for
SIAM Journal on Numerical Analysis, SIAM Journal on Scientific Computing,
SIAM/ASA Journal on Uncertainty Quantification, IMA Journal of Numerical Analysis,
Journal of Scientific Computing, Applied Numerical Mathematics,
Numerical Methods for PDEs, BIT Numerical Mathematics, Numerical Algorithms,
ESAIM: Mathematical Modelling and Numerical Analysis,
Computers and Mathematics with Applications,
Mathematical Methods in the Applied Sciences,
Computational Methods in Applied Mathematics
- Reviewer for Mathematical Reviews (since 2008)
- Member of the Local Scientific Committee for the 25th UKACM Conference on Computational Mechanics, University of Birmingham, 2017
- Director of Graduate School, School of Mathematics, University of Birmingham (since September 2024)
- Head of the Optimisation and Numerical Analysis research group, School of Mathematics, University of Birmingham (2023–2024)
- PGR Recruitment Lead for the Applied Mathematics group, School of Mathematics, University of Birmingham (2021–2022)
- Head of the Applied Mathematics group, School of Mathematics, University of Birmingham (2018–2021)
- Deputy Director of Year 1 Undergraduate Programmes in Mathematics, School of Mathematics, University of Birmingham (2015–17)
- Applied Mathematics seminar organiser (joint), School of Mathematics, University of Birmingham (2013–15)
- Numerical Analysis seminar organiser, School of Mathematics, University of Manchester (2010–12)
- Fellow of the Higher Education Academy, UK (awarded in March 2016)