

Curriculum Vitae

Mark Ainsworth

Current Academic Position & Affiliation

Francis Wayland Professor of Applied Mathematics,
Division of Applied Mathematics,
Brown University,
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Prizes and Honours

- 2014 Elected to Fellowship of the Society for Industrial and Applied Mathematics (SIAM Fellow)
- 2010 Elected to Fellowship of the Institute of Mathematics and Its Applications (FIMA)
- 2004 Awarded Whitehead Prize for mathematics from London Mathematical Society.
- 2004 Awarded J.L. Lions Prize for Computational Mathematics from ECCOMAS
- 2003 Elected Fellow of Royal Society of Edinburgh (Scottish National Academy of Science and Letters, FRSE)
- 2002 Leverhulme Research Fellowship.
- 1989 Leslie Fox Prize for Numerical Analysis. *Runner up.*

Education

- PhD Mathematics (1989). *A Posteriori Error Estimation in the Finite Element Method.* Durham University, 1986-1989. Supervisor: A.W. Craig.
- BSc (Hons) Mathematics, *First class.* Durham University, 1983-1986. Awarded Collingwood Memorial Prize (for performance in final honours examinations in mathematics).

Academic Positions

- 2013-present: *Joint Faculty Appointment* (Oak Ridge National Laboratory);
- 2012-present *Professor of Applied Mathematics* (Brown University);
- 2004-2012 *The 1825 Chair Professor of Mathematics* (Strathclyde University);
- 1998-2004 *Professor of Applied Mathematics* (Strathclyde University);
- 1996-98 *Reader in Mathematics* (Leicester University);
- 1991-96 *Lecturer* (Mathematics, Leicester University);
- 1991-92 *Lecturer* (University of Texas at Austin);
- 1989-91 *Lecturer* (Mathematics, Lancaster University);

Editorial Duties

- Member of editorial board of *Computer Methods in Applied Mechanics and Engineering* (2022-present).
- Member of editorial board of *SIAM Journal on Numerical Analysis* (2013-present).
- Member of editorial board of *IMA Journal on Numerical Analysis* (2004-present).

Member of editorial board of *SIAM Journal on Scientific Computing* 2001-2016 (Served five terms).
 Senior Editor of *Applied Numerical Mathematics* (2003-2013). Associate editor (1998-2003).
 Member of editorial board of *Journal on Scientific Computing* 2012-2014.
 Member of editorial board of *International Journal for Numerical Methods in Engineering* (2003-present).
 Member of editorial board of *International Journal of Numerical Analysis and Modelling* (2004-2012).
 Member of editorial board of *Numerical Methods for Partial Differential Equations* (2004-present).
 Member of editorial board of *International Journal for Numerical Methods in Fluids* (2005-present).
 Member of editorial board of *Proceedings of Royal Society of Edinburgh. Section A: Mathematics* (2003-2007).
 Invited to become Editor-in-Chief 2008 (declined).

Distinguished Scholarly Activity

London Mathematical Society Prize Committee 2014–2016

Director of Centre for Numerical Algorithms and Intelligent Software, 2011-2012. £5M multi-disciplinary centre formed by Universities of Strathclyde, Edinburgh, Heriot-Watt and Edinburgh Parallel Computing Centre. Ainsworth was one of four founding members of the centre.

Mathematical Sciences Research Institute (Berkeley): Programme on Numerical and Applied Mathematics (6th March-28th April 2000). Co-organiser along with Professors Babuška, Bank and Verfürth, of MSRI workshop on *A Posteriori Error Estimation and Adaptive Approaches in the Finite Element Method* supported by MSRI and NSF.

Isaac Newton Institute for Mathematical Sciences (Cambridge): Programme on *Computational Challenges in Partial Differential Equations* held in Cambridge, January-July 2003. Co-organiser with Professors C.M. Elliot and E. Süli.

EMS Prize Committee: Member of prize committee of Edinburgh Mathematical Society 2004-2012.

Leslie Fox Prize Committee: Member of prize committee for Leslie Fox Prize in Numerical Analysis 2008-2013. Chair of adjudicating panel 2013.

Other Scholarly Activity

Member of Edinburgh Mathematical Society travel and research awards committee. 2003-2012.

Member of London Mathematical Society research meetings committee. 2003-2009.

Member of London Mathematical Society computer science committee. 2009-2012.

Member of Royal Society of Edinburgh sectional committee in mathematics. 2003-2005.

External examiner for MSc in Computational Mathematics at University of Manchester. 2004-2008.

External examiner for undergraduate final honours degree at Heriot-Watt University, Edinburgh. 2001-2003.

External PhD Thesis Examiner

University of New South Wales, Norwegian Institute of Science and Technology, University of Bath, University of Cape Town, ...

Member of EPSRC Mathematics Peer Review College 1997–present.

Member of SIAM; London Mathematical Society; Edinburgh Mathematical Society.

Journal Reviews.

Regularly review papers for many leading international journals in mathematics, scientific computing and engineering.

Book Reviews.

Published book reviews in *SIAM Review*, *Mathematics of Computation* and *Mathematical Reviews*.

Conference Organisation

Conference chair of *24th Biennial Numerical Analysis Conference* held at Strathclyde University, Glasgow UK from 28th June-1st July 2011.

Organiser of *WIMCS/INI Workshop on Computational Challenges in PDEs* held at Swansea University, UK from 4-8th April 2011.

Conference chair of *23rd Biennial Numerical Analysis Conference* held at Strathclyde University, Glasgow UK from 23rd-25th January 2009.

Organiser of conference on *Mathematical Challenges in Scientific and Engineering Computation* held at Newton Institute, Cambridge UK from 20th-25th January 2003.

Joint organiser *London Mathematical Society Symposium on Computational Wave Propagation* at Durham University from 15th-25th July, 2002.

Joint organiser series of *EPSRC Numerical Analysis Summer Schools* at Leicester University held in 1994, 1996 and 1998.

Plenary Lectures at Major International Conferences

Plenary speaker *Quantum & Kinetic Problems: Modeling, Analysis, Numerics & Applications* held at National University of Singapore, Singapore, 18-22nd November 2019.

Plenary speaker *From Subdiffusion to the Wave Equation: Analysis, Models & Computation* held at University of Sussex, Brighton, United Kingdom, 26-28th September, 2019.

Plenary speaker *FEEC and High Order Methods* held at University of Oslo, Oslo, Norway, 4-6th June 2018.

Plenary speaker *30th Chemnitz Finite Element Symposium* held at St Wolfgang, Austria from 25-27th September 2017.

Plenary speaker *14th US National Congress on Computational Mechanics* held at Montreal, Canada from 17th-21st July 2017.

Plenary speaker at *Mathematics of Finite Elements and Applications MAFELAP 2017* held in London, UK from 13th-17th June 2016.

Plenary speaker *Congresso Nacional de Matemática Aplicada e Computacional (CNMAC2016)* held at Gramado, Brazil from 5th-9th September 2016.

Plenary speaker at *European Conference on Numerical Mathematics. ENUMATH 2015* held in Ankara, Turkey from 14th-18th September 2015.

Plenary speaker at *2014 AARMS-CRM Workshop on Adaptive Methods for PDEs* held in St. John's, NL, Canada from 17-22nd August 2014.

Plenary speaker at *Durham LMS Symposium on Connections and Challenges in Modern Approaches to PDEs* held at Durham University, UK from 7-16th July 2014.

Plenary speaker at *International Workshop on Finite Element and Spectral Methods* held at Shanghai Normal University, Shanghai, China from 16-18th May 2014.

Plenary speaker at *Adaptive Multiscale Methods for the Atmosphere and Ocean* held at Isaac Newton Institute, Cambridge UK from 22 - 24 August 2012.

Plenary speaker at *International Conference on Computational Science* held at Shanghai Normal University, Shanghai, China from 16-20 July 2012.

Plenary speaker at *High-Order Numerical Approximation for Partial Differential Equations* held at Hausdorff

Centre for Mathematics, Bonn from 6-10 February 2012.

Plenary speaker at *Discontinuous Galerkin Methods for Partial Differential Equations* held at Archimedes Centre, Heraklion, Crete from September 26-28, 2011.

Plenary speaker at *Modern Techniques in the Numerical Solution of Partial Differential Equations* held at Archimedes Centre, Heraklion, Crete from September 19-23, 2011.

Plenary speaker at *Numerical Solutions of Partial Differential Equations: Fast Solution Techniques* to be held at IMA Minnesota, USA from 29th November-3rd December 2010.

Plenary speaker at *Fundamentals of aerodynamic flow and combustion control by plasmas* held at Ecole de Physique des Houches, Mont Blanc, France from 11-15th October 2009.

Plenary speaker at *Adaptive Finite Elements: Analysis and Application* held in Kirchzarten, Germany from 7-11th September 2009.

Plenary speaker at *International Conference on Adaptive Modelling and Simulation (ADMOS)* held in Brussels, Belgium from 25th-27th May 2009.

Plenary speaker at *Third International Workshop on Analysis and Numerical Approximation of Singular Problems IWANASP2008* held in Lisbon, Portugal from 10th-12th September 2008.

Plenary Speaker and organiser of *International Workshop on High-Order Finite Element Methods*, held at Herrsching am Amerssee, Germany, 17th-19th May 2007.

Plenary speaker at *Theory of Highly Oscillatory Problems* held at Isaac Newton Institute for Mathematical Sciences, Cambridge, 26th-30th March, 2007.

Plenary speaker at *INdAM Workshop on Multiscale Problems: Modelling, Adaptive Discretization, Stabilization, Solvers* held in Cortona, Italy, 18th-22nd September 2006.

Plenary speaker at *Seventeenth International Conference on Domain Decomposition Methods (DDM XVII)* held in St. Wolfgang, Austria, 3rd-7th July 2006.

Plenary speaker at conference on *Mathematics of Finite Elements and Applications (MAFELAP 2006)* held at Brunel University, UK, 13th-16th June 2006.

Keynote speaker at *Second International Conference on Scientific Computing and PDEs and First East Asia SIAM Symposium*, held in Hong Kong, 12th-16th December 2005.

Keynote speaker at *International workshop on Direct and Inverse Field Computations in Mechanics*, held at Austrian Academy of Sciences, Linz, Austria, 7th-11th November 2005.

Keynote speaker at *International Conference on Finite Elements in Fluids*, held at University of Wales Swansea, 4th-6th April 2005.

Plenary speaker at *International Conference on High Order and Spectral Methods (ICOSAHOM)*, held at Brown University, Providence USA from 21st-24th June 2004.

Plenary speaker at *Superconvergence and A Posteriori Error Estimation* held in Changsha, China from 31st May-4th June 2004.

Plenary speaker at Institute of the Chinese Academy of Sciences conference on *Recent Advances in Adaptive Computation* held in Hangzhou City, China from 24th-28th May 2004.

Plenary speaker at First Chilean Workshop on Numerical Analysis of Partial Differential Equations (WONAPDE 2004) held in Concepcion, Chile from 13th-16th January 2004.

Plenary speaker at Conference on *Numerical Treatment of Differential and Differential Algebraic Equations (NUMDIFF 10)*, held in Halle, Germany from 8th-11th September 2003.

Plenary speaker at *Mathematical and Numerical Aspects of Wave Propagation (WAVES 2003)* held in Jyväskylä, Finland from 30th June-4th July 2003.

Plenary speaker at *Mathematics of Finite Elements and Applications (MAFELAP 2003)* held at Brunel University, UK, 21st-24th June 2003.

Plenary speaker at *Multiscale Modelling, Multiresolution and Adaptivity* held at Newton Institute, Cambridge UK from 7th-11th April 2003.

Plenary speaker at IMACS conference on *Adaptive Methods for PDEs* held at Fields Institute for Research in Mathematical Sciences, Toronto, Canada from 6th-9th August 2002.

Keynote review lecture at annual conference of *Association for Computational Mechanics and Engineering (ACME-02)* held in Swansea, Wales from 15th-17th April 2002.

Keynote speaker at *Second European Conference on Computational Mechanics (ECCM-2001)* held in Krakow, June 26-29, 2001.

Keynote speaker at *Numerical and Applied Mathematics* held at Mathematical Sciences Research Institute, Berkeley, 1st-28th April 2000.

Plenary speaker at *Dundee Biennial Conference on Numerical Analysis* held in Dundee, 29th June-2nd July 1999.

Plenary speaker at *Eleventh International Conference on Domain Decomposition Methods (DDM XI)* held in Greenwich, 20th-24th July 1998.

Keynote speaker at symposium on *Adaptive Methods for Partial Differential Equations* held in Salt Lake City, 22nd-24th June 1998.

Plenary speaker at *IMA Workshop on Mesh Generation and Adaptive Methods for PDEs* held in Minneapolis, 28th April-3rd May 1997.

Other Plenary and Invited Lectures (with financial support)

Plenary speaker *Finite Elements in Flow* held at University of Dortmund, Germany, 31 May 2021. (Meeting to mark the retirement of Rüdiger Verfurth).

Plenary speaker *DelMar Numerical Analysis Day* held at University of Delaware, Newark DE, 5 April 2018.

Plenary speaker *2nd International conference on Modern Mathematical Methods and High Performance Computing in Science & Technology (M3HPCST-2018)* held in Gaziabad, India on January 4-6, 2018.

Plenary speaker *YM60—Conference in honor of Yvon Maday* held in Roscoff, France from 2-5th May 2017.

Plenary Speaker *Advances in Computational Sciences and Engineering* University of Texas at Austin, 20-21st February 2017.

Plenary Speaker *Workshop on Future Directions in Fractional Calculus and Applications* Michigan State University, 17th-21st October 2016.

Speaker *High-Order Finite Element and Isogeometric Methods HOFEIM 2016*, 30th May-2nd June 2016, Jerusalem, Israel.

SCI Distinguished Lecturer, The Scientific Computing and Imaging Institute, University of Utah, 8th November 2013.

Keynote speaker at workshop *XXXIII Congresso Nacional de Matemática Aplicada e Computacional (CN-MAC2010)* held at Aguas de Lindóia, Sao Paulo, Brazil from 20th-23rd September 2010.

Keynote speaker at BICS Workshop on *The Future of Complexity Science* held at University of Bath, Bath from 15-16th September 2009.

Keynote speaker at *18th International Conference on Computer Methods in Mechanics (CMM2009)* held at University of Zielona Gora, Poland from 18th-21st May 2009.

Keynote speaker at *Workshop on A Posteriori Error Estimates for Adaptive Mesh Refinement and Error Control* held in Paris, 11th-14th October 2008.

Opening speaker at meeting on *Non-Standard Finite Element Methods*, Mathematisches Forschungs Institut Oberwolfach, 10-16th August, 2008.

Keynote speaker at *MIMS Workshop on New Directions in Analytical and Numerical Methods for Forward and Inverse Wave Scattering* held in Manchester, 23-34th June 2008.

Speaker at *WIMCS Workshop on Higher Order Methods* held in Swansea, Wales, 15th May 2008.

Plenary speaker at *Maxwell Symposium on Computational Mathematics* held at Maxwell Institute for Mathematical Sciences, Edinburgh. 22nd November 2007.

Speaker at meeting on *Adaptive Methods for Partial Differential Equations*, Mathematisches Forschungsinstitut Oberwolfach, 11-15th June, 2007.

Speaker at meeting on *Computational Electromagnetics and Acoustics*, Mathematisches Forschungsinstitut Oberwolfach, 5-9th February, 2007.

Speaker at *Workshop on Computation of Flow and Transport in Heterogeneous Media* held in Bath, 19th-20th June 2006.

Speaker at *International Conference on Programs and Algorithms of Numerical Mathematics XIII* held in Prague, 28th-31st May 2006.

Speaker at meeting on *Non-Standard and Mixed Finite Element Methods*, Mathematisches Forschungsinstitut Oberwolfach, 31st January- 5th February, 2005.

Invited speaker at *Scottish Computational Mathematics Symposium* held in Glasgow, 9th-10th September 2004.

Opening lecturer at meeting on *Adaptive Methods for PDEs*, Mathematisches Forschungsinstitut Oberwolfach, 22nd-26th March, 2004.

Keynote survey lecture at meeting on *Computational Electromagnetics*, Mathematisches Forschungsinstitut Oberwolfach, 23rd-27th February, 2004.

Recent Advances on Computational Continuum Mechanics held at Universität Dortmund from 14th-15th January 2002.

Conference on *Adaptive Finite Element Methods in Computational Mechanics* held in Hannover, 8th-12th March 2000.

Plenary speaker at *European workshop on Computational Mechanics* held in Barcelona, March 29-30, 2001.

Main speaker at *Workshop on Convection-Diffusion Problems* held at Albert-Ludwigs Universität Freiburg, 12th-14th November 1999.

Keynote speaker at *Scottish Computational Mathematics Symposium* held in Edinburgh, 15th September 1999.

Keynote speaker at conference on *High Order Finite Element Methods* held in Bonn, 16-18th March 1998.

Keynote speaker at conference on *Adaptive Finite Element Methods in Computational Mechanics* held in Stuttgart, 10th-11th March 1997.

Keynote speaker at conference on *Reliability of Modelling and Computation in Applied Mechanics* held in Hannover, 24th-26th November 1996.

Invited Short-Courses

Introduction to the Finite Element Method and Its Applications. Series of eight lectures presented at Institute of Advanced Studies at Nanyang Technological University, Singapore, 7th-28th November 2006.

hp-Finite Element Methods. Series of three lectures presented at Summer School held at Universität Karlsruhe, 20th-24th September 2004.

27th Dutch-Flemish Conference on Numerical Mathematics held at Woudschoten, Zeist, Netherlands from 25th-27th September 2002. Series of five lectures on *Adaptive Finite Element Methods*.

hp-Finite Element Methods for Incompressible Flow. Series of three lectures presented at DFG summer

school on *Effiziente Algorithmen-Adaptive Finite Element Methods* at Kloster Benediktbeuern, Munich, 9th-14th September 2001.

Multi-level and Domain Decomposition Methods in Numerical Analysis of PDEs. Short course presented at International Centre for Mathematical Sciences, Edinburgh, 9th May 2001.

Theoretical and Practical Aspects of hp-Finite Element Methods. Lecture series presented at Albert-Ludwigs Universität Freiburg, 10th-15th November 1997.

Grants Awarded

2016 ASCR CODAR: *Co-Design Center for Online Data Analysis and Reduction at Exascale* (Co-PI).

2015 ARO MURI: *Fractional PDEs for Conservation Laws and Beyond: Theory, Numerics and Applications* (Co-PI).

2015 ASCR SIRIUS: *Science Driven Data Management for Multi-tiered Storage* (Co-PI).

2013- UT Batelle *Joint Faculty Appointment* ORNL (PI).

2012 AFOSR *Methods for High-order Multi-Scale and Stochastic Problems: Analysis, Algorithms, and Applications* (Co-Investigator). 7/15/12-7/14/16.

2011 EPSRC EP/J007242/1 *Optimal Design of Drug Eluting Stents* (Co-PI). **£548,344**.

2009 EPSRC EP/G036136/1 *Numerical Algorithms and Intelligent Software for the Evolving HPC Platform* (Principal Investigator at Strathclyde). **£4,550,814** plus additional contribution of **£290,000** from Scottish Funding Council. This is a collaborative award with Universities of Edinburgh, Heriot-Watt, and Edinburgh Parallel Computer Centre (UK's national supercomputer HeCTOR).

2008 EPSRC/Strathclyde RAIS Award *Assessing and Quantifying the Accuracy of FEA of Thin-Walled Structures* (Principal Investigator). **£25,000** plus contribution of **£5,000** from industrial partner, Ideas Ltd, Glasgow.

2007 EPSRC EP/E040993/1 *Adaptive Numerical Methods for Optoelectronic Devices*. (Principal Investigator). **£422,285**.

2007 Hewlett-Packard Laboratories, UK. *Adaptive Numerical Methods for Optoelectronic Devices*. (Principal Investigator) **£70,076**.

2005 Royal Society of Edinburgh/Scottish Executive Research Fellowship. (Principal Investigator). Provides funds for appointment of lecturer to release recipient from all academic duties for one year.

2003 EPSRC GR/S10153/01 *Multiscale Modelling and Numerical Analysis of Masonry*. (Principal Investigator). **£190,000**.

2003 Leverhulme Trust Fellowship *Robust Algorithms in Computational PDEs*. (Principal Investigator). **£16,161**.

2003 EPSRC GR/S01276/01 *Computational Challenges in Partial Differential Equations*. (Principal Investigator). **£10,250**.

2002 EPSRC GR/R40173/01 *Computational Methods for Wave Propagation in Direct Scattering: An LMS Durham Research Symposium*. (Co-investigator). **£51,068**.

2000 EPSRC Visiting Fellowship GR/N21970 - Dr W. McLean *Multilevel preconditioners for boundary element methods on adaptively refined meshes*. (Principal Investigator). **£1,625**.

1999 EPSRC Visiting Fellowship GR/M55961 - Dr W. Dörfler *Numerical analysis of convection diffusion problems*. (Principal Investigator). **£3,350**.

1999 EPSRC GR/M59426 *Computational Simulation of Electromagnetic Scattering*. (Principal Investigator). **£78,000** plus additional funds of **£96,863** to Prof. K. Morgan (Swansea University).

1998 EPSRC Visiting Fellowship GR/M09155 - Professor Benqi Guo *Domain decomposition methods for boundary element methods in three dimensions*. (Principal Investigator). **£3,800**.

1997 Australian Research Council **A\$311,914** *Post-processing and a posteriori error bounds for finite element analysis*. (Associate Investigator. PIs were Prof. Kelly and Sloan, UNSW).

1997 EPSRC GR/L90507 *Adaptive Methods for Singularly Perturbed Elliptic Systems*. (Principal Investigator). **£73,550**.

Numerical Analysis Summer Schools. (1994 Supported by EPSRC grant of **£21,892**; 1996 Supported by EPSRC grant of **£22,294**; and 1998 Supported by EPSRC under grant GR/M05034 of **£23,995**).

Numerous travel grants etc. from Royal Society, Glasgow Mathematical Journal, Edinburgh Mathematical Society, London Mathematica Society, etc.

Graduate Students Supervised

David Alan Kay (PhD, 1997). *The p- and hp- Finite Element Method Applied to a Class of Non-Linear Elliptic PDEs*. Supported EPSRC Research Studentship. David now holds a lectureship at Oxford University.

William Carl Senior (PhD, 1998). *Parallel Data Structures and Implementation of h-p Finite Element Algorithms*. Supported by EPSRC Research Studentship. Bill is now based in the Netherlands where he heads a computational reservoir simulation team at Shell.

Mark Edward Arnold (PhD, 1999). *A Posteriori Error Estimation and Hierarchical Modelling*. Supported by EPSRC Earmarked Studentship. Mark went on to model spread of foot and mouth disease for the Veterinary Laboratories Agency, UK.

Patrick William Coggins (PhD, 2000). *Adaptive Finite Element Methods for Stokes and Oseen Equations*. Supported by EPSRC Earmarked Studentship. Pat went on to develop software and climate models at the UK Meteorological Office.

David James Blacker (PhD, 2002). *Robust Non-conforming Finite Element Methods for Nearly Incompressible Elasticity*. Supported by EPSRC Studentship. David went on to model gas networks for Transco UK.

Richard Rankin (PhD 2008). *Fully computable a posteriori error bounds for non-conforming and discontinuous Galerkin finite element approximations*. Supported by EPSRC Studentship. Richard went on to work at Rice University.

Hafiz Abdul Wajid (PhD, 2009) *Analysis and Application of High Order Reduced Integration Schemes for Wave Propagation*. Supported by scholarship from COMSATS Institute of Technology, Pakistan. Hafiz is now an Associate Professor at COMSATS.

Alejandro Allendes (PhD, 2012) *A posteriori error estimation and adaptivity for Stokes and Navier-Stokes equations*. Supported by Faculty scholarship and Chilean Government. Alejandro now has a position at Universidad Tecnica Federico Santa Maria, Chile.

Gaelle Andriamaro (PhD, 2013) *Bernstein-Bezier methods for finite element approximation*. Supported by ORSAS and Faculty scholarship Gaelle is a researcher at Vector Fields, Cobham UK.

Omer Riaz (PhD, 2014) *Algorithmic skeletons and auto-tuning of finite elements for high performance computing*.

Hongrui Wang (PhD, 2016) *Error and Stability Analysis for High Order B-Spline Finite Element Methods*

Christian Glusa (PhD, 2017) *Multigrid and domain decomposition methods in fault-prone environments* Christian is now with Sandia National Laboratories.

Ben Whitney (PhD, 2018) *Compression of Large-Scale Scientific Data: Algorithms and Analysis*

Shuai Jiang (PhD, 2020) *Efficient Preconditioning of High Order Finite Element Approximations and Applications*

Charles Parker (PhD, 2022) *High Order C^1 -Conforming Finite Element Approximation*

Justin Dong (Current) *Approximation of Variational PDEs by Neural Networks*

Mingyu Wang (Current) *Preconditioning High Order FEM Approximation*

Visiting Positions

2012 *Research Fellow* Isaac Newton Institute for Mathematical Sciences, Cambridge UK for duration of programme on *Multiscale Numerics for the Atmosphere and Ocean* (22 August - 21 December 2012).

1990 *Research Fellow* Texas Institute for Computational Mechanics, The University of Texas at Austin.

1991-1992 *Lecturer*. Mathematics Department, The University of Texas at Austin.

1991 *Research Engineer*. COMCO, Austin, Texas.

Monographs

- [1] M. AINSWORTH AND J. ODEN, *A posteriori error estimation in finite element analysis*, Pure and Applied Mathematics, Wiley-Interscience, John Wiley & Sons, New York, 2000.

Publications in Refereed Journals

- [1] M. AINSWORTH, *The performance of Bank-Weiser's error estimator for quadrilateral finite elements*, *Numer. Meth. PDE.*, 10 (1994), pp. 609–623.
- [2] ———, *Hierarchical domain decomposition preconditioner for h-p finite element approximation on locally refined meshes*, *SIAM J. Sci. Comp.*, 17 (1996), pp. 1395–1413.
- [3] ———, *The influence and selection of subspaces for a posteriori error estimators*, *Numer. Math.*, 73 (1996), pp. 399–418.
- [4] ———, *A preconditioner based on domain decomposition for h-p finite element approximation on quasi-uniform meshes*, *SIAM J. Numer. Anal.*, 33 (1996), pp. 1358–1376.
- [5] ———, *A posteriori error estimators for fully discrete hierarchical modelling on thin domains.*, *Numer. Math.*, 80 (1998), pp. 325–362.
- [6] ———, *Identification and a posteriori estimation of pollution errors in finite element analysis*, *Comput. Methods Appl. Mech. Engrg.*, 176 (1999), pp. 3–17.
- [7] ———, *Essential boundary conditions and multi-point constraints in finite element analysis*, *Comput. Methods Appl. Mech. Engrg.*, 190 (2001), pp. 6323–6339.
- [8] ———, *Discrete dispersion relation for hp-version finite element approximation at high wave number*, *SIAM J. Numer. Anal.*, 42 (2004), pp. 553–575.
- [9] ———, *Dispersive and dissipative behaviour of high order discontinuous Galerkin finite element methods*, *J. Comput. Phys.*, 198 (2004), pp. 106–130.
- [10] ———, *Dispersive properties of high order Nédélec/edge element approximation of the time-harmonic Maxwell equations*, *Phil. Trans. Roy. Soc. Series A*, 362 (2004), pp. 471–491.
- [11] ———, *A posteriori error estimation for non-conforming quadrilateral finite elements*, *Int. J. Numer. Anal. Model.*, 2 (2005), pp. 1–18.
- [12] ———, *Robust a posteriori error estimation for nonconforming finite element approximation*, *SIAM J. Numer. Anal.*, 42 (2005), pp. 2320–2341 (electronic).
- [13] ———, *A synthesis of a posteriori error estimation techniques for conforming, non-conforming and discontinuous Galerkin finite element methods*, *Contemp. Math.*, 383 (2005), pp. 1–14.
- [14] ———, *“A posteriori error estimation for non-conforming quadrilateral finite elements”* [*Int. J. Numer. Anal. Model.* 2 (2005), no. 1, 1–18; *mr2112654*], *Int. J. Numer. Anal. Model.*, 4 (2007), pp. 141–142.
- [15] ———, *A posteriori error estimation for a discontinuous Galerkin finite element method*, *SIAM J. Numer. Anal.*, 45 (2007), pp. 1777–1798.
- [16] ———, *A posteriori error estimation for lowest order Raviart-Thomas mixed finite elements*, *SIAM J. Sci. Comp.*, 30 (2007/08), pp. 189–204.
- [17] ———, *A framework for obtaining guaranteed error bounds for finite element approximations*, *J. Comput. Appl. Math.*, 234 (2010), pp. 2618 – 2632.

- [18] ———, *Dispersive behaviour of high order finite element schemes for the one-way wave equation*, *J. Comput. Phys.*, 259 (2014), pp. 1–10.
- [19] ———, *Pyramid algorithms for Bernstein-Bézier finite elements of high, nonuniform order in any dimension*, *SIAM J. Sci. Comp.*, 36 (2014), pp. A543–A569.
- [20] M. AINSWORTH, A. ALLENDES, G. R. BARRENECHEA, AND R. RANKIN, *Computable error bounds for nonconforming Fortin-Soulie finite element approximation of the Stokes problem*, *IMA J. Numer. Anal.*, 32 (2012), pp. 417–447.
- [21] ———, *Fully computable a posteriori error bounds for stabilised fem approximations of convection reaction diffusion problems in three dimensions*, *Internat. J. Numer. Methods Fluids*, 73 (2013), pp. 765–790.
- [22] ———, *On the adaptive selection of the parameter in stabilized finite element approximations*, *SIAM J. Numer. Anal.*, 51 (2013), pp. 1585–1609.
- [23] M. AINSWORTH, G. ANDRIAMARO, AND O. DAVYDOV, *Bernstein-Bézier FEM and optimal assembly algorithms*, *SIAM J. Sci. Comp.*, (2011), pp. 3087–3109.
- [24] ———, *A bernstein-bezier basis for arbitrary order raviart-thomas finite elements*, *Constructive Approximation*, (2014), pp. 1–22.
- [25] M. AINSWORTH AND M. ARNOLD, *Construction and analysis of optimal hierarchic models of boundary value problems on thin circular and spherical geometries*, *SIAM J. Sci. Comp.*, 22 (2000), pp. 673–703.
- [26] ———, *Computable error bounds for some simple dimensionally reduced models on thin domains*, *IMA J. Numer. Anal.*, 21 (2001), pp. 81–105.
- [27] M. AINSWORTH AND I. BABUŠKA, *Reliable and robust a posteriori error estimation for singularly perturbed reaction diffusion problems*, *SIAM J. Numer. Anal.*, 36 (1999), pp. 331–353.
- [28] M. AINSWORTH, G. R. BARRENECHEA, AND A. WACHTEL, *Stabilization of high aspect ratio mixed finite elements for incompressible flow*, *SIAM J. Numer. Anal.*, 53 (2015), pp. 1107–1120.
- [29] M. AINSWORTH AND P. COGGINS, *The stability of mixed hp-finite element methods for Stokes flow on high aspect ratio elements*, *SIAM J. Numer. Anal.*, 38 (2000), pp. 1721–1761.
- [30] ———, *A uniformly stable family of mixed hp-finite elements with continuous pressures for incompressible flow*, *IMA J. Numer. Anal.*, 22 (2002), pp. 307–327.
- [31] M. AINSWORTH AND J. COYLE, *Hierarchic hp-edge element families for Maxwell’s equations on hybrid quadrilateral/triangular meshes*, *Comput. Methods Appl. Mech. Engrg.*, 190 (2001), pp. 6709–6733.
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