

# Curriculum Vitae

Andrea Moiola

31st August 2022

## 1 Personal data

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Current position     Associate professor  
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### Scientific IDs:

MathSciNet           931770  
ORCID ID             0000-0002-6251-4440  
ResearcherID        K-6182-2015 (Web of Science/Publons)  
Scopus Author ID    37049069900  
Google Scholar      <https://scholar.google.com/citations?user=jZXS1W0AAAAJ>

## 2 Employment

- Since July 2020 I am associate professor in numerical analysis at the Department of Mathematics “F. Casorati” of the University of Pavia, Italy. I have obtained the national habilitation in numerical analysis (01/A5) as associate professor (PA, valid 28.3.2017–28.3.2026) and as professor (PO, valid 9.11.2020–9.11.2029).
- From July 2017 to June 2020 I was a “*ricercatore a tempo determinato di tipo B*” (RTDB, equivalent to lecturer/assistant professor) at the Department of Mathematics “F. Casorati” of the University of Pavia.
- From March 2013 to June 2017 I was “senior research fellow” at the Department of Mathematics and Statistics of the University of Reading, UK (permanent position equivalent to lecturer).
- From March 2012 to February 2013, I held a postdoctoral position at the Department of Mathematics and Statistics of the University of Reading under a “Fellowship for prospective researchers” on “Computational wave propagation”, funded by the Swiss National Science Foundation (SNSF).<sup>1</sup> During the fellowship I was supervised by Prof. S.N. Chandler-Wilde.
- From September 2008 to November 2011, I was scientific assistant at the Seminar for Applied Mathematics (SAM) of the ETH Zürich, Switzerland. Funded to carry out research on the project “Plane Wave Discontinuous Galerkin” towards a PhD and to carry out teaching duties for undergraduate students.

## 3 Education

- PhD at ETH Zürich – SAM, Seminar for applied mathematics, 2008–2011
  - Thesis           Trefftz-discontinuous Galerkin methods for time-harmonic wave problems
  - Supervisor      Prof. R. Hiptmair
  - Co-supervisor   Prof. I. Perugia
  - Viva             15 September 2011
  - Funding         Swiss National Science Foundation
- Master Degree in Mathematics, University of Pavia (*Laurea specialistica*), 2006–2008, Cinquini–Cibrario prize.
- Bachelor Degree in Mathematics, University of Pavia (*Laurea triennale*), 2003–2006.
- Alumnus of [Collegio Ghislieri](#), Pavia, 2003–2008.
- Alumnus of the *Institute for Advanced Study* in Pavia ([IUSS](#)), undergraduate internal courses, 2003–2008.

<sup>1</sup>SNSF webpage: <http://p3.snf.ch/Project-137294>

## 4 Scientific talks

### Invited talks at conferences and workshops

- “Scattering and propagation of waves: theoretical and computational challenges”, Reading, 27–29 June 2022.
- “Solvers for frequency-domain wave problems and applications”, Glasgow, 20–24 June 2022.
- “Calcolo scientifico e modelli matematici: alla ricerca delle cose nascoste attraverso le cose manifeste”, Roma, 6–8 April 2022.
- “Scattering by random heterogeneous media” workshop, Augsburg, 13–15 September, 2021.
- “Interplay of multiscale data assimilation and data science with advanced PDE discretizations”, ESI Vienna, 25–29 June, 2018. Part of the ESI programme “Numerical Analysis of Complex PDE Models in the Sciences”.
- Oberwolfach workshop on “Space-time Methods for Time-dependent PDEs”, 12–18 March 2017.
- “Space-Time Methods for PDEs”, RICAM Linz, Austria, 7–11 November 2016.
- LMS–EPSRC Symposium, “Mathematical and Computational Aspects of Maxwell’s Equations”, Durham, 11–21 July 2016.
- “Computational and Numerical Analysis of Transient Problems in Acoustics, Elasticity, and Electromagnetism”, BIRS, Banff, Canada, 17–22 January 2016.
- LMS–EPSRC Symposium, “Building bridges: connections and challenges in modern approaches to numerical PDEs”, Durham, 8–16 July 2014.
- “British Computational PDEs Colloquium: New Trends”, ICMS, Edinburgh, 23–24 January 2014.
- Oberwolfach workshop on “Computational electromagnetism and acoustics”, 20–26 January 2013.
- Workshop on: “Non-Standard Numerical Methods for PDE’s”, Pavia, Italy, 29 June–2 July 2010.
- Oberwolfach workshop on “Computational electromagnetism and acoustics”, 14–20 February 2010.

### Invited contributions to minisymposia at conferences

- XXI UMI conference (“Unione Matematica Italiana”), Pavia, 2–7 September 2019.
- ICIAM 2019, Valencia, 15–19 July 2019.
- MAFELAP 2019, Brunel, 17–21 June 2019.
- WONAPDE 2019, Concepción, Chile, 21–25 January, 2019 (two minisymposia).
- “Inverse Problems: Modeling and Simulation” conference, Malta, 21–25 May 2018.
- Equadiff, Bratislava, 24–28 July 2017.
- International Conf. on Domain Decomposition Methods, DD XXIV, Svalbard, Norway, 6–10 February 2017.
- MAFELAP 2016, Brunel university, UK, 14–17 June 2016.
- XXIV CEDYA / XIV CMA conference, Cadiz, Spain, 8–12 June 2015.
- MAFELAP 2013, Brunel university, UK, 10–14 June 2013.
- 3rd European Seminar on Computing (ESCO2012), Pilsen, Czech Republic, 25–29 June 2012.
- DSPDEs’10, Barcelona, 31 May–4 June, 2010.
- WONAPDE 2010, Concepción, Chile, 11–15 January, 2010.
- MAFELAP 2009, Brunel university, UK, 9–12 June, 2009.

### Invited research seminars

- PDE afternoon, University of Vienna, 11 May 2022.
- CIDMA, University of Aveiro, Portugal, 17 March 2022.
- [One World Numerical Analysis](#), online, 21 February 2022.
- Department of Mathematics, Sapienza University, Roma, 14 May 2019.
- Oldenburg, 15 November 2018.
- Bologna, 20 June 2018.
- SBAI, Sapienza University, Roma, 21 March 2018.
- SAM, ETH Zürich, 2 November 2016.
- Hamburg University of Technology, 23 June 2016.
- Laboratoire Poems, ENSTA-INRIA-CNRS, Palaiseau, 18 November 2015.

- Durham, 29 April 2015.
- Bath, 20 February 2015.
- Oxford, 15 May 2014.
- University of Vienna, 24 March 2014.
- Collège de France, Paris, 17 May 2013.
- Leicester, 18 October 2012.
- Strathclyde, 17 April 2012.
- Bath, 23 March 2012.
- Reading, 12 March 2012.
- Chinese University of Hong Kong, 9 September 2009.

#### Contributed talks at conferences

- “Waves 2022”, Paris, 25–29 July 2022.
- “Mathematics of wave phenomena”, online/Karlsruhe, 14-18 February 2022.
- GNCS meeting, Montecatini, 11-13 February 2020.
- “Waves 2019”, Vienna, 25–30 August 2019.
- “New directions in numerical computation”, Oxford, 25–28 August 2015.
- “Waves 2015”, Karlsruhe, 20–24 July 2015.
- “Boundary & finite element methods for high frequency scattering problems”, Reading, 15–16 Dec. 2014.
- “Waves 2013”, Gammarth, Tunisia, 3–7 June 2013.
- “InnoWave”, Nottingham, 3–7 September 2012.
- Finite Element Fair/Rodeo/Circus, Paris, 3–4 June 2011.
- “Highly Oscillatory Problems: From Theory to Applications”, Cambridge, 12–17 September 2010.
- Swiss Numerics Colloquium, Basel, 24 April 2009.

#### Other talks at research seminars

- IMATI-CNR, Pavia, 12 April 2019.
- PDE seminar, Reading, 18 October 2016.
- Numerical analysis research afternoon, Reading, 30 October 2013.
- Brain Embodiment Lab, Reading, 25 September 2013.
- Waves group meeting, Reading, 26 March 2013.
- Reading departmental analysis day, 19 October 2012.
- Pro\*Doc summer retreat, Disentis, 18–21 August 2010.

#### Poster presentations

- “Wave Propagation and Scattering, Inverse Problems and Applications in Energy and the Environment”, RICAM Linz, Austria, 21–25 November 2011.

## 5 Grants and invitations

### Grants

- INdAM–GNCS research project 2019, “*Metodi numerici non-standard per PDEs: efficienza, robustezza e affidabilità*”, 6 100€, PI.<sup>2</sup>
- ANVUR “*Finanziamento delle attività base di ricerca*” (FFABR), 2017, 3 000€.<sup>3</sup>
- EPSRC (British Engineering and Physical Sciences Research Council) First Grant EP/N019407/1 on “*Discretisations of sign-definite formulations for the Helmholtz equation*”, 2016–2018, £ 100 000. Ranked first in November 2015 EPSRC Mathematics Prioritisation Panel Meeting<sup>4</sup>. (The grant was transferred to S.N. Chandler-Wilde when I left UK.)

<sup>2</sup><https://www.altamatematica.it/gnsc/archivi/storico-progetti-di-ricerca>

<sup>3</sup>[http://www.anvur.org/index.php?option=com\\_content&view=article&id=1204](http://www.anvur.org/index.php?option=com_content&view=article&id=1204)

<sup>4</sup><https://gtr.ukri.org/projects?ref=EP/N019407/1#/>

- London Mathematical Society Conference Grant–Scheme 1, to organise a workshop on “Recent advances in discontinuous Galerkin methods” at Reading, 2016, with T. Pryer (£ 1 300).
- London Mathematical Society Conference Grant–Scheme 1, to organise a workshop on “Recent advances in discontinuous Galerkin methods” at Reading, 2014, with A. Chernov and T. Pryer (£ 1 800).
- International personal research fellowship “Fellowship for prospective researchers” at the Department of Mathematics and Statistics of the University of Reading, March 2012–February 2013. Funded by the Swiss National Science Foundation (42 000 Swiss francs).
- Exchange Ph.D. student at the Chinese University of Hong Kong under the “Global Scholarship Programme for Research Excellence—CNOOC Grants”, September–October 2009 (HK\$ 15 000, ~€ 1 470).
- Several small travel grants to attend conferences (WONAPDE 2010 in Concepción, DSPDEs in Barcelona, ESF conference in Cambridge, two OWLG grants for workshops in Oberwolfach, CIME in Cetraro, UoR “Research Travel Grant” for CEDYA in Cadiz, IMA small grant for workshop in Banff).

### Participation in other projects and grants

- GNCS research project 2022, “*Metodi numerici efficienti e innovati per la risoluzione di PDE*”. PI: M. Tani.
- GNCS research project 2020, “*Aspetti teorici e numerici di tecniche innovative per la risoluzione efficiente di PDE*”. PI: L. Tamellini.
- PRIN 2017 (201752HKH8) [NA-FROM-PDEs](#), “Numerical analysis for full and reduced order methods for the efficient and accurate solution of complex systems governed by partial differential equations”. PI: G. Rozza. 2019–2022.
- Visiting Researcher on the EPSRC grant [EP/S01375X/1](#), “Integral equations on fractal domains: analysis and computation”, August 2019–July 2021. PI: D.P. Hewett (UCL).
- GNCS research project 2018, “*Metodi non conformi per equazioni alle derivate parziali*”. PI: A. Veenser.
- SNSF ProDoc grant [124883](#), “Plane wave discontinuous Galerkin methods”, 2009–2011. PI: R. Hiptmair.

### Invited research visits and scientific programmes

- Erwin Schrödinger Institute (ESI) thematic programme, Vienna, 25 June–20 July 2018.
- Laboratório Nacional de Computação Científica, Petropolis (Brazil), 23–27 Jan. 2012.
- Pontificia Universidad Católica de Chile, Santiago, 4–8 February 2019.
- SAM, ETH Zürich, 1–4 November 2016, 29 May–1 June 2018, 24–29 June 2019.
- Sapienza University, Roma, 13–16 May 2019.
- University College of London, 11–13 April 2011, 13–17 June 2022.
- University of Bath, 7–11 January 2019.
- University of Reading, 8–10 September 2010, 5–8 April 2011, 23–27 April and 4–8 June 2018.
- University of Vienna, 24–28 March and 23–27 June 2014, 7–16 April 2016, 9–13 May 2022.

## 6 Publications

### Refereed journal papers

- [1] R. Hiptmair, A. Moiola, E.A. Spence, *Spurious quasi-resonances in boundary integral equations for the Helmholtz transmission problem*, [SIAM J. Appl. Math.](#), 82(4), 2022, pp. 1446–1469. DOI: 10.1137/21M1447052.
- [2] S. Gómez, A. Moiola, *A space–time Trefftz discontinuous Galerkin method for the linear Schrödinger equation*, [SIAM J. Numer. Anal.](#), 60(2), 2022, pp. 688–714. DOI: 10.1137/21M1426079.
- [3] A. Caetano, D.P. Hewett, A. Moiola, *Density results for Sobolev, Besov and Triebel–Lizorkin spaces on rough sets*, [J. Funct. Anal.](#), 281(3), 2021, 109019. DOI: 10.1016/j.jfa.2021.109019.
- [4] S.N. Chandler-Wilde, D.P. Hewett, A. Moiola, J. Besson, *Boundary element methods for acoustic scattering by fractal screens*, [Numerische Mathematik](#), 147, 2021, pp. 785–837. DOI: 10.1007/s00211-021-01182-y.
- [5] P. Bansal, A. Moiola, I. Perugia, Ch. Schwab, *Space–time discontinuous Galerkin approximation of acoustic waves with point singularities*, [IMA J. Numer. Anal.](#), 41(3), 2021, pp. 2056–2109. DOI: 10.1093/imanum/draa088.

- [6] A. Gibbs, S.N. Chandler-Wilde, S. Langdon, A. Moiola, *A high frequency boundary element method for scattering by a class of multiple obstacles*, *IMA J. Numer. Anal.*, 41(2), 2021, pp. 1197–1225.  
DOI: 10.1093/imanum/draa025.
- [7] K. McCusker, C.D. Westbrook, A. Moiola, *Analysis of the internal electric fields of pristine ice crystals and aggregate snowflakes, and their effect on scattering*, *J. Quant. Spectrosc. Radiat. Transf. (JQSRT)*, 230, June 2019, pp. 155–171.  
DOI: 10.1016/j.jqsrt.2019.04.019.
- [8] A. Moiola, E.A. Spence, *Acoustic transmission problems: wavenumber-explicit bounds and resonance-free regions*, *Math. Models Methods Appl. Sci. (M3AS)*, 29(02) 2019, pp. 317–354. DOI: 10.1142/S0218202519500106.
- [9] G.C. Diwan, A. Moiola, E.A. Spence, *Can coercive formulations lead to fast and accurate solution of the Helmholtz equation?*, *J. Comput. Appl. Math.*, 352, 2019, pp. 110–131. DOI: 10.1016/j.cam.2018.11.035.
- [10] A. Moiola, I. Perugia, *A space–time Trefftz discontinuous Galerkin method for the acoustic wave equation in first-order formulation*, *Numerische Mathematik*, 138(2) 2018, pp. 389–435. DOI:10.1007/s00211-017-0910-x.
- [11] D.P. Hewett, A. Moiola, *A note on properties of the restriction operator on Sobolev spaces*, *Journal of Applied Analysis*, 23(1) 2017, pp. 1–8. DOI:10.1515/jaa-2017-0001.
- [12] S.N. Chandler-Wilde, D.P. Hewett, A. Moiola, *Sobolev spaces on non-Lipschitz subsets of  $\mathbb{R}^n$  with application to boundary integral equations on fractal screens*, *Integr. Equat. Oper. Th.*, 87(2) 2017, pp. 179–224.  
DOI:10.1007/s00020-017-2342-5.
- [13] D.P. Hewett, A. Moiola, *On the maximal Sobolev regularity of distributions supported by subsets of Euclidean space*, *Analysis and Applications*, 15(5) 2017, pp. 731–770. DOI:10.1142/S021953051650024X.
- [14] F. Kretschmar, A. Moiola, I. Perugia, S.M. Schnepp, *A priori error analysis of space-time Trefftz discontinuous Galerkin methods for wave problems*, *IMA J. Numer. Anal.*, 36(4) 2016, pp. 1599–1635.  
DOI:10.1093/imanum/drv064.
- [15] R. Hiptmair, A. Moiola, I. Perugia, *Plane wave discontinuous Galerkin methods: exponential convergence of the hp-version*, *Found. Comput. Math.*, 16(3) 2015, pp. 637–675. DOI:10.1007/s10208-015-9260-1.
- [16] S.N. Chandler-Wilde, D.P. Hewett, A. Moiola, *Interpolation of Hilbert and Sobolev spaces: Quantitative estimates and counterexamples*, *Mathematika*, 61(2) 2015, pp. 414–443. DOI:10.1112/S0025579314000278.
- [17] A. Moiola, E.A. Spence, *Is the Helmholtz equation really sign-indefinite?*, *SIAM Review*, 56(2) 2014, pp. 274–312. DOI:10.1137/120901301.
- [18] C.J. Howarth, P.N. Childs, A. Moiola, *Implementation of an interior point source in the ultra weak variational formulation through source extraction*, *J. Comput. Appl. Math.*, 27 2014, pp. 295–306.  
DOI:10.1016/j.cam.2014.04.017.
- [19] R. Hiptmair, A. Moiola, I. Perugia, Ch. Schwab, *Approximation by harmonic polynomials in star-shaped domains and exponential convergence of Trefftz hp-dGFEM*, *ESAIM: Math. Model. Numer. Anal. (M2AN)*, 48(3) 2014, pp. 727–752. DOI:10.1051/m2an/2013137.
- [20] R. Hiptmair, A. Moiola, I. Perugia, *Trefftz discontinuous Galerkin methods for acoustic scattering on locally refined meshes*, *Appl. Numer. Math.*, 79 2014, pp. 79–91. DOI:10.1016/j.apnum.2012.12.004
- [21] A. Moiola, *Plane wave approximation in linear elasticity*, *Applicable Analysis*, 92(6) 2013, pp. 1299–1307.  
DOI:10.1080/00036811.2012.671300.
- [22] R. Hiptmair, A. Moiola, I. Perugia, *Error analysis of Trefftz-discontinuous Galerkin methods for the time-harmonic Maxwell equations*, *Math. Comput.*, 82(281) 2013, pp. 247–268. DOI:10.1090/S0025-5718-2012-02627-5.
- [23] R. Hiptmair, A. Moiola, I. Perugia, *Stability results for the time-harmonic Maxwell equations with impedance boundary conditions*, *Math. Models Methods Appl. Sci. (M3AS)*, 21(11) 2011, pp. 2263–2287.  
DOI:10.1142/S021820251100574X.
- [24] A. Moiola, R. Hiptmair, I. Perugia, *Plane waves approximation of homogeneous Helmholtz solutions*, *Z. Angew. Math. Phys.*, 62(5) 2011, pp. 809–837. DOI:10.1007/s00033-011-0147-y.
- [25] A. Moiola, R. Hiptmair, I. Perugia, *Vekua theory for the Helmholtz operator*, *Z. Angew. Math. Phys.*, 62(5) 2011, pp. 779–807. DOI:10.1007/s00033-011-0142-3.
- [26] R. Hiptmair, A. Moiola, I. Perugia, *Plane wave discontinuous Galerkin methods for the 2D Helmholtz equation: analysis of the p-version*, *SIAM J. Numer. Anal.*, 49(1) 2011, pp. 264–284. DOI:10.1137/090761057.



**Refereed book chapters**

- [27] R. Hiptmair, A. Moiola, I. Perugia, *A survey of Trefftz methods for the Helmholtz equation*. In: G.R. Barrenechea, F. Brezzi, A. Cangiani, E.H. Georgoulis (editors), “Building Bridges: Connections and Challenges in Modern Approaches to Numerical Partial Differential Equations”, [Springer Lect. Notes Comput. Sci. Eng.](#), 2016, pp. 237–278. DOI:10.1007/978-3-319-41640-3\_8.

**Reports and preprints**

- [28] E. Parolin, D. Huybrechs, A. Moiola *Stable approximation of Helmholtz solutions by evanescent plane waves*, [arXiv:2202.05658](#), 2022 (submitted).
- [29] A. Gibbs, D.P. Hewett, A. Moiola, *Numerical quadrature for singular integrals on fractals*, [arXiv:2112.11793](#), 2021 (to appear on Numer. Algorithms).
- [30] L.M. Imbert-Gérard, A. Moiola, P. Stocker, *A space-time quasi-Trefftz DG method for the wave equation with piecewise-smooth coefficients*, [arXiv:2011.04617](#), 2020 (to appear on Math. Comput.).
- [31] A. Gibbs, S. Langdon, A. Moiola, *Numerically stable computation of embedding formulae for scattering by polygons*, [arXiv:1805.08988](#), 2018.
- [32] A. Moiola, *Approximation properties of plane wave spaces and application to the analysis of the plane wave discontinuous Galerkin method*; [SAM report 2009-06](#), ETH Zürich.

**Conference proceedings**

- [33] Proceedings of [Waves 2022](#), ENSTA Paris:
- E. Parolin, D. Huybrechs, A. Moiola, *Stable approximation of Helmholtz solutions with evanescent plane waves*, pp. 98–99.
  - A.M. Caetano, S.N. Chandler-Wilde, A. Gibbs, D.P. Hewett, A. Moiola, *A Hausdorff-measure boundary element method for scattering by fractal screens I: Numerical analysis*, pp. 100–101.
  - A. Gibbs, D. Hewett, A. Moiola, *A Hausdorff-measure boundary element method for scattering by fractal screens II: Numerical quadrature*, pp. 102–103.
  - S. Gómez, A. Moiola, *A space-time Trefftz discontinuous Galerkin method for the linear Schrödinger equation*, pp. 172–173.
  - L.-M. Imbert-Gérard, A. Moiola, P. Stocker, *A space-time quasi-Trefftz DG method for the wave equation with smooth coefficients*, pp. 202–203.
  - P. Bignardi, A. Moiola, *A space-time continuous and coercive variational formulation for the wave equation*, pp. 220–221.
  - S. Fraschini, A. Moiola, G. Sangalli, *Stability of space-time isogeometric methods for wave propagation problems*, pp. 286–287.
- [34] N. Wulbusch, R. Roden, A. Chernov, M. Blau, A. Moiola, *On the impact of the shape of the artificial boundary in exterior Helmholtz problems*, proceedings of [23rd International Congress on Acoustics \(ICA\)](#), Aachen, pp. 7504–7511.
- [35] Proceedings of [Waves 2019](#), Vienna: DOI:10.34726/waves2019
- S.N. Chandler-Wilde, D.P. Hewett, A. Moiola, *Boundary element methods for scattering by fractal screens*, pp. 78–79.
  - P. Bansal, A. Moiola, I. Perugia, C. Schwab, *Space-time discontinuous Galerkin method for the wave equation in polygonal domains*, pp. 296–297.
- [36] A. Gibbs, S. Langdon, A. Moiola, *Stable implementation of embedding formulae for computation of far field patterns*, proceedings of [Waves 2017](#), Minneapolis, USA, pp. 157–158.
- [37] A. Moiola, *Space-time Trefftz discontinuous Galerkin methods for wave problems*; in Mathematisches Forschungsinstitut Oberwolfach Report 15/2017, 2017, pp. 913–915. DOI:10.4171/OWR/2017/15.
- [38] A. Moiola, *Trefftz discontinuous Galerkin methods on unstructured meshes for the wave equation*, [arXiv:1505.00120](#), 2015 (proceedings of the XXIV CEDYA / XIV CMA conference, pp. 387–395).
- [39] Proceedings of [Waves 2015](#), Karlsruhe, Germany:

- S.N. Chandler-Wilde, D.P. Hewett, A. Moiola, *Function spaces for integral equations on fractal domains*, pp. 73–74.
- A. Gibbs, S.N. Chandler-Wilde, S. Langdon, A. Moiola, *Hybrid numerical asymptotic approximation for multiple scattering problems*, pp. 130–131.
- F. Kretschmar, A. Moiola, I. Perugia, S.M. Schnepp, *The space-time Trefftz discontinuous Galerkin method for the wave equation*, pp. 140–141.

[40] Proceedings of [Waves 2013](#), Gammarth, Tunisia:

- A. Moiola, E.A. Spence, *Is the Helmholtz equation really sign-indefinite?*, pp. 245–246.
- R. Hiptmair, A. Moiola, I. Perugia, Ch. Schwab, *Trefftz-discontinuous Galerkin methods: hp-version and exponential convergence*, pp. 359–360.

[41] A. Moiola, *A sign-definite formulation of the Helmholtz impedance problem*; in Mathematisches Forschungsinstitut Oberwolfach Report 03/2013, 2013, pp. 210–214. DOI:10.4171/OWR/2013/03.

[42] A. Moiola, *Approximation by plane waves*; in Mathematisches Forschungsinstitut Oberwolfach Report 10/2010, 2010, pp. 479–482. DOI:10.4171/owr/2010/10.

### Thesis

[43] A. Moiola, *Trefftz-discontinuous Galerkin methods for time-harmonic wave problems*; Ph.D. dissertation, 2011, Seminar for applied mathematics, ETH Zürich. DOI:10.3929/ethz-a-006698757. Available at <http://e-collection.library.ethz.ch/view/eth:4515>.

Preprints are available on <https://arxiv.org/search/?searchtype=author&query=Moiola>

The accepted or published versions of some of the papers are available on:

<http://centaur.reading.ac.uk/view/creators/90005242.html>

<https://iris.unipv.it/browse?type=author&authority=rp11759>

## 7 Teaching and supervision

### Courses

- Spring terms 2019, 2020, 2021 and 2022, “*Advanced numerical methods for PDEs*”, mathematics, master and PhD students, Pavia. Joint with F. Brezzi (2020, 2021 and 2022) and G. Sangalli (2019 and 2020).
- Autumn terms 2017, 2018, 2019, 2020 and 2021, “*Modellistica numerica*” (numerical modelling), third-year undergraduate mathematics students, Pavia.
- Autumn terms 2019, 2020 and 2021, “*Complementi di matematica*” (PDEs and numerical methods), engineering, master students, Pavia. Joint with L.D. Marini.
- Spring terms 2016 and 2017, “*Numerical methods for financial engineering*”, master students at the ICMA Centre of the Henley Business School in Reading.
- Autumn terms 2013, 2014, 2015 and 2016, “*Vector calculus*”, second-year mathematics students at Reading.

Student evaluation reports: <https://sisvaldidat.unifi.it/> (in Italian).

From January 2014 to July 2015 I have attended the Academic Practice Programme (APP) at the University of Reading and in October 2015 I have been recognised as Fellow of the Higher Education Academy (HEA).

### Lecture notes and teaching material available online

- Numerical modelling (in Italian), <https://euler.unipv.it/moiola/T/MN2021/MN2021.html>
- Scattering of time-harmonic acoustic waves: Helmholtz equation, boundary integral equations and BEM, <https://euler.unipv.it/moiola/T/MNAPDE2021/MNAPDE2021.html>
- Vector calculus, <https://euler.unipv.it/moiola/ReadG/VC2016/VC2016.html>

**Tutorial series**

Term/Semester:	Course:	Students:	
Spring 2017	<i>linear algebra</i>	mathematics	Reading
Autumn 2016	<i>linear algebra</i>	mathematics	Reading
Spring 2016	<i>real analysis</i>	mathematics	Reading
Spring 2015	<i>algebra</i>	mathematics	Reading
Autumn 2014	<i>foundation of mathematics</i>	mathematics	Reading
Spring 2014	<i>real analysis 1</i>	mathematics	Reading
Autumn 2013	<i>foundation of mathematics</i>	mathematics	Reading
Autumn 2012&Spring 2013	<i>algebra 1</i>	mathematics	Reading
Autumn 2010	<i>numerical methods for CSE</i>	computer science & CSE	ETH Zürich
Spring 2010	<i>numerical mathematics</i>	mechanical engineering	ETH Zürich
Autumn 2008	<i>linear algebra</i>	civil engineering	ETH Zürich
Autumn 2006 & 2007	<i>mathematical analysis and informatics</i>	biotechnology	Pavia
Autumn 2006 & 2007	<i>“pre-class” of mathematics</i>	biology	Pavia

For some of these courses, I have been in charge of the design of extensive teaching material, the preparation, the supervision and the grading of the exams.

**Supervision**

- 2022.05–08, A. Sardi, visiting intern student from ENSTA Paris.
- 2021.10–. . . , P. Bignardi, PhD student.
- 2021.04–2021.09, P. Bignardi, scholarship.
- 2021.01–. . . , E. Parolin, postdoc.
- 2020.11–. . . , F. Locatelli, PhD student.
- 2020.10–. . . , S. Gómez, PhD student.
- 2019.10–2020.02, P. Stocker, visiting PhD student from Univ. of Vienna. Now postdoc at Göttingen.
- 2016.06–2017.06, G.C. Diwan, postdoc, Reading. Now Acoustic Engineer at FT Technologies.
- 2016–2020, K. McCusker, PhD student, Reading, thesis on “Fast, approximate methods for electromagnetic wave scattering by complex ice crystals and snowflakes”, main supervisor C. Westbrook (Meteorology). Now postdoc at Reading.
- 2013–2017, A. Gibbs, PhD student, Reading, thesis on “Numerical methods for high frequency scattering by multiple obstacles”, co-supervised with S. Langdon and S.N. Chandler-Wilde. Now postdoc at UCL.
- Master in mathematics final dissertations (*Laurea magistrale*), Pavia:
  1. F. Locatelli, “*Migrazione di CO2 in strutture geologiche profonde: modelli e metodi numerici*”, 2020, superv. with S. Manenti.
  2. S. Fraschini, “*Stability of space-time isogeometric methods for wave propagation problems*”, 2021, supervised with G. Sangalli.
- BSc in mathematics final dissertations (*Laurea triennale*), Pavia:
  1. A. Kushova, “*Calcolo dello spettro dell’operatore di Schrödinger senza risoluzione di problemi agli autovalori*”, 2018;
  2. A. Massimini, “*Modellizzazione degli tsunami: il metodo aggiunto per il raffinamento della griglia computazionale*”, 2019;
  3. M. Silvestri, “*Approssimazione numerica delle figure di Chladni tramite metodo spettrale*”, 2019;
  4. U. Zerbinati, “*Second order finite difference methods for the wave equation with Dirichlet boundary conditions*”, 2020;
  5. N. Galante, “*Un’analisi a posteriori per il metodo degli elementi finiti*”, 2020;
  6. E. Cerri, “*Quantificazione dell’incertezza per un problema di diffusione*”, 2020;
  7. M. Carcano, “*Analisi di alcuni modelli di reazione e diffusione per la dinamica delle popolazioni*”, 2020;
  8. S. Regola, “*Onde acustiche: metodi numerici per la risoluzione dell’equazione di Helmholtz*”, 2020;
  9. F. Dabraio, “*Adattività  $h_p$  per il metodo degli elementi finiti in una dimensione*”, 2021;
  10. C. Perinati, “*Applicazioni del metodo degli elementi finiti ai quantum graphs*”, 2021.
  11. S. Tonali, “*Fast Marching Method: analisi teorica e implementazione numerica*”, 2021.
  12. A. Gervasio, “*Metodo delle differenze finite per l’approssimazione dell’equazione del calore*”, 2022.
  13. L. Labati, “*Problemi di diffusione ellittici e parabolici, separazione delle variabili ed elementi finiti*”, 2022.
- Between 2013 and 2017 at Reading I have supervised an MMath fourth-year project and 14 BSc third-year projects. I have also been personal tutor of 22 undergraduate students.



## PhD student examination

- J. Pinto, “Spectral methods for boundary integral equations in complex media”, Pontificia Universidad Católica de Chile, advisor C. Jerez-Hanckes, 2021, external examiner.
- S. Fragapane, “Regularity and asymptotics for  $p$ -Laplace type operators in fractal and pre-fractal domains”, Roma, advisor M.A. Vivaldi, 2018, external examiner.
- L. Swift, “Geometrically unfitted finite element methods for the Helmholtz equation”, UCL, advisor E. Burman, 2017, external examiner.
- A. Reinarz, “Sparse space-time boundary element methods for the heat equation”, Reading, advisor A. Chernov, 2015, internal examiner.

I am member of the faculty board (*collegio dei docenti*) of the UniPv–USI “International PhD Program in Computational Mathematics and Decision Sciences” (<http://compmat.unipv.it/>). I have also been in the monitoring committee for several PhD students at Reading.

## 8 Other activities

### Organisation of scientific events and participation in scientific committees

- Member of the scientific committee of the Waves 2022 conference, Paris.
- “**Very informal seminars**” series, Pavia. Co-organised with L. Spinolo and L. Tamellini, since 2021.
- Minisymposium on “Analysis and numerical methods for wave problems in heterogeneous media and complicated domains”, at the Waves 2019 conference, Vienna, 25–30 August 2019.
- Part of the local organising committee of HOFEIM 2019, High-Order Finite Element and Isogeometric Methods Workshop, Pavia, 28–31 May 2019.
- Workshop on “**Wave propagation in complex domains**”, UCL, 30 March 2017. Co-organised with D.P. Hewett and S.N. Chandler-Wilde.
- “**ReaDG**” workshop on “Recent advances in discontinuous Galerkin methods”, Reading, 13 June 2016. Supported by the London Mathematical Society, co-organised with T. Pryer.
- Minisymposium on “Wave-based discretisations” at the Waves 2015 conference, Karlsruhe, 20–24 July 2015. Co-organised with D.P. Hewett.
- “**ReaDG**” workshop on “Recent advances in discontinuous Galerkin methods”, Reading, 11–12 September 2014. Supported by the London Mathematical Society, co-organised with A. Chernov and T. Pryer.

### Other conferences and schools attended (no presentations given)

- MOX20, Milano, 27 May 2022.
- Structure, Regularity, and Robustness in the Approximation of PDEs, Milano, 10 February 2020.
- HOFEIM 2019, High-Order Finite Element and Isogeometric Methods Workshop, Pavia, 28–31 May 2019.
- IGA 2017, International Conference on Isogeometric Analysis, Pavia, 11–13 September 2017.
- IperPV2017, the XVII Italian Meeting on Hyperbolic Equations, Pavia, 6–8 September 2017.
- POEMS 2017, Polytopal Element Methods in Mathematics and Engineering, Milano, 5–7 July 2017.
- 7th meeting of Reading-Bath-Cardiff network on gener. solutions for nonlinear PDEs, Reading 13 June 2017.
- Mathematics in the Spirit of Joe Keller, Turing Gateway to Mathematics, Cambridge, 2–3 March 2017.
- Modern topics in nonlinear PDEs and geometric analysis, LMS–CMI research school, Reading, 4–8 July 2016.
- 3rd International Conference on Neural Field Theory, Reading, 16–18 June 2014.
- CIME course on Computational Electromagnetism, Cetraro, Italy, 9–14 June 2014.
- Recent Advances in Nonlinear PDEs and Calculus of Variations, Reading, 12–14 February 2014.
- Analysis of PDEs, symposium in honour of V. Maz’ya, Liverpool, 16–17 December 2013.
- From Spectral Gaps to Particle Filters workshop, Reading, 17–18 September 2013.
- Data Assimilation and Inverse Problems summer school, Reading, 22–26 July 2013.
- CNS 2013, Computational Neurosciences Meeting, Paris, 13–18 July 2013.
- LMS–EPSRC short course on Modern Nonlinear PDE Methods in Fluid Dynamics, Reading, 8–12 July 2013.
- NETT Neural Engineering summer school, Nottingham, 1–5 July 2013.

- Meeting on Riemann-Hilbert problems and their applications, Reading, 29–30 May 2013.
- SIAM–UKIE annual meeting, Reading, January 8, 2013.
- Zürich Summer School 2012 on “A Posteriori Error Control and Adaptivity”, 20–24 August 2012.
- “Mathmondes 2012”, French-British Network on Waves, Reading, 9–10 July 2012.
- Conference in honour of Nancy Nichols’ 70th birthday, Reading, 2–3 July 2012.
- ICMS Workshop on “BVPs for linear elliptic and integrable PDEs”, Edinburgh, 28 May–1 June 2012 (invited).
- Second international conference on Neural Field Theory, Reading, 19–21 April 2012.
- Numerical analysis postgraduate seminar day, Reading, 30 March 2012.
- Colloquium on “Analysis and numerics of PDEs”, in memory of Enrico Magenes, Pavia, 2–4 November 2011.
- Workshop on “Advances in computational wave propagation”, UCL, London, 2–3 September 2011 (invited).
- Pro\*Doc summer retreat, Disentis, 17–19 August 2011.
- Swiss Numerics Colloquium, Università della Svizzera Italiana, Lugano, 6 May, 2011.
- “Numerical methods for hyperbolic equations, recent trends and future directions”, 18–19 February 2011.
- “Next generation numerical methods for comput. wave propagation”, Cambridge, 17–18 Sept. 2010 (invited).
- Zürich Summer School on “Sparse tensor discretisations of high-dimensional problems”, 23–27 August 2010.
- ACE’10–6th Workshop on Advanced Computational Electromagnetics, ETH Zürich, 5–7 July 2010.
- Swiss Numerics Colloquium, ETH Zürich, 16 April 2010.
- Pro\*Doc summer retreat, Disentis, 16–19 August 2009.

#### Visitors hosted (in Pavia)

- D. Huybrechs, 13–17 January 2020.
- P. Stocker, October 2019–February 2020.
- A. Gibbs, 12–15 November 2019.
- C. Jerez-Hanckes, 23–25 October 2018.
- D.P. Hewett, 16–19 April 2018.
- E.A. Spence, 12–16 February 2018.

#### Professional affiliations

- Fellow (*associato con incarico di ricerca*) of the [IMATI–CNR](#), Pavia, since March 2021.
- [SIAM](#), Society for Industrial and Applied Mathematics, since 2010.
- [GNCS](#), Gruppo Nazionale di Calcolo Scientifico of the Istituto Nazionale di Alta Matematica (INdAM).
- [UMI](#), Unione Matematica Italiana, since 2019.

#### Selection committees

- Postdoctoral position on “*Metodi numerici per la simulazione di equazioni alle derivate parziali*”, Pavia, 5.2022.
- Postdoctoral position on “*Adaptive, low-rank and multi-fidelity methods for Forward and Inverse UQ of PDEs with random coefficients*”, IMATI-CNR, 12.2021.
- Postdoctoral position on “*Hydrologic-hydrogeological modelling of surface and sub-surface water flow and transport*”, Pavia, 11.2021.
- Two postdoctoral positions on “*Risolutori paralleli scalabili per modelli di reazione-diffusione in elettromeccanica cardiaca*”, Pavia, 6.2021.
- Postdoctoral position on “*Modellistica numerica di flusso idrico sotterraneo*”, Pavia 5.2021.
- Scholarship on “*Metodi numerici per la simulazione di propagazione di onde*”, Pavia, 3.2021.
- Postdoctoral position “*Adaptive multi-fidelity methods for forward and inverse UQ of PDEs and ODEs with random coefficients*”, IMATI-CNR, 12.2020.
- Two postdoctoral positions on “*Innovative methods for PDEs*”, Mathematics, Pavia, 10.2020.
- Postdoctoral position “*Mathematical methods for the analysis of PDEs on networks*”, IMATI-CNR, 10.2020.
- Admission to the joint PhD in Mathematics, Universities of Milano Bicocca and Pavia, 9.2020.
- Scholarship on “*Computational fluid dynamics in geological structures*”, Mathematics, Pavia, 7.2020.
- Internal selection committee for the best master dissertation and best PhD dissertation prize “*Con.Scienze*”, Department of Mathematics, University of Pavia, 9.2019 and 9.2020.
- Postdoctoral position on EPSRC grant EP/N019407/1, Reading, 4.2016.

## Refereeing activity

Advances in Computational Mathematics (ACOM),  
 Applied Mathematics and Computation (AMC),  
 Applied Mathematics Letters,  
 Applied Numerical Mathematics (APNUM),  
 BIT Numerical Mathematics,  
 Cogent Mathematics,  
 Communications in Computational Physics (CiCP),  
 Communications in Mathematical Sciences (CMS),  
 Computational and Applied Mathematics (COAM),  
 Computers and Mathematics with Applications (CAMWA),  
 Computer Methods in Applied Mech. and Eng. (CMAME),  
 Computer Physics Communications (CPC),  
 Fractal and fractional,  
 Engineering Analysis with Boundary Elements (EABE),  
 IMA Journal of Applied Mathematics (IMA-MAT),  
 IMA Journal of Numerical Analysis (IMA-JNA),  
 Journal of Computational Physics (JCP),  
 Journal of Computational and Applied Math. (JCAM),  
 Journal of Computational Mathematics,  
 Journal of Engineering Mathematics (ENGI),  
 Journal of Integral Equations and Applications (JIEA),  
 Journal of Mathematical Analysis and Applications (JMAA),  
 Journal of Scientific Computing (JSC/JOMP),  
 Math. Models and Methods in Applied Sciences (M3AS),  
 Mathematical Modelling and Numerical Analysis (M2AN),  
 Mathematics of Computation (Math. Comp.),  
 Numerical Algorithms (NUMA),  
 Numerical Math.: Theory, Methods and Applic. (NMTMA),  
 Numerical Methods for Partial Differential Eq. (NMPDE),  
 Numerische Mathematik (Numer. Math.),  
 Sampling Theory in Signal and Image Processing (STSIP),  
 SIAM Journal on Scientific Computing (SISC),  
 SIAM Journal on Numerical Analysis (SINUM),  
 SMAI Journal of Computational Mathematics (SMAI-JCM),  
 Transactions of Mathematics and Its Applications,  
 Wave Motion (WaMot),  
 Zeitschrift für Ang. Mathematik und Physik (ZAMP);  
 ICOSAHOM conference proceedings,  
 Waves conference proceedings;  
 Springer Verlag books;  
 Mathematical Reviews (MR) / MathSciNet;  
 Fondecyt/Conicyt grants (Chile),  
 Deutsche Forschungsgemeinschaft (DFG) grants,  
 London Mathematical Society Bursaries,  
 Swiss National Science Foundation grants,  
 STIC Math AmSud.

## Other responsibilities

I am the departmental representative in the science faculty quality assurance committee<sup>5</sup>.

At Reading I have been the departmental representative at the Isaac Newton Institute and scrutineer for the applied maths undergraduate exams.

## 9 Scientific interests

Numerical analysis of partial differential equations (PDEs) and integral equations. In particular:

- Finite element methods (FEM), discontinuous Galerkin methods (DG), boundary element methods (BEM).
- FEM with non-polynomial basis, Trefftz and quasi-Trefftz methods.
- Computational electromagnetics, computational acoustics, wave propagation.
- Approximation of PDE solutions by special functions.
- Stability and regularity of PDE solutions in polyhedral and non-smooth domains, wavenumber-explicit analysis of time-harmonic boundary value problems, applications of Rellich- and Morawetz-type identities.
- Wave scattering by rough domains and screens. Sobolev spaces on non-Lipschitz domains and fractals.
- Space–time discretisations of PDEs.

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<sup>5</sup><http://www-aq.unipv.it/>

<b>1</b>	<b>Personal data</b>	<b>1</b>
<b>2</b>	<b>Employment</b>	<b>1</b>
<b>3</b>	<b>Education</b>	<b>1</b>
<b>4</b>	<b>Scientific talks</b>	<b>2</b>
	Invited talks at conferences and workshops . . . . .	2
	Invited contributions to minisymposia at conferences . . . . .	2
	Invited research seminars . . . . .	2
	Contributed talks at conferences . . . . .	3
	Other talks at research seminars . . . . .	3
	Poster presentations . . . . .	3
<b>5</b>	<b>Grants and invitations</b>	<b>3</b>
	Grants . . . . .	3
	Participation in other projects and grants . . . . .	4
	Invited research visits and scientific programmes . . . . .	4
<b>6</b>	<b>Publications</b>	<b>4</b>
	Refereed journal papers . . . . .	4
	Refereed book chapters . . . . .	6
	Reports and preprints . . . . .	6
	Conference proceedings . . . . .	6
	Thesis . . . . .	7
<b>7</b>	<b>Teaching and supervision</b>	<b>7</b>
	Courses . . . . .	7
	Lecture notes and teaching material available online . . . . .	7
	Tutorial series . . . . .	8
	Supervision . . . . .	8
	PhD student examination . . . . .	9
<b>8</b>	<b>Other activities</b>	<b>9</b>
	Organisation of scientific events and participation in scientific committees . . . . .	9
	Other conferences and schools attended (no presentations given) . . . . .	9
	Visitors hosted (in Pavia) . . . . .	10
	Professional affiliations . . . . .	10
	Selection committees . . . . .	10
	Refereeing activity . . . . .	11
	Other responsibilities . . . . .	11
<b>9</b>	<b>Scientific interests</b>	<b>11</b>