Matias Ruiz

Lecturer in Applied Mathematics
School of Computing and Mathematical Sciences
University of Leicester, Leicester LE1 7RH, UK
Email: mr447@leicester.ac.uk

Research Interests

Wave propagation in complex media, applied spectral theory, boundary integral equations, asymptotic analysis.

Appointments

University of Leicester — Leicester, UK
Lecturer in Applied Mathematics, member of the Scientific Computing group — Aug 2023 – present

University of Edinburgh — Edinburgh, UK
Whittaker Research Fellow — Jul 2020 – Jul 2023

Imperial College London — London, UK
Postdoctoral Research Associate (with Ory Schnitzer) — Nov 2018 – Jun 2020

Suez Eau France — Bordeaux, France
R&D Researcher — Sep 2017 – Oct 2018

Education

École Normale Supérieure — Paris, France
PhD in Applied Mathematics. Supervisor: Habib Ammari. Defended 27 June 2017 — 2014 – 2017
Thesis: *Mathematical analysis of plasmonic resonances for nanoparticles and applications*

École Polytechnique — Palaiseau, France
MSc in Applied Mathematics, summa cum laude — 2013 – 2014
Diplôme d'Ingénieur — 2010 – 2014

Funding and Awards

- Royal Society International Exchange Grant, PI (£1,630), 2022. Collaboration with H. Lee and S. Yu on nonlocal plasmonics.
- Saltire Early Career Fellowship, Royal Society of Edinburgh, PI (£17,430.98), 2021. Research visit to the POEMS group, ENSTA Paris.
- Whittaker Research Fellowship, University of Edinburgh, 2020.
- AMX Scholarship for doctoral studies, French Ministry of Higher Education and Research, 2014.
- Eiffel Excellence Scholarship, French Ministry of Europe and Foreign Affairs, 2011.

Teaching

University of Leicester and Dalian–Leicester Institute — 2023 – present

- MA2252 Introduction to Computing (MATLAB). MA2403 Statistical Distributions and Inference (R). MA2261 Linear Statistical Models.

University of Edinburgh. Calculus for Engineers and Scientists (2022, 2023). Research Skills for Applied and Computational Mathematics (MSc, teaching assistant) — 2021 – 2023

Scottish Mathematical Sciences Training Centre. Quantum Computing, PhD course, co-designed and co-taught with Des Johnston (Heriot-Watt) — 2022

Imperial College London. Asymptotic Analysis, MSc lectures — 2019

Paris Sciences et Lettres (PSL). Linear Algebra, module convenor (designed and delivered) — 2014 – 2016

Supervision and Training

- Leicester. Project supervision in Investigations in Mathematics.
- Edinburgh. Four MSc dissertations, MSc in Computational Applied Mathematics (2021–2022). Eight short group research projects (2021–2023). One undergraduate project on computational methods in nanophotonics (2021–2022).

Service

- PGR Tutor for Mathematics, School of Computing and Mathematical Sciences, University of Leicester (Oct 2023 – present).
- Committee member, MAGIC postgraduate mathematics consortium.
- Faculty lead for SIAM Student Chapter, University of Leicester.
- Organiser, workshop on Mathematical Methods for Wave Problems, University of Leicester (10–11 June 2025).
- Co-organiser, Maxwell Institute Applied Mathematics Seminar, Edinburgh (Sep 2021 – Jul 2023).
- Organiser, MAC-MIGS online workshop on Boundary Integral Methods (27 May 2021).
- Referee for Multiscale Modeling & Simulation, Studies in Applied Mathematics, Journal of Computational Physics, SIAM Journal on Applied Mathematics, SN Partial Differential Equations and Applications, SIAM Journal on Imaging Sciences.

Publications

Preprints

[1] **Matias Ruiz**. A block-Toeplitz approach to the spectrum of the Neumann–Poincaré operator on self-similar chains. arXiv:2608.30991, 2026. Under review.

[2] Hyundae Lee, **Matias Ruiz**, and Sanghyeon Yu. Spectral theory of plasmonic resonances in the nonlocal regime. arXiv:2604.18461, 2026. Under review.

Monograph

[3] Habib Ammari, Brian Fitzpatrick, Hyeonbae Kang, **Matias Ruiz**, Sanghyeon Yu, and Hai Zhang. *Mathematical and Computational Methods in Photonics and Phononics*, volume 235 of ***Mathematical Surveys and Monographs***. American Mathematical Society, 2018.

Journal articles

[4] **Matias Ruiz** and Ory Schnitzer. Plasmonic resonances of slender nanometallic rings. ***Physical Review B***, 105:125412, 2022.

[5] **Matias Ruiz** and Ory Schnitzer. Slender-body theory for plasmonic resonance. ***Proceedings of the Royal Society A***, 475:20190294, 2019.

[6] Habib Ammari, Mihai Putinar, **Matias Ruiz**, Sanghyeon Yu, and Hai Zhang. Shape reconstruction of nanoparticles from their associated plasmonic resonances. ***Journal de Mathématiques Pures et Appliquées***, 122:23–48, 2019.

[7] Habib Ammari, **Matias Ruiz**, Sanghyeon Yu, and Hai Zhang. Reconstructing fine details of small objects by using plasmonic spectroscopic data. Part II: The strong interaction regime. ***SIAM Journal on Imaging Sciences***, 11(3):1931–1953, 2018.

[8] Habib Ammari, **Matias Ruiz**, Sanghyeon Yu, and Hai Zhang. Field expansions for systems of strongly coupled plasmonic nanoparticles. ***SIAM Journal on Numerical Analysis***, 56(4):2029–2044, 2018.

[9] Habib Ammari, Francisco Romero, and **Matias Ruiz**. Heat generation with plasmonic nanoparticles. ***Multiscale Modeling & Simulation***, 16(1):356–384, 2018.

[10] Habib Ammari, **Matias Ruiz**, Sanghyeon Yu, and Hai Zhang. Reconstructing fine details of small objects by using plasmonic spectroscopic data. ***SIAM Journal on Imaging Sciences***, 11(1):1–23, 2018.

[11] Habib Ammari, Pierre Millien, **Matias Ruiz**, and Hai Zhang. Mathematical analysis of plasmonic nanoparticles: the scalar case. ***Archive for Rational Mechanics and Analysis***, 224(2):597–658, 2017.

[12] Habib Ammari, **Matias Ruiz**, Wei Wu, Sanghyeon Yu, and Hai Zhang. Mathematical and numerical framework for metasurfaces using thin layers of periodically distributed plasmonic nanoparticles. ***Proceedings of the Royal Society A***, 472:20160445, 2016.

[13] Habib Ammari, **Matias Ruiz**, Sanghyeon Yu, and Hai Zhang. Mathematical analysis of plasmonic resonances for nanoparticles: the full Maxwell equations. ***Journal of Differential Equations***, 261(6):3615–3669, 2016.

Conference proceedings

[14] Habib Ammari, Pierre Millien, **Matias Ruiz**, and Hai Zhang. Mathematical analysis of plasmonic nanoparticles: the scalar case. In ***Imaging and Applied Optics 2016***, *OSA Technical Digest (Mathematics in Imaging)*, page MW1G.4, 2016.

[15] **Matias Ruiz** and Frédéric Barbaresco. Radar detection for non-stationary Doppler signal in one burst based on information geometry distance between paths. In ***2015 16th International Radar Symposium (IRS)***, pages 422–427, 2015.

Talks

Invited talks

Multiple Wave Scattering in Locally Resonant Materials, Isaac Newton Institute, Cambridge	Aug 2026
Applied Mathematics Seminar, University of Warwick	Oct 2025
MetaMAT Webinar	Feb 2024
Thematic Day on Plasmonics, Aix-Marseille Université, Marseille	Dec 2023
Applied Mathematics seminar, Korea University, Seoul	May 2022
CNRS–Imperial Metamaterials Conference, Imperial College London	Apr 2022
Conference on Mathematics of Wave Phenomena, Karlsruhe Institute of Technology	Feb 2022
Joint Webinar on Analysis and Computation in Materials Science, online	Sep 2020
Nanophotonics group seminar, Laboratoire Charles Fabry, Institut d'Optique, Palaiseau	Nov 2019
POEMS seminar, ENSTA Paris, Palaiseau	Nov 2019
Applied Inverse Problems (AIP) 2019, Grenoble	Jul 2019
The Mathematics of Metamaterials workshop, University of Liverpool	May 2019
Applied Inverse Problems (AIP) 2017, Hangzhou. Two invited talks	May 2017
Mathematics department seminar, Hong Kong University of Science and Technology	Jan 2017
10th International Conference on Computational Physics (ICCP10), Macao	Jan 2017
Inverse Problems in the Physical Sciences, satellite conference of ICMP 2015, Santiago	Aug 2015

Contributed talks

Mathematical Methods for Wave Problems workshop, University of Leicester	Jun 2025
Non-self-adjoint operators in the physical world, CIRM, Marseille	Jun 2024
WAVES 2022, ENSTA Paris, Palaiseau	Jul 2022
TNTN 2020 workshop, Zuse Institute Berlin	Feb 2020
META 2019, Lisbon	Jul 2019
International Congress on Industrial and Applied Mathematics (ICIAM) 2019, Valencia	Jul 2019
British Applied Mathematics Colloquium (BAMC) 2019, Bath	Apr 2019
WAVES 2017, Minneapolis	May 2017
14th International Conference on Integral Methods in Science and Engineering (IMSE 2016), Padova	Jul 2016