Paulo Sergio Piva

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Profile

To work in research or R&D, in the areas of engineering, applied mathematics, or physics, in a position where I can use my physics, mathematics, and programming skills to solve real-world problems and contribute to society.

Research interests: Wave emission, sensing, propagation, and scattering (acoustic, elastic, electromagnetic, gravity), statistical and numerical methods, inverse problems, and continuum mechanics.

Current role

Nov 2025 – Present

Knowledge Transfer Partnership (KTP) Associate with the University of Sheffield and Johnson Matthey.

Project Title: Next Generation Ultrasonic Sensors for Particulates.

Role Overview: Selected as the sole Associate to lead a high-profile, collaborative R&D project bridging academic innovation and industrial application. Responsible for the end-to-end development and testing of a novel ultrasonic sensor technology for particle size distribution measurements.

Key achievement: Designed an ultrasonic sensor prototype from scratch and took it from concept to installation-ready hardware in ten months, including manufacturing specification, component sourcing and full-system assembly.

Education

PhD **University of Sheffield** (Mechanical Engineering, 2021–2026)
- *"Average Wave Propagation and Scattering in Random Particulate Media: a broad frequency range"*
- Thesis Supervisor: Dr Artur Lewis Gower
- Emphasis on ultrasound waves in random complex media

MSc **University of Campinas (UNICAMP)** (Physics, 2019–2021 - GPA 4.0/4.0)
- *"Gravitational Waves and Robinson-Trautman Spacetimes"*
- Thesis Supervisor: Prof. Alberto Vazquez Saa
- Emphasis on gravitational wave emission and propagation
- Scored 89% in the Unified Physics Exam (EUF in Portuguese), ranking among Latin America's 4.05% highest grades.

BSc **University of Campinas (UNICAMP)** (Physics, 2015 – 2019 – Cumulative grade average: 0.8973/1.0000)
- *"Aspects of image formation in general relativity"*
- Monograph Supervisor: Prof. Alberto Vazquez Saa
- Emphasis on the scattering of light rays in General Relativity

Publications

- PhD thesis: P. S. Piva (2026). *Average Wave Propagation and Scattering in Random Particulate Media: a broad frequency range.* Available here.
- Journal paper: P. S. Piva, Art L. Gower, and I. David Abrahams (2026). *Designing Band Gaps with Randomly Distributed Sub-Wavelength Helmholtz Resonators.* npj Acoustics 2, 10. DOI: 10.1038/s44384-026-00045-w
- Conference paper: P. S. Piva and Art L. Gower (2025). *Acoustic waves in layered material filled with random particulate: Applications and Theoretical Advancements*. Bremen Workshop on Light Scattering.
- Journal paper: P. S. Piva, K. K. Napal, and Art L. Gower (2024). *Acoustic waves in a halfspace material filled with random particulate*. New J. Phys. 26, 123033. DOI: 10.1088/1367-2630/ad9ed0.
- Journal paper: A. Karnezis, P. S. Piva, and Art L. Gower (2024). *The average transmitted wave in random particulate materials*. New J. Phys. 26, 063002. DOI: 10.1088/1367-2630/ad49c2.

- Journal paper: K. K. Napal, P. S. Piva, and Art L. Gower (2024). *Effective T-matrix of a cylinder filled with a random two-dimensional particulate*. Proc. R. Soc. A 480, 20230660. DOI: 10.1098/rspa.2023.0660.
- Conference paper: P. S. Piva, et al. (2023). *Mathematical Model for Layered Acoustic Materials with Random Particulate Microstructure*. Phononics.
- Report from study group with PepsiCo, ESGI 171: C. J. Budd OBE, P. S. Piva, M. D. Shirley, and R. J. Whittaker (2023). *Microwave cooking of thin potato discs.* Mathematics in industry reports. DOI: 10.33774/miir-2023-mxttp.
- Master's thesis: P. S. Piva (2021). *Gravitational waves and Robinson-Trautman spacetimes*. UNICAMP's scientific and intellectual production repository. Access the PDF here.

Awards, prizes and funding

Prizes and recognition

Oct 2026	Nominated by colleagues for recognition as an outstanding postdoc, Postdoc Appreciation Week, University of Sheffield.
Dec 2024	Finalist at UKAN+ Mathematical and Computational Acoustics Paper Prize & Workshop.
Jul 2024	Prize at DRG showcase 2024, University of Sheffield: "Poster presentation prize, second place".
Jul 2023	Prize at the UK Graduate Modelling Camp, Isaac Newton Institute, Cambridge: "IMA Best Presentation Prize for group presentation".
Jan 2023	Prize at Winter School MWSW05, Isaac Newton Institute, Cambridge: "Member of the team with best numerical solution and overall solution for the Computational Challenge".

Funding

4 scholarships and research grants since 2017

- **PhD ICASE scholarship with Johnson Matthey**, Engineering and Physical Sciences Research Council **(EPSRC)**
  Oct 2021 – Sep 2025 (EP/W522235/1)
  Funding: ~ £70k + full tuition fees
- **MSc scholarship**, São Paulo State Research Support Foundation **(FAPESP)**
  Mar 2019 – Feb 2021 (grant # 2018/23857-8)
  Funding: ~ $14.5k
- **Undergraduate research scholarship**, São Paulo State Research Support Foundation **(FAPESP)**
  Dec 2017 – Nov 2018 (grant # 2017/19116-0)
  Funding: ~ $2.5k
- **Undergraduate research scholarship**, National Council for Scientific and Technological Development **(CNPq)**
  Jan 2017 – Nov 2017
  Funding: ~ $1.5k

Talks and posters

14 talks, 6 posters, and 1 webinar since 2022

Invited talks

Aug 2026	Invited talk at MWSW06, Isaac Newton Institute, Cambridge: *Scattering and Physical Bounds of Randomly Placed Helmholtz Resonators*. Available on YouTube.
Jul 2026	Invited talk at MetaMAT 2026, Corsica: *Band Gaps and Physical Bounds from Randomly Distributed Resonators*. Recording here.
Jun 2025	Invited talk at British Mathematical Colloquium and British Applied Mathematics Colloquium, Exeter: *From Time to Frequency: Interpreting Reflections in Layered Acoustic Medium via Formal Power Series*.

Contributed talks, posters and webinar

Mar 2026 Webinar at MetaMAT seminar series: *From Multiple Scattering to Effective Properties: Engineering Bandgaps in Random Media*. DOI: 10.52843/meta-mat.5n1qn8

Apr 2025 Talk at Johnson Matthey academic conference (JMAC), Coventry: *In-line acoustic sensing for dense particulate materials.*

Apr 2025 Talk at Workshop on Metamaterials with Extra Dimensions, Imperial College, London: *Band gaps from randomly distributed resonators*.

Dec 2024 Talk (as a finalist) at UKAN+ Mathematical and Computational Acoustics Paper Prize & Workshop.

Jul 2024 Poster at DRG showcase 2024, University of Sheffield: *Modelling Ultrasound Sensing Methods for Particulate Materials*.

Jun 2024 Poster at Second-year MechEng poster presentation, University of Sheffield: *Modelling Ultrasound Sensing Methods for Particulate Materials*.

Apr 2024 Talk at a seminar series at Imperial College, London: *Acoustic Sensing of Particulate Materials through Layers*.

Apr 2024 Talk at British Applied Mathematics Colloquium, Newcastle: *Acoustic Sensing of Particulate Materials through Layers*.

Oct 2023 Talk at a seminar series at the University of Manchester: *Why care about inverse problems if your focus is modelling?* (shared talk with Art L. Gower and Jessica R. Kent).

Aug 2023 Talk at International Congress on Industrial and Applied Mathematics, Tokyo: *Wave Scattering from Layers of Random Particulate Materials*.

Jul 2023 Talk at the European Study Group with Industry ESGI 171, Edinburgh: Chosen to present PepsiCo company results with Matthew Shirley.

Jul 2023 Talk at the UK Graduate Modelling Camp, Isaac Newton Institute, Cambridge: *Modelling lipid raft formation* (Group presentation).

Jun 2023 Poster at Phononics, Manchester: *Mathematical Model for Layered Acoustic Materials with Random Particulate Microstructure*.

Apr 2023 Poster at Johnson Matthey academic conference (JMAC), Coventry: *Modelling Ultrasound Sensing Methods for Particulate Materials*.

Apr 2023 Talk at British Applied Mathematics Colloquium, Bristol: *Wave Scattering from Layers of Random Particulate Materials*.

Mar 2023 Poster at Workshop MWSW02, Isaac Newton Institute, Cambridge: *Waves in a Cylinder Filled with Random Particulate Material*.

Jan 2023 Talk at Winter School MWSW05, Isaac Newton Institute, Cambridge: selected as the presenter for my group's solution to the Computational Challenge.

Apr 2022 Poster at Johnson Matthey academic conference (JMAC), Coventry: *Sensing Particulates with Multiple Scattering*.

Skills and techniques

- **Experimental:** Design ultrasonic experiments for transmission and reflection testing, high-frequency (MHz range) immersion transducers, pitch-catch and pulse-echo techniques for ultrasonic inspection.
- **Numerical skills:** Multi-core programming (parallel computations), computational fluid dynamics (CFD), symbolic algebra (Mathematica and SymPy), and management of open-source/collaborative scientific libraries (GitHub).
- **Programming languages:** Julia, Python, Mathematica, MATLAB, and TeX (LaTeX, BibTeX, TikZ).
- **Numerical methods:** Monte-Carlo methods, maximum likelihood estimation, Galerkin spectral methods for PDE solving, finite differences to solve PDEs and ODE systems, and ray tracing for image formation.
- **Mathematics:** Wave propagation, scattering, homogenisation, mathematical modelling, random processes, ensemble averaging, statistical inference, inverse problems, spherical harmonics, ODE and PDE solving.
- **Physics:** Continuum mechanics, acoustics, surface water waves, gravitational waves, wave scattering, quantum mechanics, general and special relativity.

Teaching

2022–2025 **Graduate Teaching Assistant, University of Sheffield**
Modules: MechEng's first-year integrated project (MEC11002 and MEC11005), Modal analysis (MEC326), Dynamics I (MEC212), and occasional help with MechEng's and GenEng's second-year integrated projects (MEC216/MEC217 and GEE201).

2016 **Undergraduate Teaching Assistant, University of Campinas**
Supervisor: Prof. Christian Horácio de Oliveira – Calculus II courses at IMECC-UNICAMP.

Service and outreach

since 2025 **Reviewer for scientific journals:**
- Nonlinear Dynamics (Springer Nature);
- npj Acoustics (Nature Partner Journals);
- Wave Motion (Elsevier).

2024 **Organisation of events**
Organised and chaired a mini-symposium at the British Applied Mathematics Colloquium, Newcastle: *Acoustic and elastic wave scattering*.

2021–2022 **Outreach events**
- (2021) Exhibitor at Bradford Science Festival stand, UKAN acoustics stand;
- (2022) Exhibitor at New Scientist Live, UKAN acoustics stand.

2020–2021 **Online Mathematical Physics journal club (Seminário dos Batutas), University of Campinas**
Founder, organiser, and frequent speaker.

2020–2021 **Member of the board of the Physics Post-Graduates Association (APGF in Portuguese), University of Campinas**
- Organised mental health and English classes programmes for PGRs in Physics;
- President of elections: organised the first online voting due to the COVID-19 Pandemic.

Language proficiencies

Portuguese (mother tongue), English (advanced)