

# Umberto Zerbinati

## Curriculum Vitae

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## Scientific Biography

I am a DPhil student in Applied Mathematics at the University of Oxford, under the supervision of Prof. Patrick E. Farrell. My research interests are in Partial Differential Equations, Numerical Analysis and Scientific Computing. I focus on the derivation and analysis of models for fluids with ordering, such as liquid crystals, starting from a kinetic description.

## Education

- October 2022 **DPhil in Mathematics, University of Oxford, Oxford, United Kingdom**  
present **Supervisors:** Prof. Patrick E. Farrell.
- August 2020 **Master Degree in Applied Mathematics, KAUST, Thuwal, Saudi Arabia**
- September 2022 **Thesis Title:** A Priori Error Analysis For A Penalty Finite Element Method  
**Supervisors:** Prof. Daniele Boffi, GPA: 3.74/4.
- September 2016 **Bachelor Degree in Mathematics, University of Pavia, Pavia, Italia**
- February 2020 **Thesis Title:** Second Order Finite Difference Methods For The Wave Equation  
With Dirichlet Boundary Conditions  
**Supervisors:** Prof. Andrea Moiola and Prof. Ilaria Perguia, Graduation Grade: 106/110.
- February 2019 **Erasmus+ Traineeship, University of Vienna, Vienna, Austria**
- September 2019 **Research Topic:** Numerical solution of the wave equation.
- September 2016 **Collegio Ghislieri, Pavia, Italia**
- September 2019

## Teaching Experience

- January 2025 **Stipendary Lecturer in Applied Maths , Oriel College, University of Oxford, Oxford, United Kingdom**
- May 2025 **Visiting Lecturer on spectral theory and spectral practice, University of Edinburgh, Edinburgh, United Kingdom**  
**Invited by:** Prof. Kaibo Hu
- October 2023 **TA for Applied Partial Differential Equations (B5.2), Mathematical Institute, Oxford**
- December 2023 **Lecturer:** Prof. Andreas Muench.
- October 2023 **Tutor for Metric Spaces and Complex Analysis (A2), Wadham college, Oxford**
- December 2023 **Lecturer:** Prof. Yuji Nakatsukasa.
- January 2023 **Tutor for Numerical Analysis (A7), Magdalen College, Oxford**
- March 2023 **Lecturer:** Prof. Andrew Wathen.
- October 2022 **TA for Numerical Linear Algebra (C6.1), Mathematical Institute, University of Oxford**
- December 2022 **Lecturer:** Prof. Yuji Nakatsukasa.

## Research Visit

March 2023 **University of Catania**, *Working with Prof. Giovanni Russo*

**Research Topic:** Particle pushers for non-Hamiltonian systems.

December 2019 **University of Wien**, *Working with Prof. Anastasia Molchanova*

**Research Topic:** Finite element discretisations for elasticity.

## Work Experience

September 2020 **Founder and CEO of ZOEEN S.r.l.**, *Pavia, Italia*

present **ZOEEN** is a startup company for the of high-power energy devices for medical applications.

## Software Development

	Level	Skill	Comment
Language:	■■■■■	Python	<i>I contribute to software libraries PETSc and Firedrake. I develop and maintain my own software library, ngsPETSC.</i>
	■■■□□	C++	<i>I contribute to the software library Netgen and NGSolve.</i>

## References

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- [2] Clarissa Astuto, Armando Coco, and Umberto Zerbinati. A comparison of the coco-russo scheme and  $\eta$ -fem for elliptic equations in arbitrary domains. *arXiv preprint (2405.16582)*, 2024.
- [3] Jose A. Carrillo, Patrick E. Farrell, Andrea Medaglia, and Umberto Zerbinati. A kinetic theory approach to ordered fluids, 2025. <https://arxiv.org/abs/2508.10744>.
- [4] P Farrell, G Russo, and U Zerbinati. Kinetic derivation of an inviscid compressible leslie-ericksen equation for rarified calamitic gases. *Multiscale Modeling and Simulation*, 2024.
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- [6] Patrick E. Farrell, Tim van Beeck, and Umberto Zerbinati. Analysis and numerical analysis of the helmholtz-korteweg equation, 2025. <https://arxiv.org/abs/2503.10771>.
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- [8] Lorenzo Lazzarino, Yuji Nakatsukasa, and Umberto Zerbinati. Preconditioned normal equations for solving discretised partial differential equations, 2025. <https://arxiv.org/abs/2502.17626>.
- [9] Manuel Trezzi and Umberto Zerbinati. When rational functions meet virtual elements: the lightning virtual element method. *Calcolo*, 61(3):35, Jun 2024.
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- [13] Stefano Zampini, Umberto Zerbinati, George Turkyiah, and David Keyes. Petscml: Second-order solvers for training regression problems in scientific machine learning. In *Proceedings of the Platform for Advanced Scientific Computing Conference, PASC '24*, New York, NY, USA, 2024. Association for Computing Machinery.
- [14] U. Zerbinati. PINNs and GaLS: A priori error estimates for shallow physics informed neural networks applied to elliptic problems. *IFAC-PapersOnLine*, 55(20):61–66, 2022. 10th Vienna International Conference on Mathematical Modelling MATHMOD 2022.