

Nicola Muca Cirone

mucacirone.nicola@gmail.com

<https://www.linkedin.com/in/nmucacirone> <https://github.com/MucaCirone>

EDUCATION	<p>PhD Mathematics - CDT Mathematics of Random Systems, Imperial College London - University of Oxford 2022-2026</p> <ul style="list-style-type: none">Machine Learning, Mathematical Finance, Rough Paths Analysis.Supervised by <i>Dr. Cristopher Salvi</i> and <i>Prof. Thomas Cass</i>.Researching scaling limits of Neural Networks.Developing new Kernel Methods for Time Series analysis. <p>MSc Mathematics, University of Pisa - ETH Zürich 2021-2022</p> <ul style="list-style-type: none">Honour's degree (110/110 cum Laude) GPA 30 e LodeStochastic Calculus, Stochastic PDEs, Mathematical Finance, ML in Finance.Thesis: <i>Kernel Methods on Path Spaces</i> supervised by <i>Prof. Josef Teichmann</i>. <p>BSc Mathematics, University of Pisa 2018-2021</p> <ul style="list-style-type: none">Honour's degree (110/110 cum Laude) GPA 29.88/30Thesis on advanced topics in Geometrical Model Theory.
PUBLICATIONS	<p>[1] Nicola Muca Cirone, Maud Lemerrier and Cristopher Salvi. <i>Neural signature kernels as infinite-width-depth-limits of controlled ResNets.</i> <i>Proceedings of the 40th International Conference on Machine Learning</i>, 25358–25425, 2023. url: https://proceedings.mlr.press/v202/muca-cirone23a.html</p> <p>[2] Nicola Muca Cirone, Antonio Orvieto, Benjamin Walker, Cristopher Salvi and Terry Lyons. <i>Theoretical Foundations of Deep Selective State-Space Models.</i> <i>Arxiv Preprint</i> url: https://arxiv.org/abs/2402.19047</p> <p>[3] Nicola Muca Cirone, Jad Hamdan and Cristopher Salvi. <i>Graph Expansions of Deep Neural Networks and their Universal Scaling Limits.</i> <i>Arxiv Preprint</i> url: https://arxiv.org/abs/2407.08459</p>
TALKS	<p>DataSig - Rough Paths Interest Group , Alan Turing Institute May 2024 Title: <i>Signature Reconstruction from Randomized Signatures.</i></p> <p>Computer Vision Group Seminar , University of Michigan April 2024 Title: <i>Theoretical Foundations of Deep Selective State-Space Models.</i></p> <p>Talks in Financial and Insurance Mathematics , ETH Zürich Dec 2023 Title: <i>Neural Signature Kernels (and Trees).</i></p> <p>7th London-Paris Bachelier Workshop, Imperial College London Sept 2023 Title: <i>Rough Kernel Hedging.</i></p> <p>CDT Mathematics of Random Systems Workshop, University of Oxford June 2023 Title: <i>Neural Signature Kernels.</i></p> <p>16th Oxford-Berlin Young Researchers Meeting, University of Oxford Dec 2022 Title: <i>Signatures and the infinite-width-depth limit of Data Driven ResNets.</i></p>
EXPERIENCE	<p>Industry Project - Neural Signature Kernels, Imperial College London June 2024 Co-organized one of the 2024 CDT Industry Projects. Supervised a group of PhD students exploring the empirical advantages of various Neural Signature Kernels</p>

over established Time Series Analysis techniques.

Teaching Assistant - Stochastic Calculus for Finance, ICL Business School Oct - Dec 2023
MSc Risk Management & Financial Engineering. Taught exercise classes.

Industry Project - Brain signal analysis with Signatures, Imperial College London June 2023
Challenge: analyze MEG data from several subjects, detect the one who had a seizure.
Our team used Signature techniques, the success and clarity of our results won the competition.

Teaching Assistant - Numerical Methods for Finance, Imperial College London Feb 2023
MSc Mathematics and Finance. Taught exercise classes.

Teaching Assistant - Data Analysis, Università di Pisa 2021-2022
MSc Mathematics. Provided tutoring support.

NLP Project - Classification of mathematical papers, Università di Pisa 2021-2022
Task: classify which mathematical subjects an academic paper belongs to, given its title and abstract.
The implementation was done in Python.

AWARDS **INDAM Scholarship**, [Istituto Nazionale di Alta Matematica](#) 2022
Two year scholarship from the Italian Institute of Higher Mathematics.
Placed [2nd](#) at National level.

COMPETENCES **Languages** Italian (*native*), English (C1), French (*basic*)
Technical Skills Python, Pytorch, Jax, TensorFlow, R, Matlab, Java