

Cristopher Salvi | Curriculum Vitae | March 2024

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Summary

Research interests: Deep learning and kernel methods for biological and financial signal processing (feature extraction, compression, decoding, forecasting, anomaly detection, denoising, hypothesis testing). Neural differential equations for generative modelling (neural SDEs, diffusion models, state-space models, spiking neural networks).

Academically (571 citations; h-index 11): Developed the fields of neural differential equations and signature kernels for irregular time series. Wrote a [textbook](#) on rough paths and signature methods in machine learning.

Open source software: Implemented GPU-capable, auto-differentiable signature kernels and differential equation solvers in JAX and PyTorch.

Publications (selected)

14 total with 12 jointly first-author. * Equal contribution.

A structure theorem for streamed information
C. Salvi*, J. Diehl, T. Lyons, R. Preiss, J. Reizenstein — J. of Algebra (2023).

Neural signature kernels as ∞ -width-depth-limits of cResNets
N. M. Cirone*, C. Salvi*, M. Lemerrier — ICML (2023).

Non-adversarial training of Neural SDEs with signature kernel scores
Z. Issa*, M. Lemerrier*, C. Salvi*, B. Horvath, — NeurIPS (2023).

Neural Stochastic PDEs for spatio-temporal signals
M. Lemerrier*, C. Salvi*, A. Gerasimovics — NeurIPS (2022).

SigGPDE: scaling sparse GPs on sequential data
M. Lemerrier*, C. Salvi*, T. Cass, T. Damoulas, T. Lyons — ICML (2021).

Distribution regression for sequential data
M. Lemerrier*, C. Salvi*, T. Damoulas, E.V. Bonilla, T. Lyons — AISTATS (2021).

The signature kernels is the solution of a Goursat PDE
C. Salvi*, T. Cass, J. Foster, T. Lyons, W. Yang — SIAM SIMODS (2021).

Neural rough differential equations for long time series
J. Morrill*, C. Salvi*, P. Kidger, J. Foster, T. Lyons — ICML (2021).

Higher order kernel mean embeddings for stochastic processes
M. Lemerrier*, C. Salvi*, C. Liu, B. Hovarth, T. Lyons — NeurIPS (2021).

Deep signature transforms
P. Bonnier*, P. Kidger*, I.P. Arribas*, C. Salvi*, T. Lyons — NeurIPS (2020).

Academic Jobs

Imperial College London (Jun. 2022 - Present)
ASSISTANT PROFESSOR IN MATHEMATICS AND MACHINE LEARNING
Department of Mathematics & [Imperial-X](#). 2 PhD students, 1 postdoc.

Imperial College London (Oct. 2021 - Jun. 2022)
CHAPMAN FELLOW IN MATHEMATICS
Highly competitive postdoctoral fellowship in mathematics.

The Alan Turing Institute (Oct. 2019 - Sep. 2023)
VISITING RESEARCHER IN AI
Lead of research theme [Rough paths in ML for sequential data](#).

Open-source software (selected)

sigkernel: Signature kernel methods for irregular time series in PyTorch.

sigkerax: Signature kernel methods for irregular time series in JAX.

torchspde: Autodifferentiable stochastic PDE solvers in PyTorch.

Industry Jobs

Kaiju Capital Management (Jun. 2022 - Present)
MACHINE LEARNING CONSULTANT
Neural differential equations and signatures for time series modelling.

Entrepreneur First (Apr. 2021 - Sep. 2021)
STARTUP ACCELERATOR - LONDON COHORT
Technical lead at early-stage startup for synthetic time series generation.

Citigroup (Dec. 2017 - Oct. 2018)
ALGORITHMIC TRADER - LONDON OFFICE
Deep learning for bonds trading.

BlackRock (Jun. 2017 - Sep. 2017)
DATA SCIENTIST - LONDON OFFICE
Summer internship.

Schroders (Jun. 2016 - Aug. 2016)
QUANTITATIVE RESEARCHER - LONDON OFFICE
Summer internship.

Education

University of Oxford (Sep. 2018 - Sep. 2021)
PHD IN MATHEMATICS AND MACHINE LEARNING | SUPERVISOR: PROF. TERRY LYONS
Thesis title: Rough paths, kernels, differential equations and an algebra of functions on streams.

Imperial College London (Oct. 2014 - Jun. 2017)
MSc + BSc IN MATHEMATICS | FIRST CLASS
Topics: stochastic-functional-numerical analysis, probability and statistics, linear algebra, optimisation, scientific computing.

Lycée Louis le Grand - Paris (Aug. 2012 - Jun. 2014)
CLASSES PREPARATOIRES AUX GRANDES ECOLES | MPSI-MP
Intensive preparation in Mathematics and Physics for the highly competitive entrance exams to the French Engineering Schools.

Additional information

Awards: G-Research PhD prize in mathematics and data science (1st place), Citadel European regional datathon (3rd place).

Grants (Lead): Quantum ML for Financial Data Streams (Innovate UK 2023).

Teaching: Statistics & Numerical Analysis (Imperial MSc math finance), Rough Paths (PhD course in [CDT Random Systems](#) at Oxford-Imperial), Stochastic Calculus (TA, Oxford math UG).

Development Tools: Git: proficient in version control and collaborative coding. PyCharm: primary IDE for Python development. Cloud Platforms: Azure Machine Learning studio.

Invited talks (selected 2021-2023): Caltech, UCL, Bank of America, Royal Statistical Society, Credit Suisse, Brown, Citigroup, ETH, Twitter, Institut Henri Poincaré, UCSD, Cambridge, Oxford, Warwick, Oberwolfach.

Journal and conference reviews: NeurIPS, ICML, ICLR, Journal of Machine Learning Research (JMLR), Nature Communications, Nature Reviews Physics, Mathematical Finance, SIAM Journal on Imaging Sciences, SIAM Journal of Mathematics of Data Science, Finance and Stochastics, Bayesian Analysis, Physica D: Nonlinear Phenomena, Stochastics and PDEs.

Languages: Italian (native), French (native), English (professional).