Edoardo Lanari

Quantitative Researcher, Capital Fund Management (CFM)
Paris, France.

• email • website • LinkedIn • Github

Summary

Mathematician with 6 years of experience in mathematical research, with strong Data Science skills (Python, Machine Learning) and a passion for algorithmic trading and quantitative finance in general.
In my postgraduate years I have researched Homotopy Theory and Topological Data Analysis, and my interests are now shifted towards Machine Learning applications to Quantitative Finance.

Skills

- Higher Category Theory/Homotopy Theory
- Machine Learning (Numpy, Scikit-Learn, ...)
- Deep Learning (Keras)
- Stochastic Modelling and Statistics
- (Topological) Data Analysis

Job Experience

2022-present **Quantitative Researcher**, Capital Fund Management (CFM), Paris.

2021-2022 **Assistant Vice President (Rates/FX Derivatives)**, Deutsche Bank, Berlin.

- Analyze and validate stochastic models for Rates/FX Derivatives.
- Stress test of pricing and sensitivities models for complex derivatives products.

2019-2021 **Postdoctoral Researcher in Mathematics**, Institute of Mathematics CAS, Prague.

- Develop and investigate the theory of **higher structures**, in particular $(\infty, 2)$-categories, used in homotopy-coherent geometry, topology and algebra.
- Study different kinds of **homotopical distances** for persistence structures in Topological Data Analysis, such as **persistent spaces** and **persistent sheaves**.

2020-2021 **Lecturer in Programming**, Prague College.

- Taught a third year undergraduate course in Object-Oriented Programming.
- Autonomously designed and structured the course, with main focus on the core concepts of OOP, implemented in Python.

2018-2019 **Lecturer in Mathematics**, Charles University, Prague.

- Structured a whole two-semesters Master course in Algebraic Topology from scratch.

- Delivered classes both in person and on online platforms
- Evaluated the students performance with exams and tests I designed.

2015-2018 **Teaching Assistant**, Macquarie University, Sydney.

- TA for fundamental courses (e.g. calculus, abstract and linear algebra, discrete mathematics and probability) aimed at mathematicians and applied sciences students

Education

2015-2018 **PhD in Mathematics** under the supervision of Prof. Richard Garner and Prof. Dominic Verity, Macquarie University Faculty of Mathematics and Statistics, Sydney.

- Thesis entitled "**Homotopy theory of Grothendieck weak ∞-groupoids and ∞-categories** ".
- Pure Mathematics (homotopy theory/higher category theory) research program
- Worked on an open problem in homotopy theory, with significant results published in scientific journals
- Gave talks at international conferences.

2013-2015 **Double Master Degree in Mathematics**, magna cum laude, University of Padova (Italy) and University of Leiden (The Netherlands).

- Among top 3 students in Algebraic Topology in my year. Graduated summa cum laude (average grade 9.0/10 in Leiden and 28.8/30 with 4 out of 8 exams being awarded magna cum laude in Padova).
- Focus on advanced mathematical topics (algebraic topology, category theory, functional analysis)
- Produced a final research project (written thesis and final dissertation) entitled "**Compatibility of Homotopy Colimits and Homotopy Pullbacks of Simplicial Presheaves**", under the supervision of Prof. Ieke Moerdijk and Dr. Matan Prasma.

2010-2013 **BSc in Mathematics**, magna cum laude, University of Trento, Italy.

- Math-major 3 years Bachelor Degree. Average grade: 29.46/30 with 12 exams out of 25 being awarded magna cum laude.
- Courses including Real and Complex Analysis, Probability, General/Algebraic Topology, (differential) Geometry, Group Theory and Programming.
- Produced a final thesis entitled "Embedding of Small Abelian Categories" under the supervision of Prof. Gianluca Occhetta.

Publications

2022 **On the equivalence of all models for $(\infty, 2)$-categories** (joint work with Andrea Gagna and Yonatan Harpaz), to appear in *Journal of the London Mathematical Society*, available at link.

2021 **Rectification of interleavings and a persistent Whitehead theorem** (joint work with Luis Scoccola), to appear in *Algebraic and Geometric Topology*, available at link.

2020 **Gray tensor products and lax functors of $(\infty, 2)$-categories** (joint work with Andrea Gagna and Yonatan Harpaz), to appear in *Advances in Mathematics*, available at link.

2019 **Cartesian factorization systems and pointed cartesian fibrations of ∞-categories**, to appear in *Higher Structures*, available at link.

2018 **On truncated quasi-categories** (joint work with Alexander Campbell), *Cahiers de Topologie et Géométrie Différentielle Catégoriques Volume LXI (2020) Issue 1*, link.

2018 **Towards a globular path object for weak ∞-groupoids**, *Journal of Pure and Applied Algebra, Volume 224, Issue 2, February 2020, pages 630-702*, link.

Preprints

2021 **Bilimits are final objects** (joint work with Andrea Gagna and Yonatan Harpaz), submitted for publication, available at link.

2020 **Fibrations and lax limits of $(\infty, 2)$-categories** (joint work with Andrea Gagna and Yonatan Harpaz), submitted for publication, available at link.

2020 **Fire Sales, the LOLR and Bank Runs with Continuous Asset Liquidity** (joint work with Ulrich Bindseil), submitted for publication, available at link.

2019 **On the homotopy hypothesis in dimension 3** (joint work with Simon Henry), available at link.

2018 **A semi-model structure for Grothendieck weak 3-groupoids**, submitted for publication, available at link.

2018 **Homotopy theory of Grothendieck weak ∞-groupoids and ∞-categories** PhD thesis, available at link.

Scolarships and Grants

2015-2018 International Macquarie University Research Excellence Scholarship (iMQRES)

2018 Macquarie University Postgraduate Research Fund (PGRF)

Projects

- **Backtesting**. Portfolio optimization (alpha factors, risk factor model, transaction costs) and backtesting, using Barra data.
- **Combining Signals for Enhanced Alpha**. Build a random forest to generate better alpha, aggregating several factors.
- **Sentiment Analysis with Neural Networks**. Utilised an LSTM RNN to perform sentiment analysis on tweets.
- **NLP on Financial Statements**. Alpha generation from sentiment analysis on 10-k financial statements.

- **Alpha Research and Factor Modeling**. Researched and implemented alpha factors, built a risk factor model using PCA, used alpha factors and risk factors to optimize a portfolio.
- **Smart Beta and Portfolio Optimization**. Built a smart beta portfolio tracking an index, with quadratic programming used for optimization.
- **Breakout strategy**. Implementation in Python of a breakout strategy, including outliers analysis and statistical testing.
- **Trading strategy with momentum**. Implementation in Python of a trading strategy consisting of taking long/short positions based on momentum.

Certificates

2020-2021 **AI for Trading**, Udacity Nanodegree.

- Quantitative trading strategies
- Portfolio optimization
- Machine learning methods for quantitative research

2021 **Convolutional Neural Networks**, issued by DeepLearning.AI (Coursera).

- theoretical building blocks of convnets
- Keras and Tensorflow implementation of image classification, object detection and face recognition models.

2021 **Structuring ML Projects**, issued by DeepLearning.AI (Coursera).

- Machine Learning pipeline
- metrics choice, bias-variance analysis and train/test distribution mismatches.

2021 **Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization**, issued by DeepLearning.AI (Coursera).

- optimization algorithms
- regularization techniques
- batch normalization
- Tensorflow fundamentals.

2020 **Neural Networks and Deep Learning**, issued by DeepLearning.AI (Coursera).

- fundamentals of Neural Networks architectures
- forward/back propagation
- binary classifier implementation.

2020 **Quantitative Finance and Algorithmic Trading in Python**, issued by Udemy.

- Modern Portfolio Theory (Markowitz model)

- CAPM
- Black-Scholes model for options pricing and the Greeks
- VaR
- Machine Learning methods.

2020 **Probability-The Science of Uncertainty and Data**, issued by MITx.

- discrete/continuous random variables
- Bayesian inference
- Stochastic Processes (Bernoulli, Poisson), Markov Chains and Random Walks.