Edoardo Lanari

- email
- website
- LinkedIn
- Github

Summary

Mathematician with over 4 years of experience in mathematical research, and good knowledge of Python and Machine Learning. In addition to Homotopy Theory and Higher Category Theory, my scientific interests include Machine Learning (in particular Deep Learning) and other models for time-series analysis and quantitative trading.

Skills

- Higher Category Theory/Homotopy Theory
- Machine Learning
- Python
- SQL
- (Topological) Data Analysis
- Statistics

Job Experience

2019-present **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-present **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).

- 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.
- graduated summa cum laude in a double degree joint program (the Algant international program).

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

- Math-major 3 years Bachelor Degree.
- courses including Programming, Advanced Calculus, Probability and Measure Theory, Abstract Algebra and Topology.
- Produced a final thesis entitled "Embedding of Small Abelian Categories" under the supervision of Prof. Gianluca Occhetta.

Publications

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.

2020 **Rectification of interleavings and a persistent Whitehead theorem**(joint work with Luis Scoccola), submitted for publication, available at link.

2019 **On the equivalence of all models for $(\infty, 2)$-categories** (joint work with Andrea Gagna and Yonatan Harpaz), 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

- **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-attending **AI for Trading**, Udacity Nanodegree.

- quantitative trading strategies
- portfolio optimization
- NLP for quantitative trading

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.