ALESSIO BRINI, PH.D

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RESEARCH AND WORK EXPERIENCE

Executive in Residence - Duke University - Pratt School of Engineering   07/01/2024 - Ongoing
Digital Asset Research & Engineering Collaborative (DAREC)   *Durham, NC, USA*
305 Teer Engineering Building Box 90271, Durham, NC 27708

· My current role as a faculty member in FinTech continues my work in applying machine learning and data science methodologies to financial challenges, particularly in digital assets and decentralized finance (DeFi), while delivering advanced coursework and leading research projects in these areas.

Postdoctoral Researcher - Duke University - Pratt School of Engineering   01/23/2022 - 06/30/2024
Digital Asset Research & Engineering Collaborative (DAREC)   *Durham, NC, USA*
305 Teer Engineering Building Box 90271, Durham, NC 27708

· Applied machine learning and data science methodologies to address financial challenges, specializing in digital assets and decentralized finance (DeFi). Developed proficiency in diverse machine learning paradigms (supervised, unsupervised, reinforcement learning).

· Delivered coursework on *Machine Learning for Fintech*, *Data Wrangling and Visualization with Python*, and *Introduction to Statistics* for the Master of Engineering in Financial Technology program.

· Directed FinTech Capstone Projects spanning Machine Learning, Data Science, and Digital Ledger Technologies.

· Led summer research projects on DeFi and machine learning for graduate students.

Ph.D - Scuola Normale Superiore   11/2018 - 09/2022
Mathematical Finance   *Pisa*
P.za dei Cavalieri, 7, 56126 Pisa PI, Italy

· Concentrated on the implementation of value-based and policy-based reinforcement learning algorithms to solve diverse economic and financial issues, including trading, portfolio selection, and best execution.

Actuarial Analyst - Milliman   03/2018 - 09/2018
Florence (Remote)
V. Roberto Lepetit, 4, 20124 Milano MI, Italy

· Utilized spreadsheets, databases, and other analytical tools to synthesize and evaluate data. Communicated findings to colleagues, project leads, and senior executives and compiled detailed written reports.

TEACHING EXPERIENCE

FINTECH 540: Machine Learning for FinTech - Pratt School of Engineering, Duke University:

Explored the impact of machine learning on the rapidly evolving FinTech industry through both theoretical understanding and practical application, with extensive coding sessions utilizing real financial data.

FINTECH/ECE 590: Data Wrangling and Visualization with Python - Pratt School of Engineering, Duke University:

Leveraged Python for data querying, cleaning, manipulation, and visualization. Covered advanced topics such as Databases (MySQL, NoSQL), Web Scraping, Data Manipulation, and Data Collection.

FINTECH 502: FinTech Capstones - Pratt School of Engineering, Duke University:

Oversaw teams of students developing real-world technical solutions in the FinTech industry, with projects sponsored by industry professionals.

FINTECH 520: Introduction to Statistics - Pratt School of Engineering, Duke University:

Designed specifically for graduate students in Financial Technology, this course established fundamental statistical concepts and tools essential for advanced FinTech studies and research.

Python for Data Science - University of Florence (Italy) - March-May, Sep-Dec, 2020:

Provided an introduction to Python, covering the basics of the language structure and the main packages of the scientific stack for data analysis and extraction of meaningful information.

LIST OF PAPERS

Published Papers

· "Deep Reinforcement Trading with Predictable Returns" (with Daniele Tantari), published in "Physica A: Statistical Mechanics and its Applications"

· "Reinforcement Learning Policy Recommendation for Interbank Network Stability" (with Gabriele Tedeschi and Daniele Tantari), published in "Journal of Financial Stability"

· "Assessing the resiliency of investors against cryptocurrency market crashes through the leverage effect" (with Jimmie Lenz), published in "Economics Letters."

· "A Comparison-Based Study of Cryptocurrency Volatility-benchmarking New and Mature Asset Classes" (with Jimmie Lenz), published in "Financial Innovation".

· "Tree-Based Cryptocurrency Option Pricing: Outperforming Black-Scholes Model" (with Jimmie Lenz), published in "Economic Modelling"

· "SpotV2Net: Multivariate Intraday Spot Volatility Forecasting via Vol-of-Vol-Informed Graph Attention Networks" (with Giacomo Toscano) published in "International Journal of Forecasting".

· "Data-driven Derivative Hedging with Quadratic Variation Penalty" (with Giacomo Domeniconi and Ali Fathi) published as a conference proceedings at "ICAIF'24 5th ACM International Conference on AI in Finance".

· "Modeling and Simulating a Startup Ecosystem Development with a Delayed Differential Equation" (with Viviana Fanelli), published in "Soft Computing."

Working Papers

- "A Machine Learning Approach to Forecasting Honey Production with Tree-Based Methods" (with Elisa Giovannini and Elia Smaniotto), arXiv:2304.01215 (2023), submitted to Applied Soft Computing.

- "On Deep Reinforcement Learning for Dynamic Trading with PPO: Challenges and Future Directions" (with Petter Kolm), submitted to "Journal of Financial Data Science".

- "Honey-at-Risk: A study to quantify honey production risk in Italy" (with Ginevra Virginia Lombardi, Maria Elvira Mancino, Elia Smaniotto, and Giacomo Toscano) Available at SSRN 4562432 (2023).

- "Empirical Evaluation of Machine Learning Models for Option Pricing" (with David Hsieh, Patrick Kuiper, Sean Mouseghian, and David Ye) arXiv:2506.17511 (2025).

- "Improving DeFi Accessibility through Efficient Liquidity Provisioning with Deep Reinforcement Learning" (with Haonan Xu) arXiv:2501.07508 (2025).

Other Articles and Lightly Refereed Publications

- "Crypto dynamics during market downturns: Another dotcom boom-bust cycle?" (with Jimmie Lenz and Emma Rasiel), DAREC working paper

- "Bitcoin ETFs: Measuring the performance of this new market niche" (with Jimmie Lenz), DAREC working paper

EDUCATION

Ph.D. at Scuola Normale Superiore   11/2018 - 09/2022
Mathematical Finance.   *Pisa*

- Thesis: *Reinforcement learning for sequential decision-making: a data-driven approach for finance*

Master's degree at Università degli studi di Firenze   2016 - 2018
Quantitative Finance and Risk Management   *Florence*

- Thesis: "Beyond the parameters' estimation burden: a Bayesian framework for option pricing."

Bachelor's degree at Università degli studi di Firenze   2012 - 2015
Business and Economics.   *Florence*

GRANTS

- Co-Investigator on the project "Risk Management in Times of Unprecedented Geo-Political Volatility: A Machine-Learning Approach", funded by the Institut Europlace de Finance (IEF), Institute Louis Bachelier (Grant amount: 10k €).

- Collaborator in the "BEEkeepers Weather Indexed INsurance" project at the University of Florence, funded by the Italian Ministry of Agricultural, Food and Forestry Policies (Grant amount: 600k €).

CONFERENCES

AI for Social Impact: Bridging Innovations in Finance, Social Media, and Crime Prevention - AAAI Conference - Philadelphia, March 3, 2025:

- Contributed Talk: *Improving DeFi Accessibility through Efficient Liquidity Provisioning with Deep Reinforcement Learning* Won best paper award - link

ICAIF'24 5th ACM International Conference on AI in Finance - New York, November 14-17, 2024:

· Poster Presentation: *Data-driven Derivative Hedging with Quadratic Variation Penalty*

2024 NBER-NSF Time Series Conference - Philadelphia, September 20-21, 2024:

· Poster Presentation: *SpotV2Net: Multivariate intraday spot volatility forecasting via vol-of-vol-informed graph attention networks*

Machine Learning of Dynamic Processes and Time Series Analysis - Pisa, November 26-27, 2020:

· Contributed Talk: *Trading Mean Reversion with Reinforcement Learning*

13th European Financial Mathematics Summer School - Vienna, August 31 - September 4, 2020:

· Contributed Talk: *Trading Mean Reversion with Reinforcement Learning*

Eastern European Machine Learning Summer School - Krakow, July 1-9, 2020:

· Poster Presentation: *Trading Mean Reversion with Reinforcement Learning*

PROFESSIONAL ACTIVITIES AND SERVICES

Internal Activities (Duke University, Pratt School of Engineering):

· Assisting with recruitment and admissions review for the FinTech graduate program (2023-Ongoing).

· Enhancing program outreach within the industry and research landscapes.

Referee Service:

· Annals of Operations Research

· Expert Systems with Applications

· Financial Innovation

· Finance Research Letters

· Scientific Reports

· Applied Economics

· Journal of Applied Economics

· Qeios

· Animal Science Journal

· AI, Computer Science and Robotics Technology

· International Conference in AI for Finance (ICAIF) 2024

· European Conference in AI for Finance (ECAIF) 2024

Advising & Mentoring - Graduate Students:

· Duccio Guerrini, University of Florence, 2020: "Stock market indexes and machine learning algorithms. Replication of the S&P500 index by the autoencoder neural network."

· Dmitry Guzairov, University of Florence, 2021: "Hierarchical risk-parity portfolios: a clustering approach to the investment problem"

· Niccolò Tarchi, University of Florence, 2021: "Transformer-based approach for creating financial portfolios"

· Mike Liu, Duke University, 2022: Independent Study on Asset Pricing and Financial Dashboard development

· Alex Ilgenfritz, Duke University, 2023: "Optimal Liquidity Provision in Uniswap v3 with Reinforcement Learning"

· Haonan Xu, Duke University, 2024: "Improving DeFi Accessibility through Efficient Liquidity Provisioning with Deep Reinforcement Learning"

· Claire Zhou, Duke University, 2025: "Graph Neural Networks for Bridge Swap Link Detection on Uniswap"

· Longyi Hu, Duke University, 2025: "Conformal Prediction for Finance and Economics."

Conference Organizations:

· Scientific Committee - Florence-Paris Workshop: Statistics of Random Processes and Its Applications to Financial Econometrics, July 2023, Florence, Italy

· Organizer - Digital Assets at Duke (DA@D), January 2023 and 2024, Durham, NC, USA

SKILLS

Proficient Knowledge	Python, Tensorflow, Pytorch, SQL, Office suite (Excel)
Intermediate Knowledge	Docker, Matlab, R
Basic Knowledge	JavaScript, Eviews
Languages	**Italian**: Native, **English**: Fully Proficient