Caleb Maresca

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PhD student at New York University researching the intersection of artificial intelligence and economic systems.

Experience

SPAR – Mentor Sept 2025 – Dec 2025

Mentoring research on novel MLP decomposition techniques that split layers along input/output dimensions to enable dramatically finer-grained expert specialization in mixture-of-experts architectures.

Upstart – Machine Learning Research Scientist Intern Jun 2025 – Sept 2025

Developed a novel causal ML model for direct mail optimization that outperformed production baseline by 55% in A/B testing; model adopted for ongoing campaigns.

AI Safety Camp – Research Team Member Jan 2025 – June 2025

Created Python package for interactive scenario generation to train and evaluate LLM-based reinforcement learning systems.

Oxford AI Safety Initiative – ARBOx Participant Jan 2025

Completed an intensive Machine Learning Safety bootcamp. Won third place project for analyzing and proposing extensions to the novel Mixture of Monosemantic Experts architecture.

New York University – Research Assistant Aug 2024 – Jan 2025

Conducted critical analysis of LSTM architectures for investor bias quantification.

New York University – Teaching Assistant Aug 2023 – Jan 2024

Developed and led tutorial sessions for Microeconomics 1 (PhD).

Hebrew University of Jerusalem – Research Assistant 2020 – 2022

Developed theoretical proofs and statistical simulations for behavioral economics research.

Education

New York University – PhD Student – Economics 2022 – Present

Select coursework:

Foundations of Machine Learning and Deep Learning – Deep neural networks, RNNs, CNNs, attention and transformers, autoencoders, GANs

Deep Learning and LLM Systems – Distributed and cloud-based training, MLOps, LLM pre-training and fine-tuning, RAG and agents, efficient LLM serving, RLHF

Econometrics IV – Causal inference, causal machine learning

Econometrics II – Time series models, ARMA, VARs

Math for Economists II – Measure theory and measure theoretic probability theory

Math for Economists I – Real analysis

Hebrew University of Jerusalem – MA – Economics 2021 – 2022

Hebrew University of Jerusalem – BA – Economics 2018 – 2021

Professional Skills

- Programming Languages: Python, R, Julia, SQL
- ML & DL Frameworks: PyTorch, TensorFlow, Scikit-learn, XGBoost, Ray, WandB
- Data Science & Analytics: NumPy, Pandas, Scikit-learn, Matplotlib, Seaborn
- Development Tools & Systems: Git, Linux

Selected Research

Transformative AI, Entrepreneurship, and Inequality

Developing a quantitative model examining how advanced AI could affect inequality through dual channels: empowering entrepreneurs while displacing workers. I analyze whether financial frictions and fixed costs trap workers in declining labor markets despite AI making business creation more attractive.

Racing for the Future: Capital Accumulation Before Transformative AI

Developed theoretical model analyzing how expectations of advanced AI affect current economic decisions. Shows how anticipated automation creates novel savings incentives as households compete for future control of AI labor.

Multi-Stock Return Prediction Using LLMs and Financial News; with Nishant Asati

GitHub: https://github.com/CalebMaresca/nscan

Developed novel methodology integrating financial news analysis with stock embeddings using Differential Transformers to predict multiple stock returns simultaneously. Implemented end-to-end ML pipeline including data preprocessing, model architecture design, distributed training and hyperparameter optimization.