

# Nathan Weill

3<sup>rd</sup> year PhD student at Columbia IEOR  
(332)276-8348 | nmw2142@columbia.edu

## EXPERIENCE & PROJECTS

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### Research @ Columbia IEOR PhD program

New York, NY, Apr 2024 – Present

Currently working on adaptive statistical methods for learning under covariate shift, under the supervision of Professor Kaizheng Wang. Broadly interested in transfer learning and machine learning theory.

### AI Research Intern @ RTE (French electrical power TSO)

Paris, France, Apr 2023 – Sept 2023

- Implemented and validated deep learning generative models (GAN, VAE, NF) to simulate and forecast renewable power generation time series
- Published the new model at the 20th International Conference on the European Energy Market (EEM 2024): N. Weill and J. Dumas, "Deep Generative Methods for Producing Forecast Trajectories in Power Systems", doi: 10.1109/EEM60825.2024.10608920

### Machine Learning Engineer Intern @ Acoustic Wells (tech startup)

Boston, MA, Nov 2021 – Apr 2022

- Used signal processing, Bayesian linear regression & optimization for physical modeling as a filtering problem
- Developed an unsupervised outlier detection algorithm in a multi-dimensional time series for a leak detection problem
- Used AWS Cloud infrastructure & PostgreSQL for IoT application

### Quantitative Researcher Intern @ Eisler Capital (multi-strategy hedge fund)

London, UK, May 2021 – Oct 2021

- Developed a latent Ornstein-Uhlenbeck swap interest rate model calibrated via Kalman filter and recursive MLE; used it to devise and implement a relative value trading strategy
- Applied optimal stochastic control to portfolio optimization
- Used lattice-based method for American Option pricing for the wild-card option in the bond futures market

### Various projects

- Academic: Implemented a novel decomposition method and  $\ell_1$ -norm ADMM algorithm for large-scale Mixed-Integer Linear Programming
- Academic: Optimized a large network of uranium extraction pipes viewed as a Steiner Tree problem with C++ for Orano
- Volunteering: Installed hydroelectric turbines in a village in North Vietnam (Ha Giang region), providing 20 new houses with electricity

## EDUCATION

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### Columbia University IEOR, PhD level classes (GPA 3.91/4.00)

New York, NY, Sept 2023 – Present

- Stochastic Core (Measure theory, Convergence & Limit Theorems, Discrete/Continuous Markov Chains, Martingales, Poisson Processes, Concentration Inequalities, Large Deviation Theory, Chaining & High-Dimensional Probability, Brownian motion & Itô calculus, SDEs)
- Optimization Core (Linear Programming, Simplex & Interior point Methods, Combinatorial Optimization, Network Flows, Graph Algorithms)
- Other: Market Design (Matching Markets, Auctions), Generative AI (LLMs, fine-tuning, RL approaches), Differentiable Manifolds, AI agents

### Mines Paris - PSL, Master of Science and Executive Engineering (GPA 3.78/4.00)

Paris, France, Sept 2019 – Apr 2023

- Mathematics (Real & Complex Analysis, Linear Algebra, Probability, Statistics, Discrete & Continuous Optimization, Signal Processing)
- Physics (Quantum/Statistical, Thermodynamics, Fluid & Classical Mechanics, Material Science, General Relativity, Standard Model)
- Computer science (Algorithms & Data Structures, Advanced Python), Data Science (Regression & Classification problems, Ensemble Learning, Dimension Reduction, Deep Neural Networks, Computer Vision)

### ENS Paris-Saclay, MVA Master of mathematics and AI (GPA 3.86/4.00)

Paris, France, Sept 2022 – Apr 2023

- Fall: Convex Optimization, Reinforcement Learning, Optimal Transport, Computational Statistics (MCMC & Bayesian Inference)
- Spring: Machine Learning for Time Series, Deep Generative Models, Information Theory and Statistical Physics for high-dimensional data

### Lycée Louis-le-Grand, Intensive preparatory program for selective Higher Education

Paris, France, Sept 2017 – Jul 2019

- Senior level mathematics, physics, chemistry and computer science

## TECHNICAL SKILLS

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**Programming:** Python, C++, SQL(Postgres), NumPy, Pandas, Scikit-learn, TensorFlow, PyTorch, Gurobi, AWS, Git, Bash,  $\LaTeX$

**Languages:** French (native), English (fluent), German/Italian (intermediate)