

# Shenbo Xu

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## IDIO

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- Ph.D candidate in statistics at MIT, causal machine learning on multivariate stochastic processes
- Quant research: intern on alpha stat arb at Point72; portfolio construction with Liberty Mutual
- Worked with experienced industry machine learning researchers in the MIT-IBM Watson AI Lab
- Proficient in Python & R; hands-on experience with financial datasets

## EDUCATION

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**Ph.D Candidate in Statistics and Data Science, MIT**, Cambridge, MA *2019 - 2025 January*

Individually tailored interdisciplinary degree path

Dissertation: Causal inference with survival outcomes via orthogonal statistical learning

Focus: semiparametric theory, statistical learning, and counting process

Advisors: Roy Welsch, Stan Finkelstein; Other committee members: Whitney Newey, Zach Shahn

Coursework: reinforcement learning, statistical learning theory, mathematical statistics, optimization methods, computational science and engineering, advanced epidemiologic methods, causal inference, advanced quantitative research methods, stochastic systems, Major GPA: 4.7, Minor: Thermofluids

S.M. in Mechanical Engineering, MIT, Cambridge, MA

*2016 - 2019*

Master thesis: Drug repurposing: design, emulation, and analysis of synthetic in-silico clinical trials using electronic health records and modern data analytics

B.S. in Mechanical Engineering, Dalian University of Technology, Dalian, China

*2012 - 2016*

## EXPERIENCE

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**Point72 Asset Management**

New York, NY

**Quantitative Research Intern, Signal Research Team, Internal Alpha Capture** *2024 Summer*

Topic: Alpha research on mid-frequency event-driven statistical arbitrage

- Generated ideas and developed novel predictive return signals orthogonal to internal alpha from team and long/short portfolio managers
- Constructed features based on subject matter knowledge, adopted generic machine learning, ensemble learning, as well as deep learning, and identified relationships using interpretable machine learning
- Devised systematic adaptive trading strategies that outperform benchmark with low-risk
- Performed trade analytics on winning and losing trades
- Profiled, abstracted, and refactored feature ETL, EDA, model training, multiprocessing, hyperparameter tuning, performance evaluation, and backtester into reusable codebase

Extension: factor/representation/embedding investing, multimodality

Other 1-week projects: SEC 13F, limit order book, A share every 3 secs, monthly SP500 factor models

**Liberty Mutual Investments** and the MIT Quest for Intelligence

Cambridge, MA

Research Assistant, **Strategy and Asset Allocation Team**

*2024*

Topic: Strategic asset allocation for illiquid portfolio construction

Advisor: Prof. Hui Chen

- Formulated a dynamic programming/reinforcement learning framework for portfolio construction, incorporating capital commitment to illiquid assets
- Developed a stochastic optimal control algorithm for the discrete-time Bellman equation, enabling Markovian regime-switching, strategic default, liquidity default, return autocorrelation and firesale of illiquid assets, etc.
- Adopted gaussian process regression to quantify uncertainty and Bayesian active learning to improve accuracy
- Estimated required parameters using quarterly data on buyouts, growth, and venture funds and simulate paths for liquid asset dynamics as well as illiquid capital commitments to aid decision-making on asset allocation and default timing

- Profiled and optimized implementation using Numba for speed improvements
  - Employed optimizer Gurobi and scipy, and refactor code to improve efficiency and maintainability
- Extension: higher-dimensional state space, order book flow/execution, market impact, trade/liquidity research, derivatives, (deep/causal/conformal) reinforcement learning

**MIT-IBM Watson AI Lab**, Center for Computational Health, Research Assistant *2019 - 2023*  
 Topic: Medical alpha research using IBM MarketScan and IBM Explorys Advisor: Dr. Kenney Ng

**MIT Sloan, Operations Research and Statistics**, Research Assistant *2017 - 2022, and 2024*

ICL, School of Public Health, Visiting Researcher *2017 - Present*  
 Topic: Medical alpha research using CPRD Advisor: Prof. Ioanna Tzoulaki

MIT Sloan, Lab for Financial Engineering, Research Assistant *2017*  
 Topic: Spectral analysis of asset market dynamics using WRDS Advisor: Prof. Andrew Lo

TA for 15.450/15.457 Analytics of Finance/Advanced Analytics of Finance *2024 Spring*

TA for 15.S08 Natural Language Processing for Finance *2023 Fall*

TA for 15.034/15.0341 Econometrics for Managers *2023 Spring*

TA in statistics, machine learning, probability: 15.087, 15.062, 15.071/15.072, 15.077, 15.069, 15.086

## PUBLICATIONS

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**S. Xu**, B. Zheng, B. Su, S. Finkelstein, R. Welsch, K. Ng, and Z. Shahn. Can metformin prevent cancer relative to sulfonylureas? A target trial emulation accounting for competing risks and poor overlap via double/debiased machine learning estimators. *American Journal of Epidemiology*, July 2024.

**S. Xu**, R. Cobzaru, S. Finkelstein, R. Welsch, K. Ng, I. Tzoulaki, and Z. Shahn. Estimating heterogeneous treatment effect from survival outcomes via censoring unbiased orthogonal learning. Submitted to the *Journal of the American Statistical Association*.

**S. Xu**, S. Finkelstein, R. Welsch, K. Ng, I. Tzoulaki, and Z. Shahn. Estimating cumulative treatment effects on target population by double/debiased machine learning. Submitted to the *Journal of the Royal Statistical Society, Series B (Statistical Methodology)*.

**S. Xu**, C. Duffy, S. Finkelstein, R. Welsch, K. Ng, and L. Middleton. Foundational model aided automated high-throughput drug screening using self-controlled cohort study. Submitted to the AIDrugX at NeurIPS24.

Z. Shahn, P. Spear, H. Lu, S. Jiang, S. Zhang, N. Deshmukh, **S. Xu**, K. Ng, R. Welsch, and S. Finkelstein. Systematically exploring repurposing effects of anti-hypertensives. *Pharmacoepidemiology and Drug Safety*, 2022, 31(9), 944-952.

S. Finkelstein, **S. Xu**, B. Su, B. Zheng, M. Charpignon, I. Tzoulaki, L. Middleton, and R. Welsch. Anti-diabetic drug repurposing using electronic health records: design, emulation and analysis of a synthetic in-silico clinical trial for Alzheimer’s disease. *Machine Learning for Healthcare 2019*, Ann Arbor, MI.

**S. Xu**, S. Finkelstein, R. Welsch, B. Su, B. Zheng, M. L. Charpignon, and I. Tzoulaki. Repurpose anti-diabetic drugs for cancer based on causal evidence. *CFE-CMStatistics 2019*, London.

Previous papers on MEMS can be found in my Google Scholar and ResearchGate.

## SKILLS AND OTHERS

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<b>Tools</b>	Keras, PyTorch, TensorFlow, Numba, Optuna, Gurobipy, OOP, HuggingFace, etc.
<b>Programming</b>	intermediate: MATLAB, SQL; basics: C; PyCharm, VS Code, Linux, git, $\LaTeX$
<b>Finance</b>	CQF (Distinction), CFA Level 1, CAIA Level 1, FRM
<b>Award</b>	Chiang Chen Overseas Scholarship, \$50,000, 10 undergrad/grad in China, <i>2015</i>