

# Manqing Liu

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## Summary

PhD candidate at Harvard specializing in AI safety and causal machine learning. My current research focuses on detecting reasoning pathologies in large language models—specifically post-hoc, encoded, and internalized reasoning—by developing end-to-end evaluation pipelines for training-time monitoring and scalable oversight. I've also worked on causal machine learning research in collaboration with Dr. Andrew Beam and Dr. James Robins. I am seeking Research Scientist or Research Engineer roles in model evaluation, post-training, alignment, and safety.

## Education

- 2021–Present **Ph.D. in Causal Machine Learning**, *Harvard University*
- 2022–Present **Secondary field in Computer Science and Engineering**, *Harvard University*
- 2021–Present **M.Sc in Biostatistics**, *Harvard University*
- 2017–2020 **Post-Baccalaureate Studies in Maths/Statistics**, *University of Pennsylvania*
- 2014–2016 **MHS in Epidemiology**, *Johns Hopkins University*

## Relevant Coursework

- Causality Advanced Epidemiologic Methods, Models for Causal Inference
- Maths and Statistics (MIT) Matrix Methods in Data Analysis & Signal Processing, (MIT) Introduction to Functional Analysis, Probability, Statistical Inference, Advanced Regression and Statistical Learning, Bayesian Inference
- Computer Science Systems Development for Computational Science, High Performance Computing for Science and Engineering, Stochastic Methods for Data Analysis, Inference and Optimization
- Machine Learning AI safety, (MIT) Machine Learning, (MIT) Quantitative Methods for NLP, Deep Learning for Biomedical Data, Geometric Methods for Machine Learning, Algorithms for Data Science

## Research Experience

- July 2025 – **Diagnosing Pathological Chain-of-Thought in Reasoning Models**
- Sept 2025 Completed MARS fellowship developing novel metrics to detect CoT pathologies in LLMs. Developed and implemented comprehensive evaluation metrics to identify and monitor pathologies in Chain-of-Thought (CoT) reasoning across large language models, including post-hoc, internalized, and encoded reasoning patterns. Collaborated on fine-tuning open-weight LLM models to elicit internalized and encoded reasoning capabilities in model organisms.

Oct 2024 – **Doubly Robust MCTS for LLM reasoning**

Jan 2025 Integrated doubly robust estimator into Monte Carlo Tree Search (MCTS), enabling large language models to perform complex, multi-step reasoning and planning with higher accuracy and sample efficiency in real-world scenarios.

June 2023 – **DAG aware Transformer**

Dec 2024 Engineered a novel DAG-aware transformer model to precisely estimate causal effects, addressing foundational challenges in unifying causal effect estimation under various scenarios.

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## Publications

- 2025 **Diagnosing Pathological Chain-of-Thought in Reasoning Models**, *Liu M.*, Williams-King D., Caspary I. et al. Under review at ICLR, 2026. [PDF]
- 2025 **Doubly Robust Monte Carlo Tree Search**, *Liu M.*, Beam A. Under review at ICLR, 2026. [PDF]
- 2024 **DAG-Aware Transformer for Causal Effect Estimation**, *Liu M.*, Bellamy D., Beam A. Causal Representation Learning workshop at NeurIPS 2024. Available at: [arXiv:2410.10044](https://arxiv.org/abs/2410.10044)
- 2022 **Development of Machine Learning Algorithms Incorporating Electronic Health Record Data, Patient-Reported Outcomes, or Both to Predict Mortality for Outpatients with Cancer**, Parikh R.B., Hasler J.S., Zhang Y., *Liu M.*, Chivers C., et al., *JCO Clinical Cancer Informatics*, 6.
- 2021 **Trajectories of Mortality Risk Among Patients with Cancer and Associated End-of-Life Utilization**, Parikh R.B., *Liu M.*, Li E., Li R., Chen J., *npj Digital Medicine*, 4(1):104.
- 2020 **Validation of a Machine Learning Algorithm to Predict 180-Day Mortality for Outpatients with Cancer**, Manz C.R., Chen J., *Liu M.*, Chivers C., Regli S.H., et al., *JAMA Oncology*, 6(11):1723-1730.

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## Professional Experience

- Summer 2025 **Research Fellow**, *Cambridge AI Safety Hub*, Cambridge, UK, MARS Fellowship Program  
Completed competitive 3-month research fellowship focused on AI safety and alignment. Conducted independent research on detecting pathological reasoning behaviors in large language models under mentorship from University of Cambridge with collaborators from UCL and Mila. Developed novel evaluation methodologies for Chain-of-Thought pathologies with implications for AI system reliability and trustworthiness.
- Summer 2024 **Technical AI safety Fellowship**, *AI safety student team*, Cambridge, MA, USA  
Attended a 8-week reading group on AI safety, covering topics like neural network interpretability, learning from human feedback, goal misgeneralization in reinforcement learning agents, and eliciting latent knowledge.

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## Skills

Programming Languages Python, C++, R, SAS, STATA

Libraries and Frameworks PyTorch, Tensorflow, Pandas, NumPy

Others Causal Inference, Machine Learning, Deep Learning