Matt McManus

mattmcmanus41@gmail.com | mmcmanus1.github.io
Citizenship: U.S Citizen | **Location:** New York, NY

Summary

Research-oriented ML engineer focused on structure-aware learning and reliable decision systems—leakage-safe evaluation, probability calibration, and mechanistic probes for LLM agents in macro settings. MIT (Julia Lab) thesis on physics-informed INS; Two Sigma factor research with decorrelation and rigorous OOS walk-forward validation.

Education

Massachusetts Institute of Technology Cambridge, MA
Master of Engineering in Computer Science, GPA: 5.0/5.0 *Aug. 2023 - Jun. 2024*
- Thesis: Physics-informed neural ODEs for inertial navigation systems with Prof. Alan Edelman (Julia Lab)

Bachelor of Science in Mathematics & Computer Science *Aug. 2019 - Feb. 2024*
- Graduate/Research: Modeling with ML, LLMs & Beyond, Multi-Agent Comm., Scientific ML, Stat. Learning Theory
- Math/Theory: Probability, Linear Algebra, Optimization, Algorithms, Statistics
- Activities: MIT Varsity Squash, MIT Pokerbots President, MIT Bitcoin Club, HKN Tutor

Experience

Bridgewater Associates — AIA Labs New York, NY
Machine Learning Engineer *Sept. 2024 – Dec. 2025*
- Framed LLM reliability as calibration; posed hypotheses on dispersion, selective prediction, and prompt/program search.
- Built time-keyed, no-peek evaluation (recency gates, allowlists); ran walk-forward studies with Brier and log-loss.
- Evaluated Platt/isotonic calibration and LLM-as-Judge probes; documented failure modes; scaled via FastAPI/K8s.

Investment Engineer Intern *Jun. 2023 - Aug. 2023*
- Developed data models and **algorithmic systems** to solve complex investment problems
- Designed statistical instruments for analyzing macroeconomic business cycles

Two Sigma New York, NY
Quantitative Researcher (Part-time) *Jan. 2024 – Jun. 2024*
- Developed **cross-sectional alphas**; factor-neutral (beta/sector/size) and validated via rolling **OOS rank IC and IR**.
- Designed feature- and learner-level **decorrelation** (orthogonalization, column subsampling, correlation-penalized loss).
- Built a **leakage-safe** walk-forward pipeline with rolling normalization, liquidity-weighted scoring, and reproducible backtests/ablations.

MIT CSAIL — Julia Lab (Advisor: Alan Edelman) Cambridge, MA
Graduate Researcher — Scientific ML & INS *Sep. 2023 – Jun. 2024*
- Built Julia **physics-informed neural ODEs** for strapdown INS and cut 3D RMSE by **63%** vs tuned EKF.
- Developed IMU simulation harness enabling **100+ walk-forward tests** daily with automated robustness checks.
- Open-sourced reproducible pipelines with CI, adopted by Leidos for navigation-grade sensor validation.

MIT CSAIL — ALFA (Advisor: Una-May O'Reilly) Cambridge, MA
Undergraduate Researcher — LLMs for Cyber Defense *Sep. 2022 – Jun. 2023*
- Built **graph-based cyber-defense simulator**; used GPT-3 for anomaly detection and attack pathing.
- Ran controlled studies across 50+ network topologies; achieved **2x faster** decision latency vs RL baselines.
- Prototyped **neuro-symbolic** layers for interpretability; saved resources by pivoting after rigorous A/B testing.

Selected Research

AIA Forecaster: LLM-Based Judgmental Forecasting *Bridgewater, 2025*
Technical Report; LLM Agents, Calibration, Forecasting
- LLM forecasting with agentic search, supervisor reconciliation, and calibration; matched superforecasters on ForecastBench.
- Ensemble with market consensus beats consensus alone; first expert-level AI forecasting at scale.

How Do Transformers "Do" Math? Interpretability for Linear Regression *MIT, 2024*
Course Research Project / Poster; Mechanistic Interpretability, Probing & Interventions
- Showed transformers encode/use task intermediates (slope w) via features; tied encoding to performance via probing
- Provided causal evidence via reverse probes + interventions (forcing $w \to w'$ predictably shifts outputs)

Full research portfolio: mmcmanus1.github.io/research/

Technical Skills

ML/AI: PyTorch · TensorFlow · Hugging Face · Transformers/LLMs · Reinforcement Learning · Scientific ML · XGBoost
Programming: Python · Julia · C++ · Scala · Java · Go · SQL/Spark · JavaScript · R
Infrastructure: AWS · Docker · Kubernetes · Git · CI/CD · Distributed Systems · PostgreSQL
Finance: Quantitative Research · Factor Models · Backtesting · Risk Management

Leadership & Achievements

MIT Pokerbots President: Led Harvard-MIT ML poker competition (**250+** students), secured **$100k+** sponsorships
MIT Phi Kappa Theta President: Led fraternity operations and member development
MIT Varsity Squash: Achieved National Team Ranking of **16th** in U.S. (2023-2024), 4-year starter