

Timothy Habashy

thabashy@mit.edu | (832) 713-8802 | Cambridge, MA | U.S. Citizen

EDUCATION

Massachusetts Institute of Technology

2025–2029

SB AI and Decision Making; SB Physics

- Relevant coursework: Probability and Random Variables (18.600); Algorithms (6.1210); Fundamentals of Programming (6.1010); Differential Equations (18.03); Mathematics for CS (6.1200); Honors Multivariable Calculus (18.022); Physics III (8.03); Quantum Physics I (8.041).
- GPA: 5.0/5.0

PROJECTS

TabM Reproduction and Uncertainty Estimation

In Progress

- Reproducing the ICLR 2025 paper *TabM: Advancing Tabular Deep Learning with Parameter-Efficient Ensembling*; implementing TabM and TabM-mini from scratch in PyTorch and validating them against the official implementation.
- Benchmarking TabM against standard MLPs and independent ensembles across regression, binary-classification, and multiclass-classification datasets, with reproducible multi-seed experiments, unit tests, and automated result logging.
- Investigating whether disagreement among TabM’s implicit ensemble members provides useful uncertainty estimates and distribution-shift detection; studying calibrated disagreement scores and post-training member pruning to improve the uncertainty–accuracy–efficiency tradeoff across diverse tabular-learning settings.

Monte Carlo Option Pricing Engine

2026

github.com/timothyhabashy/Monte-Carlo-Option-Pricing-Engine

- Built a modular, vectorized GBM Monte Carlo pricer with **Market/Contract** dataclasses; supports European call/put, digital calls, arithmetic Asian calls, and up-and-out barrier calls; validated European prices with sanity checks.
- Implemented batched simulation for memory-safe scaling and antithetic variance reduction for terminal-payoff products; reported standard errors and 95% CI to quantify sampling uncertainty across repeated pricing experiments.
- Added visuals (sample paths) and an optional **yfinance** market bootstrap (spot/dividend yield/historical vol).

Gaia DR3 Star Mapper

2026

github.com/timothyhabashy/Star-Mapper-Gaia-Hackathon-26

- Queried Gaia DR3 via ADQL and transformed RA/Dec/parallax into an Earth-centric 3D Cartesian star map.
- Computed 3D velocities from proper motions and radial velocity and generated a dynamical animation (5,000 years/frame) of stellar trajectories using a gravitational potential and leapfrog integration.
- Placed 1st for “Most Significant Scientific Plot” at MIT’s Annual Gaia Hackathon.

RESEARCH

Math/ML Research – Dual-Number Associative Arrays, MIT SSRC

2026–Present

- Developing a dual-number-style semiring extension for associative-array algebra to track values, provenance, and first-order sensitivity simultaneously in sparse data and machine-learning computations.
- Studying how perturbations to graph, table, and feature inputs propagate through D4M/GraphBLAS-style machine-learning computations, associative-array operations, and sparse linear-algebra kernels.
- Testing representative examples across graph analytics, database-backed machine-learning workflows, and semiring-based learning methods; preparing a technical write-up and research presentation for the 2026 IEEE URTC.

Researcher – Center for Ultracold Atoms, Fermi 2

2026

- Calibrated, tested, and refined photodetectors for optical trap amplitude stabilization.
- Built a high-gain, low-noise amplifier circuit and used oscilloscopes to measure power-supply, photodetector, and Johnson–Nyquist noise in resistors, identify dominant noise sources, and improve photodetector testing accuracy.
- Constructed high-sensitivity photodiodes from individual parts; tested their response and used optical alignment procedures to integrate them into the main experimental setup for reliable optical-trap amplitude stabilization.

SCIENTIFIC AND TECHNICAL SKILLS

Languages: Python, MATLAB, Julia, C, SQL, CSS, HTML

Libraries: PyTorch, NumPy, SciPy, pandas, Matplotlib, TensorFlow, Scikit-learn, python-graphblas

Tools: Git, Linux, SLURM, Jupyter, COMSOL, LaTeX/TeX

Laboratory: Electronics, oscilloscopes, optical alignment, data acquisition

LEADERSHIP EXPERIENCE

Tutor, Arab Department Youth Meetings, Houston First Church of God

2022–Present

- Taught and continue to teach advanced HS STEM courses (AP Physics/Chem, Calc BC, Multivariable Calc).
- Guided four tutees to achieve 5s on the Calculus BC and AP Physics C: Mechanics exams through tailored weekly 2-hour tutoring sessions.