

Tim Healy

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Education

University of Illinois Urbana-Champaign

May 2025

Bachelors of Science in Mathematics (Applied Mathematics)

Physics Minor

Technical Skills

Programming: Python, C++, SQL, R, Java, Wolfram Mathematica, MicroPython

Core Competencies: Numerical Modeling, Statistical Modeling, Machine Learning, Computational Physics, Data Visualization

Computation & ML: PyTorch, scikit-learn, SciPy, GEANT4 (Monte Carlo), FFT, Agentic Programming

Hardware & Systems: Embedded Systems (ESP32, IoT), SiPM/MPPC Photosensors, DAQ systems, Circuit Board Assembly, AutoCAD

Experience

KoBold Metals x Occidental College (Muon Tomography Particle Physics Lab)

Los Angeles, CA

Research Scientist

September 2025 - Present

- Promoted to design next-generation particle detectors for sub-surface imaging technology for the rare Earth mineral discovery
- Designed, assembled, and deployed three imaging system prototypes, securing **\$3.5 million** in funding (ARPA-E) for mass production
- Deployed hodoscope imaging system in Turkish mine (July 2026)
- Spearheaded design effort to reduce detector unit cost by **5x** and assembly time by **~66%** while maintaining **>95%** efficiency
- Built GEANT4 Monte Carlo simulations (**C++**) modeling photon transport inside detector to optimize detector geometry
- Calibrated hodoscope system to achieve **<3mm** spatial resolution through statistical analysis (**Python, R**) and numerical modeling
- Reduced mineral deposit discovery period by increasing detector efficiency by **~29%** by resolving edge case issues

Research Assistant

June 2025 - August 2025

- Assembled all hardware and electronics systems of three scintillator particle detectors; developed CAD models, 3D-printed hardware components, soldered and debugged PCB circuit boards, constructed metal enclosures
- Reduced data acquisition (DAQ) software development cycle time from hour to minutes by developing remote, push-based OTA microprocessor firmware update infrastructure (**MicroPython**) for GPS-enabled embedded IoT communication DAQ

University of Illinois Urbana-Champaign (High Energy Physics Lab) x KoBold Metals

Champaign, IL

Research Assistant

March 2024 - May 2025

- Led numerical simulation effort of cosmic air shower detectors for muon tomography sub-surface imaging system
- Developed Monte Carlo simulations in GEANT4 (**C++**) to model plastic scintillator detector response to high-energy muon collisions; validated simulation accuracy against analytic Bethe-Bloch energy loss and Birks' Law scintillation yield calculations
- Performed exploratory data analysis (**EDA**) on spatial and temporal simulated distributions; created clear visualizations (**matplotlib**) for weekly progress presentations
- Assembled ten first round prototypes of detectors to meet strict development deadline; oversaw daily lab operations, including inventory tracking, workflow coordination, and meeting facilitation

Axis Capital Research Center

Champaign, IL

Data Engineer Intern

Jan 2023-Aug 2023

- Identified holes in company data records by spearheading statistical analysis (**R, Python, SQL, Databricks Notebooks**) of geospatial data to estimate financial loss distributions of probabilistic CAT (catastrophe) models; implemented parametric models and kernel density estimator
- Migrated legacy SQL databases to a modern data architecture, improving data querying and retrieval times

Publications and Projects

- *Work presented at conference:* D. Snowden-Iff, "[Muography at 1 km depth: Results](#)" *Muographers 2026*, Budapest, Hungary, 2026
- *Work presented at conference:* J. Gauvreau, "[Muography at 1 km depth: Hardware](#)" *Muographers 2026*, Budapest, Hungary, 2026
- *LLMs from scratch:* Implemented mini **GPT-2, CNN, MLP, Bigram** architectures from scratch, building from manual backpropagation in pure **NumPy** to reconstructing **PyTorch torch.nn** modules from **torch.tensor** primitives, including self-attention mechanisms

Certifications and Leadership

Stanford Online / DeepLearning.AI Certification: Advanced Learning Algorithms

Stanford Online / DeepLearning.AI Certification: Supervised Machine Learning: Regression & Classification

Executive Account Director | CTRL+V Production Agency (AAF@Illinois) - Co-led 40 member video production agency; managed five clients