Tim Healy

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Education

University of Illinois Urbana-Champaign — May 2025
Bachelors of Science in Mathematics (Applied Mathematics) — Major GPA: 3.43/4.0
Physics Minor

Experience

KoBold Metals x Occidental College (Muon Tomography Particle Physics Lab) — **Los Angeles, CA**
Research Scientist (Computational and Experimental High Energy Physics) — **September 2025 - Present**
- Promoted to lead end-to-end design and development of particle detectors to be used for next-generation imaging technology for the rare Earth mineral discovery. Contributed to the design, testing, construction, and deployment of detectors in 3 projects. Hodoscope detector design scheduled for deployment in a Turkish mine (Cayeli, 2026)
- Spearheaded detector design optimization, driving down cost (~**80%**) and manufacturing time (**~66%**) while maintaining **95%** detection efficiency by building detector monte carlo GEANT4 simulation (**C++**) and running trials
- Calibrated detector, resulting in <3mm spatial resolution by processing detector signal and performing statistical analysis (**R**)
- Streamlined detector DAQ software development cycle (GPS-enabled embedded IoT communication) by developing remote (**over-the-air**) microprocessor firmware update infrastructure (**MicroPython**), resulting in cycle time reduction from hour to minutes
- Increased detector efficiency by (**20%**) by resolving edge case issues through simulation (**Python, C++**) and theoretical analysis

Research Assistant — **June 2025 - August 2025**
- Deployed and tested particle detector array surface and subsurface applications
- Assembled and debugged electronic circuit boards (receiver, transmitter, constant fraction discriminator) for detector DAQ system
- Designed (**AutoCAD**) and fabricated custom hardware for detector electronics via **3D printing**; maintained laboratory inventory

University of Illinois Urbana-Champaign (High Energy Physics Lab) x KoBold Metals — **Champaign, IL**
Research Assistant (Computational High Energy Physics) — **March 2024 - May 2025**
- Developed Monte Carlo simulations in GEANT4 (**C++**) to model high-energy muon collisions with scintillation detectors
- Verified simulation accuracy by performing analytic calculations (Bethe-Bloch, Birks' Law) for energy deposition and light yield
- Performed exploratory data analysis (**EDA**) on spatial and temporal simulated distributions; created clear visualizations (**matplotlib**)
- Assembled first round prototype of cosmic air shower scintillator 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**) 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

Projects

Large Language Model Implementation from Scratch — **Jan 2026**
- Implemented various large language model architectures (**GPT-2, CNN, RNN, MLP, Bigram**) from scratch (**numpy**) to match **PyTorch** API

Autotune Program — **Jan 2026**
- Wrote autotune program for live audio input. Implemented **Fast-Fourier Transform** from scratch with Cooley-Tukey Algorithm

Leadership

American Advertising Federation at Illinois (AAF@Illinois) — **Champaign, IL**
Executive Board Member, Executive Account Director of CTRL+V Production Agency — **June 2023 - Dec 2023**
- Co-led largest video production organization (**~40 members**) at UIUC. Produced 5 professional quality commercials for local businesses; Served as liaison between clients and production teams, managing timelines and project outcomes

Certifications and Skills

- Stanford Online, DeepLearning.AI Certification: Advanced Learning Algorithms
- Stanford Online, DeepLearning.AI Certification: Supervised Machine Learning: Regression and Classification
- **Technologies:** C++, Python, SQL, R, Java, Wolfram Mathematica, Databricks, PyTorch, Embedded Software, IoT Networks
- **Skills:** Mathematical Modeling, Statistical Analysis, Computational Physics, Signal Processing, Agentic Programming
- **Communication:** Strong ability to distill complex technical ideas into accessible explanations, Data Visualization