

# HUGH FLOURNOY VAN DEVENTER V

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## EDUCATION

### Harvard University

*S.M. Data Science*

**Expected May 2027**

*Boston, MA*

### University of Michigan

*B.S. Mathematics & Interdisciplinary Physics, Minor: Computer Science GPA: 3.9*

**May 2025**

*Ann Arbor, MI*

## EXPERIENCE

### Honeywell

**Jun. 2025 – PRESENT**

*AI/ML Engineering Intern*

*Atlanta, GA*

- Developing **computer vision** and **OCR**-based floor plan digitization system for automated corporate building bidding pipeline, enabling downstream sensor placement optimization and cost estimation.
- Leading R&D evaluation of **open-source**, **academic**, and **foundation models** for floor plan semantic segmentation.
- Identified brittleness of heuristic-based segmentation on corporate floor plans and proposed labeled dataset creation with polygon based room representations to enable efficient human corrections, supervised model training, and quantitative evaluation metrics.
- Built an **agentic vibration analysis system** that autonomously diagnoses mechanical faults by combining signal processing with LLM-powered expert reasoning, encoding domain knowledge about fault-frequency relationships into physics-informed features to create a real-time monitoring agent for industrial equipment.

### UM Center for Academic Innovation

**Oct. 2023 – PRESENT**

*Data Science Fellow*

*Ann Arbor, MI*

- Developed novel two-stage **RAG methodology** addressing semantic gap in retrieval by generating ideal descriptions as intermediate query representations, improving course recommendation relevance over direct embedding similarity.
- Built and deployed **LLM-powered course recommender (FastAPI, AWS)** serving **10K+ courses** to university community, with bias analysis and network visualization validating embedding space semantic relationships across academic domains.
- Led research culminating in **first-author publication** and collaboration with Michigan Online for professional certification recommendations. Currently developing advanced **agentic search capabilities** with constraint extraction (prerequisites, distribution requirements, scheduling) and multi-vector search for complex queries.

### Michigan Tech Research Institute

**May. 2024 – Aug. 2024**

*Machine Learning Research Intern*

*Ann Arbor, MI*

- Led literature review on ML for super resolution and image registration for a **Ford** automotive camera project.
- Designed and trained a CNN with a custom loss function to predict warping parameters for 128x128 image chips, reducing LBFGS optimizer iterations by **30%** and accelerating image registration processing times.
- Implemented framework enabling custom gradients for functions incompatible with MATLAB autodifferentiation.

### Neurabuild

**Jul. 2023 – Aug. 2023**

*Machine Learning Intern*

*Capetown, South Africa*

- Developed ML solutions to automate sky visibility for portable astronomical sites, including a W-net for semantic segmentation of clear vs. cloudy skies and a CNN classifier achieving **95%** accuracy in night sky condition detection.
- Improved existing neuromorphic satellite detection and tracking model performance by **10%** using edge detection and KerasTuner for hyperparameter optimization.

## PUBLICATIONS AND PRESENTATIONS

”From Interests to Insights: An LLM Approach to Course Recommendations Using Natural Language Queries”

- First author, presented poster at MIDAS x ADSA Annual Data Science and AI Summit, Michigan AI Lab AI Symposium, and MIDAS Mini-symposium: ”Generative AI: From Theory to Scientific Applications” (2024).

## PROJECTS

### Unembedding Steering in Large Language Models | *PyTorch, Transformers, Representation Engineering*

- Developed novel steering method using averaged token unembedding vectors, comparing against linear probing and CAA on Gemma-2-2b with contrastive evaluation framework. Demonstrated competitive performance with learned methods while requiring no training, revealing alignment between token representations and internal model activations.

### optiMaizer: Optimization Algorithm Benchmarking Suite | *Python, Numerical Optimization, Performance Analysis*

- Implemented and benchmarked 10 optimization algorithms across diverse test functions. Conducted systematic L-BFGS memory analysis revealing intermediate memory sizes often outperform large configurations on complex landscapes.

### SHLIME: Adversarial Robustness for Explainable AI | *Python, Adversarial ML, XAI*

- Replicated adversarial attacks against LIME and SHAP, developing novel combined defense method improving robustness while maintaining explanation quality.

## TECHNICAL SKILLS

**Languages:** Python, C++, Matlab, TypeScript, SQL, L<sup>A</sup>T<sub>E</sub>X | **Dev/Cloud Tools:** Git, Docker, AWS (ECS, S3), MLflow, Weights & Biases, Google Cloud, Azure ML, CUDA

**Frameworks/Libraries:** PyTorch, TensorFlow, Transformers, Hugging Face, LangChain, OpenAI API, Scikit-learn, XGBoost, Pandas, NumPy, SciPy, Matplotlib, Plotly, Jupyter, FastAPI, React