Hugh Flournoy Van Deventer V

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EDUCATION

Harvard University **Expected May 2027**
S.M. Data Science *Boston, MA*

University of Michigan **Expected May 2025**
B.S. Mathematics & Interdisciplinary Physics, Minor: Computer Science GPA: 3.9 *Ann Arbor, MI*

Relevant Coursework: Machine Learning, Continuous Optimization, Linear Optimization, Numerical Linear Algebra, Science of LLMs, Complex Systems Modeling, Computational Physics, Probability Theory.
Activities: Physics Department Peer Advisor, Athletics Department Tutor, Wolverine Tutor, Overwatch Team Captain.

EXPERIENCE

UM Center for Academic Innovation **Oct. 2023 – PRESENT**
Data Science Fellow *Ann Arbor, MI*

- Designed an innovative two-stage **LLM**-powered course recommendation system using **Retrieval Augmented Generation** (RAG) to transform natural language queries into personalized academic recommendations.
- Developed full-stack application with **React/TypeScript** frontend and **FastAPI** backend deployed on **AWS** (Fargate, ECS), servicing **10,000+** courses for the university community.
- Conducted bias analysis across demographic dimensions and developed network visualization tools to validate interdepartmental semantic relationships captured by embedding cosine similarity.
- Led research culminating in a first-author publication on LLM-based educational technology.

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

SHLIME: Foiling Adversarial Attacks Fooling LIME and SHAP | *Python, Adversarial ML, XAI*

- Replicated the paper "Fooling LIME and SHAP: Adversarial Attacks on Post hoc Explanation Methods."
- Led presentation of mathematical foundations behind post-hoc explainer methods like LIME and SHAP.
- Developed and evaluated a novel combined method that improved robustness against adversarial attacks.

Sensitivity Analysis on ABBA Banking System Model | *Agent-Based Modeling, Finance, Netlogo*

- Conducted sensitivity analysis on ABBA, an agent-based model of banking systems developed by Jorge A. Chan-Lau.
- Investigated relationship between savers' withdrawal rates and bank credit/liquidity failures.
- Validated model strength by demonstrating that higher withdrawal rates correlate with increased liquidity failures.

TECHNICAL SKILLS

Languages: Python, C++, TypeScript/JavaScript, Matlab, SQL, HTML/CSS, LaTeX
Frameworks/Libraries: PyTorch, TensorFlow, Scikit-learn, Hugging Face, LangChain, LlamaIndex, FastAPI, React, Pandas, NumPy, SciPy, NetworkX, XGBoost, einops, Matplotlib, Seaborn, Plotly, Node.js, Tailwind CSS, Gurobipy
Developer/Cloud Tools: Git, Docker, AWS (Fargate, ECS, VPC, S3), MLflow, Google Cloud, Azure ML