

Jack Mangione

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EDUCATION

University of Notre Dame | Notre Dame, IN
Bachelor of Science | Computer Science, ACMS

May 2026
GPA: 3.63/4.0

PROFESSIONAL EXPERIENCE

Undergraduate Research Assistant | Notre Dame, IN

August 2024-Present

- Investigated SAM-2's mask propagation behavior on medical videos (vs the natural videos it's trained on), managing large datasets and compute requirements with bash scripts and remote GPUs.
- Collaborating with PhD students to develop a robust method for Video Object Segmentation in medical imaging with minimal available labeled training data

Research Intern | Notre Dame, IN

Summer 2024

- Implemented and benchmarked several Graph Neural Network models (MetaPath2vec, GCN, GAT, GIN) on AMiner & DBLP citation datasets using PyTorch and PyTorch Geometric.
- Minimized GPU memory footprint by constructing and utilizing metapaths during training in place of graph edges.
- Collaborated with a peer to collect a graph dataset of drug-related information from social media through their Python APIs
- Presented MetaPath2vec's results on the drug-related graph dataset with a peer at an undergraduate research symposium, communicating them effectively to individuals with varying levels of experience in graph learning.

PROJECTS

Analysis of Unsupervised Latent Representations | Notre Dame, IN

Summer 2024

- Implemented & trained Autoencoder & VAE models in PyTorch to reconstruct images from Fashion-MNIST dataset.
- Analyzed class groupings and other latent space characteristics with t-SNE plots and two-dimensional segments of high-dimensional unsupervised latent representations.
- Performed latent space arithmetic to associate specific positions in latent vectors with semantic meaning.
- Conducted comparative analysis of Autoencoder and VAE generated latent spaces, evaluating their observed properties against theoretical expectations.

Optimizing an MLP for Speed in C | Notre Dame, IN

Summer 2024

- Implemented an MLP in Python/NumPy as a benchmark for standard performance with high-level frameworks.
- Re-implemented the MLP in C towards the goal of faster training. Profiling this base C program identified the matrix multiplication function as the main performance bottleneck, inspiring an optimized version.
- Optimized my base C program by implementing multithreading, SIMD instructions, and pointer arithmetic for matrix multiplication. Experimented with matrix blocking techniques & evaluated their cache efficiency using cachegrind.
- Leveraged OpenBLAS for matrix multiplication in a third C program. Relative to the NumPy implementation, training time decreased by 26% (base C program), 60% (custom optimized C), and 73% (using OpenBLAS).

Exploring the Origins of Deep Learning | Notre Dame, IN

December 2023 - Present

- Implemented the MLP's three key ancestors in Python: The Perceptron(1957), Adaline(1960), and Madaline(1961).
- Developed my own visualizations for each algorithm utilizing free draw websites, Matplotlib, and CalcPlot3D.
- Built a website aiming to reconstruct the intuition that researchers had at the time, with in-depth model explanations, training examples, and historical context. Foundational concepts such as latent representations, gradient descent, and decision boundaries are visualized and evaluated from several angles.

VOLUNTEERING

DePaul Coding Club | CS for Good - Notre Dame, IN

February 2024 - Present

- Collaborating with a team of peers to teach computer science principles to teenagers in DePaul Academy using Python, fostering an interest in the subject and building programming skills.
- Constructed lesson plans, built slideshows & code examples, and lectured at DePaul Academy.

Languages, Frameworks & Tools

Proficient: Python, PyTorch, C, C++, R, Bash, Linux, Git, Anaconda | **Familiar:** CUDA, TensorFlow, CSS, JavaScript, React