Vallabh Nadgir

217-200-5229 | vnadgir2@illinois.edu | github.com/vallabh1 | linkedin.com/vallabhnadgir

Education

University of Illinois Urbana-Champaign Champaign, IL
Bachelor of Science in Computer Engineering, Minor in Math *August 2022 - May 2026*

- GPA: 3.86/4.0
- Assistantships: Analog Signal Processing (ECE 210) lab assistant (Spring 2023, Fall 2024)
- Relevant Coursework: Data Structures, Algorithms, Applied Parallel Programming, Abstract Linear Algebra, Differential Equations, Probability, FPGA programming, Systems Programming, Machine Learning, Intro to Robotics, Intro to Optimization, Combinatorics, Random Processes, Information Theory, Algorithms, Abstract Algebra

Technical Skills

Languages: C, C++, Python, JavaScript, HTML/CSS, R, SystemVerilog
Frameworks/Libraries: CUDA, Open3D, pandas, NumPy, Matplotlib, TensorFlow, PyTorch, Pydicom, OpenMP
Tools: Git, Bazel, ROS, Docker, Quartus, Vivado

Experience

Software Engineering Intern - 3D Mapping May 2025 – Present
Zoox (Amazon subsidiary) *Foster City, CA*

- Developing a **2D tiled representation** for stacked multi-level roads and implementing **mesh texturing** pipelines to generate photorealistic 3D reconstructions, along with per-level 2D textures from LiDAR and camera data.
- Generated dense mesh and per level 2D attribute textures for a $\sim$ 300 sq km geosite.
- Implemented **factor validation** using visual cues to filter incorrect constraints before **pose graph optimization** for accurate pose estimation in multi-level stacked roads.

Robotics Research intern May 2024 – Present
*Intelligent Motion Lab (IML) @ UIUC (advised by Professor **Kris Hauser**)* *Champaign, IL*

- Developed a memory optimized **3D semantic fusion algorithm** that retains a compact subset of voxel-level class labels, reducing GPU memory overhead by 80% and enabling real-time large-scale scene mapping for autonomous systems.
- Engineered an MLP-based neural compression technique with PyTorch for semantic mapping, transforming large voxel data into optimized latent representations achieving 8x compression to improve storage and compute efficiency.
- Demonstrated building-scale semantic reconstructions on commodity GPUs; **Patent pending (US 63/806,504)**.
- Exploring context-specific compression of **VLM embeddings** in 3D maps to reduce memory usage and accelerate queries without degrading open-set semantic alignment.

Machine Learning Intern January 2024 – March 2024
22 Neuro *Remote*

- Developed preprocessing pipelines for brain MRI DICOM files using **Pydicom**, including tilt correction and normalization, to ensure high-quality input for deep learning models.
- Implemented a deep learning pipeline using PyTorch with **multimodal CNN** architectures for MRI classification, integrating the model into a Clinical Decision Support System (CDSS) for flagging Alzheimer's biomarkers.

Publications

Memory-Efficient Real Time Many-Class 3D Metric-Semantic Mapping ***IROS 2025 (to appear)***
Vallabh Nadgir*, Joao Marcos Correia* Marques, Kris Hauser

Projects

Perception and Mapping Module Oct 2024 – Present

- Developing a perception-box system integrating **SLAM** on a mobile platform with a depth camera and **Nvidia Jetson**, featuring real-time semantic and metric mapping, automated dependency management, and modular mapping APIs, and optimized live mesh/map streaming using XML-RPC.
- Integrated inertial measurements into visual SLAM using an **EKF** (extended Kalman filter) to enhance pose estimation robustness and spatial consistency.

Custom Unix-Like Operating System Aug 2024 – Dec 2024

- Developed a **Unix-like OS** featuring a custom **filesystem**, **virtual memory (Sv39 paging)**, **preemptive multitasking**, and a **system call interface** for process management and file I/O.
- Implemented **block device drivers**, **interrupt handling**, and **exception management** for hardware interaction.

CUDA Optimization for Convolutional Neural Networks Mar 2024 – May 2024

- Engineered efficient **CUDA kernels** for convolutional layers, achieving a **40% speedup** in inference performance and reducing runtime by **35%** compared to baseline implementations.
- Utilized **Nsight Systems** and **Nsight-Compute** for performance analysis and fine-tuning CUDA kernels.