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Nanditha Naik

Portfolio:
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Computer Vision & Machine Learning Engineer with hands-on research experience in 3D reconstruction, differentiable rendering, and generative vision models. Specialized in Gaussian Splatting, NeRF-style pipelines, multi-view geometry, and diffusion/flow-based models, with real-time deployment using PyTorch, CUDA, TensorRT, and ROS. Experienced in translating research prototypes into latency-optimized systems for AR/VR, spatial computing, and robotics.

Skills

Computer Vision & 3D	OpenCV, COLMAP, Gaussian Splatting, NeRF, Open3D, SAM2, YOLOv11, DINOv3, 3D Geometry Processing
Deep Learning & GenAI	PyTorch, TensorFlow, NumPy, Keras, Diffusion Models(DDPM, DDIM), CNNs, Vision Transformers
Systems & Optimization	CUDA, TensorRT, GPU Inference Optimization
Languages & Infra	Python, C++, C, JavaScript, Linux, Git/Github, CI/CD, ROS

Work Experience

Graduate Research Assistant **Aug 2025 — Present**
Human computer Interaction and Visualisation Lab, University of Minnesota *Minneapolis, MN*

- **Investigating Point Ambiguity Resolution** for AR/VR/MR and Human–Robot Interaction systems, focusing on spatial grounding, spatial reasoning, and multi-object disambiguation under ambiguous pointing gestures, with ongoing exploration of Vision–Language Models (VLMs).
- **Implemented and evaluated 3D scene representations** using Gaussian Splatting, and VGGT multiview reconstruction; prototyped 3D object localization and segmentation by mapping YOLO-generated 2D masks into reconstructed scenes.
- **Designed and trained Flow Matching and diffusion-based models** for hand trajectory and endpoint prediction to infer intended target objects, conditioned on scene context and joint pose, using AVP-collected data and a Unity-based application.
- **Implemented and benchmarked real-time perception and tracking models** (SAM2, DINOv3, YOLOv11n-seg), evaluating accuracy latency tradeoffs and optimizing for on-device inference constraints (up to 38.9 mAP bbox, 1.8 ms TensorRT inference).

Graduate Research Assistant **Aug 2024 — Aug 2025**
UMN Computer Networking Lab, University of Minnesota *Minneapolis, MN*

- Processed **large-scale mobility and system dataset logs (200+ hours)** and performed **exploratory data analysis**, including **PDF estimation, time-series analysis, statistical profiling**, and **3D spatiotemporal visualizations** to extract temporal, behavioral, and KPI-based features.
- Benchmarked **time-series regression models** including **XGBoost**, **Temporal Convolutional Networks (TCN)**, **Random Forest**, and **Deep Neural Networks (DNN)** for event prediction and performance forecasting using **MAE**, **MSE**, **RMSE**, **R^2**, **MAPE**, and **residual error distribution analysis**.

Education

Master's in Electrical and Computer Engineering, *University of Minnesota, Twin Cities* Sep 2023 — Dec 2025
B.Tech in Electronics and Telecommunication Engineering, *Vishwakarma Institute of Technology, Pune* 2018 — 2022

Selected Projects

Depth Video Diffusion for Robot Policy Learning

- **Developed a conditional depth-video diffusion model** using a custom **lightweight 3D U-Net with spatial and temporal attention** from scratch.
- **Designed a multi-modal conditioning pipeline** combining **Sentence-BERT language embeddings** and a **CNN-based RGB-D visual encoder**, integrated via **FiLM-based feature modulation** across 3D U-Net layers.
- **Trained a scalable DDPM training and sampling pipeline** with **multi-GPU data parallelism on CUDA-enabled hardware**, and deployed on a single GPU achieving **10-frame inference in 1.5 minutes**.

Visuomotor Diffusion Policy for Table-Cleaning Manipulation

- Built an **end-to-end visuomotor diffusion policy** for single-arm manipulation, conditioning trajectories on **synchronized RGB-D perception (RealSense L515 LiDAR + D405)** and **UR5 joint states**; implemented **ROS/MoveIt–based system integration** with **sensor calibration and alignment across camera, robot, and world coordinate frames** using **245 expert demonstrations**.
- Achieved **66% task success (20/30 trials)** in **closed-loop deployment on a physical UR5 robot**, **outperforming CNN/LSTM behavior-cloning baselines** with stable real-time inference.

Generative Vision Models & Flow-Based Learning: GANs, Diffusion, Flow Matching

- Implemented and evaluated **GANs, VAEs, autoregressive models, diffusion models, and flow-based methods** in **PyTorch** to study **representation learning**, sample quality, and probabilistic modeling behavior.
- Designed and trained **stochastic and deterministic generative pipelines**, comparing **diffusion-based vs. flow-based approaches** through controlled experiments, trajectory analysis, and quantitative evaluation.