Noopur **Koshta**

Machine Learning and Deep Learning Engineer · GPU Kernel Optimization

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Career Summary

Focused on the intersection of Computer Vision and Machine Learning, with an keen interest in optimizing neural networks and machine learning models on edge devices. My work aims to advance AR/VR and embedded systems by improving machine understanding through innovative yet resource-conscious approaches, and leveraging large language models (LLMs) for enhanced human-computer interaction.

Professional Experience

MER Lab, Worcester Polytechnic Institute — *Worcester, MA, USA*

Graduate Research Assistant — *Jan. 2024 - Dec. 2024*

- Advanced research in pose estimation and computer vision, yielding optimized neural network with faster convergence.
- Developed innovative hybrid architecture integrating Graph Convolution Network with Unscented Kalman Filter technique, to maintain robust state estimation during visual occlusions, achieving ≤ 0.4 mean squared error (MSE) and 20x faster convergence through optimized neural network design.
- Explored a distributed control system for warehouse robot fleets, combining Extended Kalman Filtering with Voronoi partitioning to enable precise formation control and collision-free navigation. Achieved sub-meter accuracy (< 0.8m) in target surrounding maneuvers with 6+ robots operating simultaneously.

BioRobotics Lab, Carnegie Mellon University — *Pittsburgh, PA, USA*

Graduate Research Assistant — *Mar. 2024 - Apr. 2024*

- Investigated kinematic modeling of surgical snake robots to enable precise 3D navigation and control during cardiac procedures.

Ignitarium Technology Solutions Pvt — *Bangalore, India*

Senior AI Engineer — *Nov. 2021 - Jun. 2022*

- Accelerated inference times by 20-30% on resource-constrained System-on-Chip (SoC) devices through warp-optimized CUDA kernels.
- Led a project group in reengineering of OpenCV core operations (convolution, filtering, and transforms), implementing memory coalescing for efficient global memory access and strategic shared memory utilization.

Persistent Systems Pvt Ltd — *Pune, India*

Senior Machine Learning Engineer — *May 2016 - Apr. 2020*

- Developed prototypes across image classification, text analytics, and facial recognition systems, achieving benchmark performance and business metrics through rigorous testing.
- Engineered hierarchical CNN-based diabetic retinopathy lesion segmentation with cascaded feature pyramids, improving detection accuracy to 96.5% and significantly reducing false positives on IDRiD dataset.
- Built facial recognition attendance tracking system using Haar-HOG and CNN, improving accuracy from 85% to 96% across 50+ employees.
- Developed LSTM-based medical coding system achieving 85% precision in ICD classification, accelerating physician diagnostic workflow.

Relevant Projects

One-Shot Safety Alignment for Large Language Models (LLMs) via Optimal Dualization [In Progress] — Python, Convex Optimization

Reproducing MOCAN/PECAN algorithms from published research to validate proposed computational efficiency gains in RLHF for LLM safety alignment.

Exploring Query-Key Relationships in Vision Transformers Through Singular Value Decomposition (SVD) [In Progress] — Python

Reproducing research on transformer interpretability methodology analyzing self-attention singular modes to understand feature direction interactions.

Deep Q-Learning for Reward Optimization in Atari Breakout Game — Python, OpenAI Gym

Analyzed Deep Q-Network (DQN) architecture implementation for Atari Breakout, examining agent performance across 120,000 episodes to achieve a score of 91.

3D scene reconstruction with Structure from Motion (SfM) — Python, PyTorch, OpenCV

Developed 3D reconstruction using Epipolar Geometry and Perspective-n-Point (PnP) with cheirality constraints, achieving 0.98 MSE in camera pose estimation.

Multi-Sensor Fusion for Autonomous Driving — C++, Python, OpenCV, MATLAB

Engineered sensor fusion pipeline (LiDAR, radar, camera) with UKF-based multi-object tracking, achieving ≤ 0.6 MSE for surrounding vehicle localization.

Red Rabbit Robotics [Open Source Contribution] — C++, Python, ROS/ROS2

Leading migration of RX1 humanoid robot framework from ROS1 to ROS2, implementing node architecture and protocols for seamless control.

Honors & Awards

2024 **2nd Winner,** Meta and AWS Hackathon for XR (AR/VR) and GenAI — *Palo Alto, CA, USA*

2012 **1st Place,** Secured First Position in Third and Fourth Semesters (BS in Information Technology) — *Nagpur, India*

Skills

Research and Development Stack

Major Languages	Python, C/C++, MATLAB, CUDA
Machine Learning	PyTorch, TensorFlow, Optuna, OpenAI Gym, PCL
Computer Vision	OpenCV
Robotics Frameworks	ROS/ROS2, RViz

Other Tools and Skills

Development Tools	Docker, Git
Simulation Tools	Gazebo, Blender
Cloud Platforms	AWS (Bedrock, SageMaker, Lambda, EC2)

Education

Worcester Polytechnic Institute — *Worcester, USA*

M.S. in Robotics Engineering — *Aug. 2022 - Dec. 2024*

- Deep Learning-Based Visual Feature Tracking System / Advisor: Prof. Berk Calli
- Multi-Agent Localization / Advisor: Prof. Siavash Farzan
- Shape Estimation of Snake Robot / Advisor: Prof. Howie Choset