SHOUNAK NAIK

 Portfolio Github Email Linkedin (774)-418-6989

EDUCATION

Worcester Polytechnic Institute   *August 2022 - May 2024*
Masters in Science, Robotics; GPA: 4.0/4.0
Courses: Computer Vision, Deep Learning, Embedded Deep Learning, Reinforcement Learning

Birla Institute of Technology and Science, Pilani   *August 2017 - May 2022*
B.E. Computer Science, MSc. Biological Sciences; CGPA: 8.28/10

EXPERIENCE

Aireal Inc *Generative ML Engineer*   *June 2024 - Ongoing*
- Improved PSNR by 20% by alternating between Bundle Adjustment and Triangulation while refining camera poses.
- Experimenting various **Gaussian Splatting** Variants (2.5 GS and DNSplat) and integrating them into the product.

Cognex Corporation   *Computer Vision Intern, Boston*   *September 2023 - December 2023*
- Studied the effect of adding relative pose constraints to the **Perspective-n-Point** step for a multicamera system.
- Prototyped a **Epipolar Geometry** based extrinsic calibration and the motion model error detection system of a tunnel.

Carnegie Robotics *Computer Vision Intern, Pittsburgh*   *May 2023 - August 2023*
- Implemented, **Quantized** and deployed **SSD300** (object detection) on a FPGA using Xilinx Vitis AI acheiving **24 FPS**.
- Designed a ROS based error flagging system for length measuring product that uses Stereo matching and MaskRCNN.

Bloomreach, Inc *Machine Learning Engineer, Bangalore*   *July 2021 - June 2022*
- Designed, trained and analyzed multi-modal **RankNets** (images+text) to build a Neural Recommendation Engine.
- Trained networks (multiple GPUs) according to the **BYOL** self-supervised technique with **ResNet** being the base encoder.
- Improved network performance (upto 10% on certain classes) by evaluating attention maps generated by **GradCAM**.

Perception and Autonomous Robotics Lab, WPI *Graduate Research Assistant*   *Jan 2023 - May 2023*
- Generated Synthetic Optical Flow, Depth and Surface Normals datasets using Blender Python API.
- Designed a Aleoteric Uncertainty based perception stack that on a Tello Drone could **dodge static obstacles** in the scene.

Vision, Intelligence, and System Laboratory *Graduate Research Assistant*   *Jan 2024 - May 2024*
- Used COLMAP Point Clouds to signal scene depth information to novel view synthesis transformer networks (NeRFs)

TECHNICAL SKILLS

Languages:	Python, C, C#, C++, Java, Javascript, LaTeX, SQL
Tools and Libraries:	PyTorch, TensorFlow, ONNX, OpenCV, ROS2, NumPy, Pandas, GIT, Docker, Cuda

FEATURED PROJECTS/PUBLICATIONS

Structure from Motion   *Github*
- **Calibrated camera** using Zhang's method which optimizes non-linear geometric projection after finding homographies.
- Implemented **Non-Linear Triangulation**, **PnP** and **Bundle Adjustment** to reconstruct the 3D structure of a building.

Lidar Semantic Segmentation   *Github*
- Built LiDAR point cloud map using Point to Point ICP, transferred semantic labels obtained from DeepLab onto the map.

Scara Robot in Gazebo   *Github*
- Built Scara Robot (3-DOF) in Gazebo. Simulated PD control (own implementation) on it using ROS services and publishers.

Sliding Mode Control for UAV   *Github*
- Designed and deployed Sliding Mode Controller for trajectory tracking for micro UAVs within error range of 1%.

Mobile NeRF   *Github*
- Deployed a NeRF model on a M1 chip using LensStudio and ONNX after knowledge distillation and model pruning.

Depth By Stereo Matching *Github*

- Estimated a dense depth map by estimating camera poses, rectifying planes and a sliding window block matching approach.

FaceSwap *Github*

- Successfully swapped faces between 2 people by using **Delenauy Triangulation** and **Inverse Barycentric Coordinates**.

Panorama Stitching *Github*

- Stitched spatially varied photos into a panorama by using Harris corner detection, feature mapping, ANMS and RANSAC.

Probability based edge detection *Github*

- Implemented Arbelaez's edge detector which searches for texture,color and intensity discontinuities across multiple scales.

Embedded Deep Learning Projects

- **Pruning, Quantization** for optimizing the VGG-16 network for CIFAR-10 classification. *Github*
- **Neural Architecture Search** for microcontroller deployment from MCUNet super-network by evolutionary search. *Github*
- **Dynamic Network Inference** on BranchyNet to achieve entropy based early exit. *Github*

Zero Shot Semantic Style Transfer *Github*

- Implemented an AdaAttn based semantic neural style transfer pipeline. Reduced 13% FLOPS by performing ablations

Semantic Grounding in Large Language Models of Code *Github Publication*

- Studied the semantic grounding variation across layers of CodeBERT, with programming languages and finetuning amount.

La Liga Match Outcome Predictor

- Collected match statistics and implemented **Random Forest** and **XGBoost** to predict the chance of the home side winning.

Memory Hierarchy Simulation *Github*

- Simulated the complete memory hierarchy in **C** having the following specification:
  - TLB, L1 Cache with a LRU replacement policy, L2 Cache with a FIFO replacement policy.
  - Main memory with a hierarchical paging and with thrashing policy as Page fault frequency.