NAVODIT CHANDRA

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EDUCATION

Carnegie Mellon University (CMU)   Pittsburgh, PA
Master of Science in Mechanical Engineering - Advanced Study   Dec 2022
GPA: 3.97/4.0
Selected Coursework: *Machine Learning and Artificial Intelligence, Deep Learning, Computer Vision, Trustworthy AI Autonomy*

Indian Institute of Technology Kanpur   Kanpur, India
Bachelor of Technology in Mechanical Engineering | Graduated with Distinction   May 2021
GPA: 9.1/10.0

SKILLS

Programming Languages: *Advanced***:** Python, *Intermediate*: C/C++, *Familiar***:** SQL, Java, HTML
Libraries: PyTorch, OpenCV, Open3D, Gym, NumPy, Pandas, Matplotlib, Scikit-learn
Software and Tools: Linux (Ubuntu), CARLA, MATLAB, MAPLE, Arduino, Git, ROS, Latex

RESEARCH EXPERIENCE

Carnegie Mellon University   Pittsburgh, PA
Graduate Researcher, Mechanical and Artificial Intelligence Lab   May 2022 - Dec 2022
- Generated a dataset consisting of **RGB images** and **LiDAR point cloud** operating autopilot mode on CARLA simulator
- Refined **image** and **point cloud** feature maps processed by ResNet neural network architecture by introducing **Convolutional Black Attention Module**
- Improved **Driving Score** evaluation metric by **9.5%** by implementing **Additive Attention** for computation of alignment scores in **transformer block** used to combine intermediate image and LiDAR feature maps
- Experimented model performance in simulation by replacing **Self-Attention module** with **Cross-Attention module**

Indian Institute of Technology Kanpur   Kanpur, India
Students-Undergraduate Research Graduate Excellence Fellow, Energy Conservation & Storage Lab   May 2019 - July 2019
- Studied effects of gas velocity, operating current, surface wettability and capillary number on a **PEM Fuel Cell** operation by means of a **parametric study**
- **Presented** work as **first author** at 25th National and 3rd International ISHMT-ASTFE Heat and Mass Transfer Conference **(IHMTC-2019)** in Dec 2019

ACADEMIC PROJECTS

End to End Learning for Self-Driving Cars, CMU   Feb 2022 - Apr 2022
- Predicted **steering angle** of a self-driving car from images captured by it by developing an **end-to-end** learning pipeline
- Accomplished reasonably good performance on training and testing tracks by executing **CNN** and **CNN-LSTM** neural network topologies in a team of 2

Modeling & Study of Adversarial Attacks Arising from Deceiving Perception in Car Autopilot, CMU   Feb 2022 - Apr 2022
- Collaborated in a team of 3 and simulated a **real-life incident** of tricking a self-driving car to misidentify **moon** as a **yellow traffic light** deploying a targeted **adversarial attack algorithm**
- Executed **PGD algorithm** to trick autopilot system and carried out adversarial training as an effective **adversarial defensive technique** to avert such safety-critical scenarios

Seven Segment Digit Recognition using Computer Vision, CMU   Mar 2022 - Apr 2022
- Collaborated with 2 colleagues and developed an **algorithm** to take readings from devices using seven-segment display
- Enhanced **accuracy** by **7.8%** and **speeded up** process of taking readings by **10.4 times** in comparison to average computer typists by utilizing **image processing** operations and **computer vision techniques**

Depth Estimation leveraging Stereo Vision and 3D Reconstruction, CMU   Mar 2022 - Apr 2022
- Found **depth** of each pixel from **disparity map** produced by a pair of **parallel stereo** images to calculate **distance** of objects present
- Achieved **3D reconstruction** of scene by generating a **3D point cloud** for visualization and verification of correctness of **scaling ratio** used to find depth

Edge Detection, CMU   Apr 2022 - Apr 2022
- Detected edges in images by implementing **Sobel filter** and applying **Canny edge detection** with **increased performance** by tuning parameters

Point Cloud Classification and Segmentation, CMU   May 2022 - May 2022
- Implemented the PointNet framework from scratch and achieved state of the art performance on tasks of **shape classification** and **semantic segmentation**

Object Detection using ROS and OpenCV   Dec 2022 - Dec 2022
- Detected **obstacles** using **YOLO** object detection algorithm by subscribing to camera captured images
- Published 2D **bounding box information** as message on ROS topic for further processing to avoid collision