Apratim Mukherjee

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Education

Worcester Polytechnic Institute *Worcester, MA*

Master's in Robotics Engineering, Current GPA: 4.0/4.0 *Aug. 2021 - May 2023*

- Relevant Coursework: Foundations of Robotics, Robot Control, Robot Dynamics, Swarm Intelligence, Deep Learning, Reinforcement Learning.

Manipal Institute of Technology, Manipal *Karnataka, India*

Bachelor's in Computer Science and Engineering (Minor in Intelligent Systems) *July 2016 - Aug. 2020*

- Relevant Coursework: Artificial Intelligence, Machine Learning, Optimization Techniques, Computer Vision, Natural Language Processing, Object Oriented Programming, Distributed and Cloud Computing, Parallel Computing and Programming.

Skills

Programming C, C++, Python, Java, MATLAB, SQL

Libraries & Tools Pytorch, Tensorflow, ROS/ROS2, OpenCV, CUDA

Experienced in Artificial Intelligence, Deep Learning, Computer Vision, Robotics, Image and Pointcloud Processing

Research Experience

Worcester Polytechnic Institute (WPI) *Worcester, MA*

Graduate Research Student *Jun. 2021 - Present*

- Currently part of the **Novel Engineering for Swarm Technologies (NEST) Lab** under the supervision of Prof. Carlo Pinciroli.
- Working on **Swarm Collective Transport via Reinforcement Learning** with Josh Bloom, a PhD student at NEST.

Indian Institute of Science, Bangalore (IISc) *Karnataka, India*

Research Assistant *July 2020 - July 2021*

- Worked at the **Artificial Intelligence and Robotics Lab** in the Aerospace Department under Prof. Suresh Sundaram.
- Focused on implementing **fisheye cameras** and robust **SLAM** methods in simulated environments as well as run **pointcloud semantic segmentation** with **copy-paste augmentations**. [code]

Nanyang Technological University (NTU) *Singapore*

Research Intern *Feb. 2020 - July 2020*

- Part of the **Energy Research Institute at NTU (ERIAN)** under the supervision of Dr. Anshuman Tripathi and Gil Opina Jr.
- Worked on the **perception system** of the **autonomous bus** which is to be deployed on the streets of Singapore.
- Also focused on the **mapping and localization** system of an autonomous ground vehicle for indoor navigation using only an onboard camera setup.

Worcester Polytechnic Institute (WPI) *Worcester, MA*

Research Intern *Jun. 2019 - July 2019*

- Worked with the **SmartWAnDS** group under Prof. Emmanuel Agu.
- Focused on bettering segmentation methods for **pixel-wise classification** of wound images.
- Performed a systematic study of the performances of **AHRF** and different **Deep Learning** models which are presented in our paper. [paper]

Indian Institute of Science, Bangalore (IISc) *Karnataka, India*

Research Intern *May 2019 - Jun. 2019*

- Worked at the **Artificial Intelligence and Robotics Lab** in the Aerospace Department under Prof. Suresh Sundaram.
- Mainly focused on **Visual Odometry** and **VSLAM** methods for robot localization in GPS-denied environments.

Project MANAS (www.projectmanas.in) *Karnataka, India*

AI Member/Mentor *Feb. 2017 - Present*

- Oversaw the completion of an AGV for the 26th and 27th **Intelligent Ground Vehicle Competition**, and a **self-driving car** for the Mahindra **$1Million Rise Prize** challenge.
- Worked on different algorithms for tasks such as **Lane Detection**, **Speed bump Detection**, **Sensor Fusion**, **SLAM** etc. using **Image and Pointcloud Processing** along with **Deep Learning**, which were used on the 3 vehicles.

Projects

Controlled Copy-Paste Augmentations for Segmentation Networks

Work In Progress

Manipal Institute of Technology

Feb. 2018 - Present

- Study controlled **copy-paste augmentation** policies and benchmark the effects on the performance of **segmentation networks**.
- Benchmarking on various datasets using varying augmentation policies have shown a **3-10% boost** in performance of object detection and segmentation networks. [code]

Self-Driving Car for the Mahindra Rise Prize Challenge

Completed

Manipal Institute of Technology

Feb. 2017 - Dec. 2019

- **Joint winners** of the competition, beating **153** teams.
- Successfully implemented **Lane Detection, Speed Bump Detection, Sensor Fusion** amongst other things for Indian roads.
- Continuously involved in other tasks of **Traffic Light and Sign Detection** as well as **SLAM** using a sensor array consisting of **2D/3D Lidars, Radars and Mono/Stereo cameras**.

Semantic Segmentation of Wound Images: A Systematic Comparison of Convolutional Neural Networks and AHRF Approaches

DOI 10.1109/ACCESS.2020.3014175

Worcester Polytechnic Institute (WPI)

Jun. 2019 - July 2019

- Co-authored the paper published in **IEEE Access**, along with Ameya Wagh and Shubham Jain, where we compared the performances of **AHRF vs CNNs** on a wound segmentation dataset collected at **UMass Medical Center**.
- Compared various pre- and post- processing methods such as CLAHE and CRFs along with different architectures including **dilations** and **spatial pyramid pooling** while benchmarking on different subsets of the dataset.

Autonomous Ground Vehicle for IGVC 2019

Completed

Manipal Institute of Technology

Jan. 2019 - Jun. 2019

- Part of the 30 member team that won the **grand prize at IGVC 2019**, beating over 25 teams.
- Improved on the 2018 perception stack, bettering the lane and bump detection systems while integrating newer localization and mapping methods. [results] [report]

Autonomous Ground Vehicle for IGVC 2018

Completed

Manipal Institute of Technology

Jan. 2018 - Jun. 2018

- Headed the perception team responsible for **scene understanding** and mapping the environment around the map for **localization**.
- Different **Computer Vision** and **Deep Learning** approaches to achieve the most desirable results were used.
- Placed 9th among 27 teams from across the globe and 2nd in India. [results] [report]

NumJ and Java Deep Learning Library (JDL)

Completed

Manipal Institute of Technology

Oct. 2017 - Nov. 2017

- Attempted to build a multi-threaded **NumPy counterpart** for Java to ease the flow of weights through a neural network.
- Built a **Deep Learning Library** from scratch in Java using **NumJ** which was then used to create networks for basic tasks such as image classification. [code]

Extracurriculars

- Finalists for the **Philips Hackathon 2017**.
- Core Committee member of **Data Science Club, Manipal**.
- Member of **Teach Code for Good, Manipal**.
- **Deep Learning Specialization** by **deeplearning.ai** (Certificate)
- **Mathematics for Machine Learning Specialization** by **Imperial College London** (Certificate)
- **Parallel, Concurrent and Distributed Programming in Java Specialization** by **Rice University** (Certificate)
- **Robotics: Aerial Robotics** by **University of Pennsylvania** (Certificate)
- **Bayesian Statistics : From Concept to Data Analysis** by **UC Santa Cruz** (Certificate)
- **An Introduction to Practical Deep Learning** by **Intel** (Certificate)
- **Intro to Tensorflow** by **Google Cloud** (Certificate)