

# MOHAMMED IRFAN ALI

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## EDUCATION

**Northeastern University**, Boston, MA

Expected May 2025

*Master of Science, Robotics (Concentration: Electrical and Computer Engineering)*

Coursework: Computer Vision; Robotics Sensing and Navigation; Robot Mechanics and Control; Mobile Robotics.

**Osmania University**, Hyderabad, India

Jun 2023

*Bachelor of Engineering, Electronics and Communications Engineering*

Coursework: Digital Electronics; Embedded Systems; Microprocessors and Microcontrollers; Automatic Control Systems.

## TECHNICAL SKILLS

**Programming Languages:** Python, C++, MATLAB, Bash Scripting, C, HTML, CSS.

**Developer Tools:** PyTorch, TensorFlow, OpenCV, Scikit-learn, Docker, Gazebo, CUDA, Rviz, Git, Arduino, Raspberry Pi.

**Robotics:** ROS, Kalibr, Eigen, Point Cloud Library, SLAM, Kalman & Particle Filters, YOLO Object Detection.

## RESEARCH EXPERIENCE

**Research Assistant | Silicon Synapse Lab**, Northeastern University, Boston

Jan 2024 – present

- Implemented visual-inertial odometry system using ORB SLAM 3 on Raspberry Pi 4B for the Aerobot project, a bio-inspired flapping wing micro aerial vehicle with strict weight constraints (150g total weight).
- Conducted intrinsic and extrinsic calibration of both camera and IMU using Kalibr, while actively researching lightweight processors and sensors with enhanced computation resources in the project.

**Software Engineering Intern | Advanced Communications & Electronic Systems** | India

Apr 2022 – Jul 2022

- Collaborated to develop innovative business intelligence software in various stages of the software development lifecycle.
- Analyzed the performance of ML models like Random Forest, SGD, Clustering algorithms on custom datasets.
- Programmed the intuitive GUI of the desktop application in Tkinter (Python) and reviewed code written by the team.

**Student Researcher | Industrial Internet of Things (IIoT) Lab MJCET** | India

Jan 2022 – Mar 2022

- Led a team of 4 students in assembling an 8-foot industrial conveyor belt, concurrently crafting its digital twin using Unity 3D.
- Implemented precise real-time object detection using OpenCV, harnessing **SSD-MobileNet** to achieve **97.32% accuracy**.
- Optimized the model with TensorFlow Lite to run locally on Raspberry Pi 4B+, boosting detection speed by **150% to 8 fps**.

## ACADEMIC PROJECTS

**Fine-Grained Image Classification using Vision Transformer with Attention Mechanisms** [\[github\]](#)

May 2024

- Developed a ViT-based model with self-attention and hierarchical attention, achieving **77%** accuracy on CUB-200-2011 dataset,
- Utilized data parallelism for multi-GPU training, employing techniques like transfer learning, adaptive learning rate scheduler, dropout (0.5), L2 regularization, weight decay, and gradient clipping (max norm 1.0).

**Neural Network Comparative Analysis of Backbone Architectures for Semantic Segmentation** [\[github\]](#)

Jan 2024

- Benchmarked neural network architectures on a semantic segmentation task using a 400-image aerial dataset, achieving peak validation accuracy of over **80%** with ResNet34 and EfficientNet-B7 models and over **70%** with VGG-19, leveraging deep learning.

**Visual ORB SLAM 3 Comparison in an Autonomous Car v/s Indoor Setting** [\[github\]](#)

Dec 2023

- Assessed the performance of visual SLAM on outdoor NUance car videos and indoor footage, visualizing trajectory map in RViz.
- Configured the collection of camera and IMU data, and restructured ROS bag data to guarantee compatibility with ORB SLAM 3.

**Gazebo implementation of Sampling-based AM-RRT\* Motion Planning Algorithm** [\[github\]](#)

Nov 2023

- Executed TurtleBot 3 simulations in Gazebo with ROS and GMapping for enhanced motion planning in obstacle-rich environments.
- Demonstrated AM-RRT\*'s superior performance, consistently identifying optimal paths **35% faster**, such as navigating a custom-built map in **140 seconds** compared to **197 seconds** with RT-RRT\*.

**Forest Fire Detection System via Aerial Imagery using CNN** [\[github\]](#)

Aug 2023

- Integrated Pixhawk flight controller with Raspberry Pi 4B with Ardupilot Mission Control, sending SOS signal in under **5 secs**.
- Trained the CNN model using transfer learning on **InceptionV3** using a dataset of 4000 images achieving an accuracy of **91%**.

## LEADERSHIP / INVOLVEMENT

**Chairperson | Robotics Center**

Aug 2022 – July 2023

- Led a chapter of **70 members**, directing the development of innovative projects including drones, humanoid bots, and soccer bots.
- Hosted hands-on robotics workshops for a large group of **800+ students**, mentoring teams competing in inter-college events.