

# Saptadeep Debnath

Portfolio: [saptadeb.github.io](https://saptadeb.github.io)  
Github: [github.com/saptadeb](https://github.com/saptadeb)

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## EDUCATION

- University of Michigan** Ann Arbor, MI, USA  
• *Master of Science in Electrical and Computer Engineering (Robotics specialization)* Sept 2019 - Dec 2020  
GPA: 3.70/4.0  
Courses: Robotic Systems lab, Mechatronic Systems Design, Mobile Robotics, Robot Kinematics and Dynamics
- BITS, Pilani – Dubai Campus** Dubai, UAE  
• *Bachelor of Engineering in Electronics and Communication Engineering* Sept 2014 - May 2018  
GPA: 8.70/10.0  
Courses: Modern Control System, Computer-based Control Systems, Artificial Intelligence, Digital Image Processing  
Leadership Experience: Team Lead for IFOR (UAV Research Group) (Dec 2016 – May 2018)

## SKILLS SUMMARY

- Concentration Areas:** Robotic System Design, Control Systems, Robot Localization and Mapping
- Programming Languages:** Python, Bash, C, C++, HTML
- Tools and Technologies:** Robotic Operating System (ROS), OpenCV, PyTorch, NVIDIA Jetson AGX Xavier, Machine Vision Cameras (RealSense D455, ZED2i)

## WORK EXPERIENCE

- Equipment Technologies, Inc.** Mooresville, IN, USA  
• *Robotics Engineer* Mar 2021 - Present
  - In-charge of the Vision-Based Advanced Driver Assisted System initiative.
  - Designed a CNN-based semantic segmentation network to predict crop rows for CAN-linked machine steering.
  - Developed a ROS architecture to relay messages from the prediction software to the steering control manager.
  - Responsible for performing field tests for software validation.
  - Acted as an intermediary between a University development team and the company's hierarchy.
- Fulda University of Applied Sciences** Fulda, Germany  
• *Research Intern* Feb 2018 - July 2018
  - Investigated performance measures of an LSTM network by manipulating the training and testing datasets.
  - Achieved a 98% accuracy in detecting hand gestures.
  - Built a ROS pipeline to teleoperate a robot using real-time free hand gestures utilizing the LSTM network.

## ACADEMIC PROJECTS

- Object Tracking for Safety:** Engineered an object tracking module to detect and draw conclusions about the distance of the moving object from the camera; issue warning based on the proximity of the object to the camera. Tech: YOLO, DeepSORT, RGB-D (November '20) ([link](#))
- Slam and Path Planning implementation on MBot:** Explored and implemented various mapping, path planning and motion control algorithms on a simulation model for a differential drive robot Tech: C++, IMU, 2D lidar, SLAM, A-star, path planning (April '20) ([link](#))
- Invariant Extended Kalman Filtering for Robot Localization using IMU and GPS:** Developed an Invariant EKF based localization system and compared it against an Extended Kalman Filter based localization system and a GPS-alone dataset. Tech: MATLAB, invariant extended kalman filtering, IMU, GPS (April '20) ([link](#))
- 6-DOF Serial Link Robotic Manipulator:** Produced a codebase in Python to drive serially connected motors autonomously, employing object detection using a kinect camera suite for pick-n-place operation. Tech: Python, manipulator modelling, objection detection, OpenCV, path planning-smoothing, state machines (March '20) ([link](#))
- Mobile Inverted Pendulum System:** Designed a cascaded control architecture to balance a two-wheeled robot and to autonomously drive in pre-defined trajectories. Tech: C, inverted pendulum, trajectory following, IMU, PID, Beaglebone, Robot Control Library (February '20) ([link](#))
- Hand Gesture Control of a Robot using Intelligent Techniques:** Created a ROS pipeline to translate free hand gestures to motion instructions on TurtleBot running on Intel Atom. Tech: ROS, C++, Python, RNN, LSTM, TensorFlow, SLAM, TurtleBot (July '18) ([link](#))

## PUBLICATIONS

- Technical paper - Design and Development of a Non-Linear Controller for Quadrotor type Unmanned Aerial Vehicle:** IEEE International Conference on Inventive Computation Technologies. Authors: Saptadeep Debnath and Mary Lourde R (Coimbatore, India - November '18)
- Technical paper - Image based Biomechanical Case study of an International Archer:** International Conference on Sports Engineering. Authors: Saptadeep Debnath and Subir Debnath (Jaipur, India - October '17)
- Technical paper - Visual Odometry Data Fusion for Indoor Localization of an Unmanned Aerial Vehicle:** IEEE International Conference on Power, Control, Signal & Instrumentation Engineering. Authors: Saptadeep Debnath and Jagadish Nayak (Chennai, India - September '17)