Ashutosh Sahu

Roll No.:M22RM001
M.Tech RMS
Robotics and Mobility Systems
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EDUCATION

Degree/Certificate	Institute/Board	CGPA/Percentage	Year
M.Tech. (RMS)	Indian Institute of Technology, Jodhpur	8.46 (Current)	2022-Present
B.Tech. (Mechanical Eng.)	Bhilai Institute of Technology, Durg	8.02	2016-2020
Senior Secondary	CBSE Board	86.0%	2016
Secondary	CBSE Board	9.8	2014

EXPERIENCE

- **Transport and Diesel Department, Bhilai Steel Plant** *June - July 2019*
  Project Trainee Bhilai
  - Analyzed extensive failure data and categorized issues into mechanical, electrical, and other failures.
  - Utilized data visualization techniques to present complex failure data effectively, aiding in the identification of critical areas for improvement.
  - Proposed maintenance strategies, including Reliability-Centered Maintenance (RCM) and Condition-Based Maintenance (CBM).
  - Advocated for RCM to prioritize maintenance tasks based on criticality, reducing downtime.
  - Suggested CBM integration for real-time component monitoring to prevent critical failures.

M.TECH PROJECT

- **Motion planning and human in loop control of semi autonomous quadruped** *August 2023 - Present*
  This project involves developing an algorithm for IBVS coupled with MPC for motion planning
  - Executed the Image-Based Visual Servoing (IBVS) technique on a two-link robotic system, showcasing proficiency in the application of advanced control strategies to enhance robot performance and precision.
  - Successfully implemented Model Predictive Control (MPC) to achieve precise lane following capabilities, demonstrating expertise in advanced control algorithms for autonomous navigation.
  - Currently engaged in the development and deployment of Model Predictive Control (MPC) on real hardware, such as the TurtleBot3, to enable goal-directed autonomous navigation.
  - **Tools & technologies used**: MATLAB, IBVS, Model Predictive Control

COURSE PROJECTS

- **Autonomous Navigation using SLAM on TurtleBot3** *August - September 2023*
  Developed an autonomous navigation system using SLAM techniques on a TurtleBot3 Github
  - Created a custom Python and C++ script for go to goal behaviour, employing proportional control.
  - Successfully implemented and validated the control code on both physical hardware and Gazebo simulator, showcasing adaptability in real-world and simulated environments.
  - Generated a map of our robotics lab using Simultaneous Localization and Mapping (SLAM), enabling the TurtleBot3 to autonomously navigate in its environment.
  - Integrated the robot's autonomous navigation system with Rviz, simplifying goal selection through Nav2d, enhancing precision in autonomous decision-making
  - **Tools & technologies used**: ROS, Linux, Gazebo, Rviz, TurtleBot3, LIDAR and IMU sensors

- **Classical and modern approaches to semantic segmentation** *March - May 2023*
  Compared and implemented classical and modern ML algorithms for semantic segmentation Github
  - Conducted an extensive study of classical and modern approaches for semantic segmentation and implemented both these approaches.
  - Compared and implemented classical machine learning algorithms like Random Forest and SVM on a challenging aerial drone image dataset, evaluating their performance in accurately segmenting objects of interest.
  - Leveraged a cutting-edge CNN-based Unet architecture for segmenting biomedical images.
  - Implemented YoloV8, a deep learning-based approach, on a custom dataset featuring human subjects, bicycles, and various objects within the IITJ campus environment.
  - **Tools & technologies used**: Deep Learning, Yolo V8, CNN,TensorFlow, scikit-learn

- **Robust handwritten digit recognition using SVM and HOG** *Jan - Mar2023*
  Developed a robust system for accurately recognizing handwritten digits in multiple Indian languages. Github
  - Developed a robust system for accurately recognizing handwritten digits in multiple languages, including Devanagari, Tamil, and Bangla, utilizing Support Vector Machines (SVM).

- Implemented feature extraction using HOG features to capture the essential characteristics of each digit image, enabling effective classification.
- Rigorously tested the system on six diverse datasets, encompassing variations in handwriting styles, noise, and low-illumination scenarios, consistently achieving reasonable accuracy rates on most datasets.
- Attained superior classification accuracy by employing image preprocessing techniques, such as Contrast Limited Adaptive Histogram Equalization (CLAHE), histogram equalization, and Gaussian blur.
- **Tools & technologies used**: Computer Vision, Machine Learning, Image processing

- **Instagram Data Analysis** *August - September 2023*
  Data Visualization, Integration, and ML for Fraud Detection and Marketing Strategy Enhancement
  - Applied data visualization techniques for user data analysis, expanded data volume by integrating diverse datasets
  - Leveraged machine learning to detect fraudulent accounts and enhance marketing strategies.
  - **Tools & technologies used**: Machine Learning, Matplotlib, Pandas, Seaborn

B.Tech Project

- **Topological based characteristics and analysis of planar mechanism to suit a given task.** *June 2019 -May 2020*
  Developed a least calculation-intensive method to predict the kinematic behaviour of mechanisms.
  - Conducted structural analysis on planar kinematic chains through the application of Information Theory and distance matrix techniques.
  - Expressed entropy values of the topological structure as chain strings, serving as a distinctive marker for detecting isomorphism in kinematic chains. This approach also aids in predicting the structural behavior when applied to specific tasks.
  - Successfully validated the proposed method on various multi-degree-of-freedom planar kinematic chains, including those with simple joints and counter examples.
  - Accurately predicted kinematic properties, including inversions, workspace, and rigidity, utilizing chain strings and their corresponding string values.
  - **Tools & technologies used**: C++, Theory of Machines

Key Courses Taken

- Robotics,Experimental Robotics, Mobile Robots, Unmanned Aerial Vehicles, Machine Learning, Artificial Intelligence, Computer Vision, Embedded System Design, Autonomous System, Cyber Physical Systems

Technical Skills

- **Programming:** C, C++*, Python, Matlab, Embedded C, Assembly(ARM)*.
- **Tools & OS:** Git, Jupyter Notebook,Google Colab, Linux, Windows, ROS, ROS2.
- **Libraries**/**Frameworks:** Pandas, Numpy, scikit-learn, PyTorch, OpenCV, rospy, roscpp*
- **Simulators:** Gazebo, Simulink.
- **Hardware Experience:** TurtleBot, OpenManipulator-X, Arduino, STM32F412 Nucleo board, Raspberry Pi

* Elementary proficiency

Positions of Responsibility

- **Teaching Assistant,**Robotics, IIT Jodhpur *Aug 2022 - Present*
- **Teaching Assistant,**Robotics and Mobility Lab, IIT Jodhpur *Nov - Dec 2022*

Achievements

- **GATE:** Secured AIR 282 and AIR 2091 in GATE XE and GATE ME *2022*
- **JEE Mains:** Qualified JEE mains 2016 *2016*

Certifications

- ROS: Localization, Navigation and SLAM
- Advance Learning Algorithms

Hobbies

- Badminton, Chess