

Shubham Sapatale

MSc Robotics Graduate

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Education

University of Sheffield

Master of Science in Robotics

Automatic Control and System Engineering

Sheffield, United Kingdom

2023 - 2024

Merit

Government College of Engineering Karad

Bachelor of Technology

Department of Mechanical Engineering

Karad, India

2017 - 2021

CGPA: 7.93

Projects

Design of Ikshura University of Sheffield

Sheffield, UK 02/2024 - 09/2024

- Developed Ikshura, a robotic manipulator with integrated cutting for autonomous sugarcane harvesting, addressing labor shortages and environmental impact.
- Optimized end-effector design using Fusion 360 and ANSYS, improving harvest efficiency and reducing crop damage through finite element analysis.

Reinforcement Learning in Additive manufacturing University of Sheffield

02/2024 - 05/2024

- Developed a SAC reinforcement learning model in MATLAB to control EBM melt-pool temperature, achieving a 15% reduction in temperature variability across 3 adaptive approaches (layer, track, point).
- Applied normalization and regularization techniques, boosting SAC model stability by 20% and enhancing thermal consistency, which improved part quality and energy efficiency in powder bed fusion by 10%.

Computer Vision in Robotics and Automation University of Sheffield

02/2024 - 05/2024

- Designed and implemented complex data-processing solutions using Python-NumPy, Pandas to process and analyse datasets of over 10,000 entries, achieving a 25% increase in processing efficiency and ensuring model reliability through systematic testing.
- Engineered a dynamic pathfinding algorithm for a treasure-hunt simulation, achieving a 90% task success rate by applying adaptive search strategies that optimized navigation speed and decision-making in unpredictable scenarios.
- Enhanced LeNet-5 CNN architecture, achieving 87% classification accuracy by optimizing layer configurations and kernel sizes; applied regularization techniques, validated results with cross-validation, and visualized performance metrics using Matplotlib.

TurtleBot Challenge University of Sheffield

02/2024 - 05/2024

- Developed a ROS package for autonomous robot navigation, enabling a Turtlebot3 to explore a dynamic arena, avoid obstacles, and map the environment using SLAM.
- Collaborated with a team to implement efficient obstacle detection through the integration of LIDAR data, ensuring the robot successfully navigated unknown environments without collisions for the required duration.
- Optimized robot performance in real-time, refining control strategies to enhance navigation and ensure smooth, consistent performance during exploration.

Data Modelling and Machine Learning University of Sheffield

10/2023-12/2023

- Developed machine learning pipeline for chemical biodegradability prediction achieving 86.7% accuracy, implementing dual-method outlier detection system and comprehensive data visualization suite using Python, scikit-learn, and matplotlib.
- Engineered adaptive logistic regression model incorporating multiple solver algorithms with L1/L2 regularization techniques, optimizing performance through systematic hyperparameter tuning across 1,055 chemical compounds.
- Implemented five distinct overfitting prevention strategies and developed ROC curve analysis achieving AUC score of 0.83.

Aircraft State Estimation and Fault Detection University of Sheffield

02/2024 - 05/2024

- Optimized PI controller gains using NSGA-II, achieving a 97% compliance with control performance criteria; implemented Full Factorial, Random Latin Hypercube, and Sobol sampling, improving design space coverage by 22% and reducing sampling variance.
- Conducted in-depth trade-off analysis on ten performance metrics, minimizing control effort to 0.63 MJ while maintaining system stability and efficiency, automated sampling and evaluation in MATLAB, enhancing process efficiency by 30%.

The Traverser Robot *University of Sheffield*

10/2023-12/2023

- Engineered a custom-designed 2-DOF robotic arm using laser-cut acrylic, achieving precise end-effector positioning through inverse kinematics with the mobile platform for task execution in the Robot Challenge.
- Developed and implemented autonomous navigation algorithms using Arduino MEGA, multiple ultrasonic sensors, and servo motors, delivering an operational time of 1.03 hours while maintaining positional accuracy.
- Developed and fabricated a spring-loaded end-effector using Fusion360 and 3D printing technology, incorporating innovative mechanical solutions including custom T-slots and press-fit joints for optimal assembly and maintenance.

Perforated Inserts for Heat Transfer Efficiency *Government College of Engineering Karad*

1/2021

- Engineered perforated twisted tape inserts to enhance heat transfer of refrigerant R404A during flow boiling in horizontal tubes, achieving a 40% increase in heat transfer coefficient within vapor quality ranges of 10-50%.
- Optimized twist ratios in turbulent promoters, increasing thermal efficiency by minimizing mass transfer resistance at critical vapor qualities, and demonstrating superior performance over plain twisted tapes.

Professional Experience

Sales Associate *Spandan Meditech*

Solapur, India 05/2021 - 04/2023

- Stayed updated with industrial trends, understood customer needs, and provided assistance, resulting in improved customer satisfaction and increased sales.
- Co-ordinated and monitored the installation of medical instruments, ensuring proper setup and functionality, particularly managing installations remotely via phone and video conferences during COVID-19 restrictions.
- Maintained detailed documentation and records, contributing to efficient operations and compliance with company standards.

Voluntary Experience

Volunteer Tutor in Martial Arts and Roller Skating *Government College of Engineering Karad*

2019-2020

- Instructed undergraduate students in martial arts through comprehensive Karate and Kickboxing training sessions, while holding Red Belt certification in Karate.
- Developed and led Roller Skating coaching programs for beginners to advanced levels, drawing from personal experience as Inter-District Championship winner

Key Skills

- **Programming:** C/C++, Python
- **Robotics:** ROS, Autonomous Navigation, SLAM, Manipulator Design, OpenCV, Gazebo
- **Mechanical Software:** CATIA, Fusion 360, ANSYS, CNC Programming
- **Data Science & Visualization Frameworks:** Scikit-learn, TensorFlow, NumPy, Pandas, Matplotlib, Seaborn
- **Web Development:** HTML, CSS, JavaScript, React
- **Soft Skills:** Leadership, Teamwork, Problem-solving, Attention to Detail, Critical Thinking, Collaboration

Certifications

- Python Web Development — 3RI Technologies
- ROS2 — Udemy
- Robotics Painting — ABB
- CNC Programming — AWH Engineering College Kerala