

ASEEM SAXENA

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SUMMARY

Graduate Robotics Engineer with hands-on experience developing autonomous systems, machine learning algorithms, and robotic manipulation. Demonstrated expertise in ROS, digital twin simulation, and battery management systems through industry experience at AB Dynamics and Pentair Water, complemented by practical Husarion ROSbot navigation and industrial robotics projects.

EDUCATION

MSc. Robotics and Autonomous Systems | UK | September 2023 – January 2025

- Elected as Academic Representative for the Course.

Bachelor of Technology in Mechanical Engineering | India

- Research Paper: <https://github.com/AseemLab/E2O/tree/main/Paper>.

EXPERIENCE

Graduate Researcher | AB Dynamics | England, UK | April 2024 - September 2024 (Dissertation Thesis)

- Developed a **battery state-of-charge (SoC) estimation algorithm** for LiFePO4 and NMC batteries, comparing traditional methods (**Kalman Filters**, **RLS**) with machine learning models (**ANN**, **XGBoost**, **AdaBoost**). Trained models using **BMS data of 300+ million recorded states** from charge/discharge cycles and temperature variations to improve estimation accuracy.
- Analyzed model performance using **MSE metrics** for battery life prediction; tested multiple **AI models** across 270 epochs, with **AdaBoost** achieving consistent MSE of 400-500, outperforming **XGBoost's** MSE of >500 after 170 rounds of training.
- Enhanced machine learning model performance by **preprocessing BMS data** with **data augmentation**, **feature extraction**, and **noise filtering techniques**, implementing quality control measures to reduce inconsistencies and improve **model reliability**.
- Solved critical estimation challenges at extreme **battery states** (0% and 100%) by optimizing **model architecture** with **dropout layers** and **L1/L2 regularization**, applying **Bayesian tuning** to reduce prediction errors and improve **model generalization**.
- Improved **battery management system reliability** through **time-series optimization research**, discovering the optimal **time step threshold** of >1.2s for **XGBoost model**, leading to enhanced **prediction accuracy**.
- Published research on a **hybrid SoC estimation approach**, combining **traditional methods** and AI models, demonstrating the framework's effectiveness for **electric vehicle** and **grid-scale energy storage applications**, advancing **sustainable energy solutions**.
- **Designed a data collection and pre-processing pipeline**, integrating **Battery Management System (BMS) data** to train deep learning models, improving **estimation reliability for battery management systems**.

Design Engineer | Pentair | Noida, India | May 2021 – December 2022

- Designed, built, and analyzed **Inline pump assemblies** with multiple impeller sizes using Solidworks and CFD simulations, ensuring compliance with industry standards ASME, ASTM, BSI, and ISO.
- Created **3D models and manufacturing drawings** for pump components (impellers, volutes, shafts, couplings) in **Solidworks and AutoCAD**, reducing design rework by 25%.
- Developed **Python scripts to automate** mechanical design calculations, reducing **manual computation time by 90%** and improving accuracy.
- Conducted **Failure Mode and Effects Analysis (FMEA)** and **Fault Tree Analysis** in Ansys and Simulink, identifying **critical failure points**, leading to a **20% reduction in design defects**.
- Led technical data gathering and **tolerance stack-up analysis** in NPD projects using SolidWorks and GD&T, while **restructuring Product Change Order architecture** across multiple international sites, improving **design accuracy** and reducing **document retrieval time by 1/3**.

SKILLS

ROS, Python, Control Systems, Machine learning, Mathematics, Deep learning, Mechanical Engineering, Robotic Manipulation, Inverse Kinematics, Digital Twin Simulation, CoppeliaSim, Lua Programming, Path Planning
HTML, C++, MATLAB, Inverse kinematics, SolidWorks, Simulink, CoppeliaSim, Gazebo, RVIZ, UAV Navigation, Sensor Fusion, SLAM, Computer Vision, Path Planning Algorithms, Critical thinking, Problem-Solving, Creativity, Communication, Ethics, Empathy

PROJECTS

Nuclear Fuel Rod Handling System | University of Bath | 2024

- Developed a **digital twin simulation** of a **multi-robot nuclear fuel rod handling system** in **CoppeliaSim**, integrating **6-DOF robotic arms** with inverse kinematics (IK) algorithms to simulate **precise rod transfers** across reactor barriers.
- Engineered a **synchronized control system** for **four Niryo-One robots**, programming sequential **fuel rod transfers** through **Perspex safety barriers** using **Lua scripting**, and expanding the simulation to incorporate **welding processes**.
- Implemented **real-time path planning and collision avoidance**, integrating **proximity sensors, conveyor systems, and safety interlocks** to enhance **safe handling of critical materials** in nuclear reactor environments.

Autonomous Obstacle Avoidance System | University of Bath, UK | 2024

- Implemented the **Tangent Bug algorithm** for autonomous navigation in **Husarion ROSbot**, using **ROS and Python** to integrate **LiDAR sensor data** for real-time obstacle detection.
- Developed a **multi-node ROS architecture**, incorporating **odometry, action servers, and sensor fusion** to enable **dynamic path planning and obstacle avoidance**.
- Designed a simulation environment in **Gazebo**, creating **multiple test cases** to validate **navigation performance across various obstacle configurations**.

Water pump maintenance: shutdown prediction | Pentair | October 2022

- Developed a **predictive model** to forecast **pump shutdowns** using sensor data from **52 parameters**, including motor speed, current, power, flow rate, pressure, and temperature. Processed a **one-year dataset with seven system failure incidents**, cleaned raw data, and performed **signal plotting for trend analysis** to identify failure patterns.
- Implemented an **LSTM-based neural network** for time-series forecasting, leveraging its feedback connections to predict shutdown events. Trained the model on sequential data, improving **failure prediction accuracy and reducing unexpected downtime** by identifying early warning signs in sensor readings.

CERTIFICATIONS

Product design and development (NPTEL)

Code In Place 2021 - Python (Stanford University) | 2021

INVOLVEMENT

Academic Representative, MSc. Robotics and Autonomous Systems | University of Bath | September 2023 - September 2024

- Served as liaison between students and faculty to resolve academic concerns, coordinated regular feedback sessions and implemented structured communication channels, improving student satisfaction and program delivery.
- Enhanced curriculum effectiveness by incorporating industry-based examples and practical applications and collaborated with faculty to develop engaging teaching materials that increased student comprehension and participation.