Swapnil Meshram

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Summary: Robotics engineer with extensive R&D experience designing embedded systems for autonomous robots. Skilled in programming, as well as in robotics and machine learning frameworks for perception, control, and learning. Seeking research opportunities to advance collaborative, adaptive, and uncertainty-aware robots that address real-world problems.

Education

Master of Science, Robotics and Autonomous Systems (Electrical Engineering) **December 2024**
Arizona State University, Tempe, Arizona GPA: 3.71/4.00

Bachelor of Engineering, Electronics Engineering **May 2020**
K. K. Wagh Institute of Engineering Education and Research, Nashik, India CGPA: 6.48/10

Experience

Arizona State University: Graduate Research Aide **February 2023 - September 2023**
Miniaturized and Advanced Power Electronics Laboratory *Tempe, Arizona*

- Designed high-frequency planar transformer PCBs, achieving 26 kV and material-enabled 35 kV medium-voltage isolation using 7 kV/mil polyimide for photovoltaic/small-scale solar thermal applications.
- Engineered multi-layer PCB stack-ups (2-14 layers) for planar transformers, optimizing layouts and dielectrics to improve interleaving for AC loss reduction and robust medium-voltage isolation.
- Collaborated with Ph.D. researchers on a Department of Energy (DOE) funded project (DE-EE0010239), refining planar transformer PCB designs for high-efficiency, low-cost renewable energy integration.
- Resolved complex PCB design challenges, including managing fringing electric fields, optimizing via spacing, and mitigating conduction losses to ensure successful fabrication of planar transformer modules.

Aerospace Engineers Private Limited: Electrical & Electronics Engineer **February 2021 - December 2022**
Autonomous & Undersea Systems Division *Tamil Nadu, India*

- Led research and development of unmanned marine vehicle electrical systems, achieving a 15% cost reduction on key projects including the 300-meter-depth-rated Neerakshi Autonomous Underwater Vehicle (AUV).
- Engineered full-cycle embedded-system design, including component selection, schematic design, PCB layout, and final integration of underwater sensors, payloads and wireless communication interfaces.
- Optimized the Neerakshi AUV's core power-distribution system, increasing vehicle endurance by 10% and reducing wiring complexity by 30% to enhance overall system efficiency.
- Developed a high-efficiency propulsion power drive that boosted vehicle endurance by 5% and eliminated the need for active cooling through strategic Electronic Speed Controller (ESC) optimization.

Projects

Deep Learning Approaches to Musical Instrument Sound Classification **January 2024 - April 2024**
Academic Project, Arizona State University *Tempe, Arizona*

- Developed and implemented a deep learning framework for musical instrument sound classification, achieving a 63.75% test accuracy with a Convolutional Neural Network (CNN) model.
- Engineered audio preprocessing pipelines (spectrograms, MFCCs) and evaluated diverse machine learning architectures, including LSTMs, SVMs, Transformer models, and ResNet18 (via transfer learning), to enhance classification performance.

Comparative Analysis of SLAM Algorithms **January 2024 - April 2024**
Academic Project, Arizona State University *Tempe, Arizona*

- Evaluated Cartographer and GMapping SLAM algorithms on a ROS-enabled robot with an RPLIDAR sensor, measuring mapping accuracy using Mean Squared Error (MSE) and Mean Absolute Error (MAE).
- Identified GMapping's superiority in structured environments and Cartographer's strength in complex layouts through a comparative SLAM analysis, and recommended integrating depth sensors for improved obstacle avoidance.

EdgeVision: User-Defined Object Counting Using Raspberry Pi **August 2023 - December 2023**
Academic Project, Arizona State University *Tempe, Arizona*

- Developed EdgeVision, a real-time object detection and tracking system using the Faster R-CNN ResNet-50 model on Raspberry Pi 4, achieving 95.6% accuracy in bright and 82.5% in low-light environments.
- Implemented LineSegmentCounter and CentroidTracker modules for real-time object counting and tracking, supporting applications in traffic monitoring and retail analytics.

Skills

Hardware Design & Simulation: Altium Designer, KiCAD, Autodesk Eagle, Simulink, Ansys Maxwell, LTspice
Programming Languages: Python, C, Embedded C, MATLAB
Software Development & IDEs: Google Colab, Visual Studio Code, Jupyter Notebook, Anaconda, Git
Libraries & Frameworks: PyTorch, TensorFlow, Scikit-learn, NumPy, Pandas, Matplotlib, Seaborn, ROS1/ROS2