SAMARTH MURALIDHARA

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EDUCATION

Birla Institute of Technology and Science (BITS), Pilani 2023 - 2027
B.E. Mechanical Engineering 9.21

Vidya Mandir Higher Senior Secondary School, Chennai 2023
Class XII (CBSE) 95%

Vidya Mandir Higher Senior Secondary School, Chennai 2021
Class X (CBSE) 97.4%

RELEVANT COURSEWORK

Robotics, Machine Learning, Data Mining in Mechanical Sciences, Applied Statistical Methods, Mechanisms and Machines, Autonomous Mobile Robotics (Ongoing), Control Systems (Ongoing), Engineering Optimization (Ongoing)

SKILLS

Programming Languages	Python, MATLAB
Frameworks and Libraries	Tensorflow 2, ROS Noetic
Software and Tools	Ubuntu, Git, Jupyter, AutoCAD, Fusion 360

RESEARCH EXPERIENCE

Undergraduate Researcher September 2025 - Present
INSPIRE Lab, BITS Pilani *Advisor: Prof. Avinash Gautam*

Autonomous Navigation & Obstacle Avoidance for Mobile Robots via DRL

- Developed a **Deep Reinforcement Learning (DRL)** - based navigation stack for a TurtleBot3 using the **DDPG algorithm** in Gazebo for **autonomous, mapless obstacle avoidance**.
- Designed a continuous Actor-Critic neural network architecture processing a **28-dimensional state space** (24-beam LiDAR, 2D target position, 2D velocity data) into **2-axis continuous velocity control**.
- Addressing sparse-reward local minima through **composite reward shaping** balancing collision penalties and dense goal-distance feedback.
- Benchmarked baseline agent behavior across **1,000+ simulated training episodes**, successfully validating collision-avoidance capabilities while iteratively tuning **Ornstein-Uhlenbeck** noise parameters to improve forward-momentum and target acquisition.

Research Intern May 2025 - July 2025
CSIR-NAL, Bengaluru *Advisor: Ganesh Madhuranath, Senior Principal Scientist*

Kinematic Synthesis and Visualization of a Flap Actuation Mechanism

- Performed **kinematic synthesis of a four-bar linkage** used in civil aircraft flap actuation, focusing specifically on the Boeing 777 outboard flap architecture.
- **Derived the kinematic equations** for a four-bar linkage, ensuring the flap attached to the coupler passed through three key configurations: takeoff, cruise and landing.
- **Validated the mathematical model** through MATLAB simulations, refining the geometric parameters of the linkage to minimize deviation, ultimately achieving a **synthesis error margin of under 4 mm**.

Teaching Assistant - Materials Science and Engineering Aug 2025 - Dec 2025
BITS Pilani

Facilitated laboratory experiments and **evaluated undergraduate coursework**, assisting faculty in course administration.

PROJECTS

Hierarchical Fault Diagnosis of Spacecraft Propulsion Systems

Engineered a **Prognostics and Health Management (PHM)** framework to diagnose spacecraft propulsion faults using 1 kHz pressure sensor data. **Extracted frequency-domain features via FFT** to isolate water hammer effects and acoustic ringing. Built a **hierarchical ML pipeline** (Random Forest, KNN, Isolation Forest) with GroupKFold validation, achieving **78.26% fault detection** and **76.02% exact row match** accuracy on unseen test data.

Statistical Analysis and Forecasting of Solar Energy in Rajasthan, India

Conducted comprehensive **Exploratory Data Analysis (EDA)** on 15 years of hourly solar irradiance data from two solar parks in Rajasthan. Implemented and benchmarked a suite of time-series forecasting models **(AR, MA, ARMA, ARIMA, and SARIMA)** to predict future irradiance (GHI) values. Leveraged advanced statistical modeling to capture complex geographic variations and long-term seasonality, achieving an optimal average **RMSE of 19.52 W/m^2** with the SARIMA model.

Thermal Analysis & Cooling Strategy for Tesla Model S Plaid Battery Pack

Developed a MATLAB **lumped heat capacitance model** to simulate a 479 kg Tesla battery's (110S72P) thermal response across multiple drive cycles, evaluating a **peak heat generation of 38 kW**. Designed an **active liquid cooling strategy** using an **EGW mixture**, calculating a **2.21 kg/s mass flow rate** through parallel manifolds to prevent thermal throttling and maintain a rigid 5°C temperature differential.

POSITIONS OF RESPONSIBILITY

Student Faculty Council Member August 2025 - Present
Department of Mechanical Engineering, BITS Pilani

Selected as **1 of 2 representatives** from a competitive cohort of **160+ students** to serve as a direct liaison between the student body and department administration. **Orchestrated bi-semester review meetings** with faculty to proactively address academic friction points, evaluate course delivery, and resolve curriculum challenges.

Captain August 2025 - Present
Pilani Caracals Ultimate Frisbee Club, BITS Pilani

Represented BITS Pilani at the **National College Ultimate Championship (NCUC) 2025**, the premier national tournament for collegiate Ultimate Frisbee. **Direct team operations** by organizing structured practice sessions, designing tactical skill-development drills, and executing strategic roster selections for national-level tournaments.

Treasurer August 2024 - May 2025
Kannada Vedike, BITS Pilani

Managed the finances for the cultural association representing Karnataka at BITS Pilani, and played a key role in organizing Grub, an **annual food festival** celebrating regional cuisine, which drew a crowd of **600+ students** from across campus.

SCHOLASTIC ACHIEVEMENTS & AWARDS

1968-1973 Batch Golden Jubilee Scholarship Recipient Jan 2025

Awarded for **academic excellence** based on first-year performance at BITS Pilani.

OPJEMS 2024 Scholarship Finalist Sep 2024

Shortlisted among **Top 3 Mechanical Engineering students** at BITS Pilani for this **national-level scholarship**.