SHRINIDI KUPPURAJAN | ME22B018 | PR/22/ME/25/018 | Github

EDUCATION

PROGRAM	INSTITUTION	CGPA / %	YEAR OF COMPLETION
B.Tech Mechanical Engineering	Indian Institute of Technology Madras	8.57/10.0	2026
Class XII (CBSE)	Suguna Pip School, Coimbatore	96.8%	2022
Class X (CBSE)	Suguna Pip School, Coimbatore	96.6%	2020

SCHOLASTIC ACHIEVEMENTS

- Secured an **AIR rank** of **2109** in the Joint Entrance Exam (JEE) Advanced 2022 from over **200 thousand** candidates
- Qualified among **top 0.3** percentile in the Joint Entrance Exam (JEE) Main 2022 from over **1.2 million applicants**
- Recipient of the **NTSE**[1] **Scholarship** in 2020, in the top **0.2%** out of **1 million** candidates for academic excellence

RELEVANT COURSES & SKILLS

Modern Control Theory	AI: Search Methods for Problem Solving	Machine Learning Techniques
Network dynamics and Controls	Introduction to Reinforcement Learning	Multivariate Data Analysis
Synthesis of Control Systems	Recent Advancements in Reinforcement Learning	Computational Heat and Fluid Flow
Modelling: Simulink, Solidworks, Autodesk Fusion 360, AutoCAD, Autodesk Inventor	**Simulations:** ANSYS, Gazebo, OpenAI Gym, PyBullet, Optimum Kinematics	**Languages**: Python, MATLAB, ROS2, Octave, LaTeX, C, Java

PROFESSIONAL EXPERIENCE

HINDUSTAN UNILEVER LIMITED – Guide: Santosh Gupta, Supply Chain Manager (May 2025 – July 2025)

Automated In-line Quality Check

- Implemented a **ResNet-50** framework **CNN** for image classification in quality inspection to meet CRQS[2] properties
- Curated a **custom image dataset** with **multiple failure labels** achieving **94%** testing accuracy & **76.2%** for validation
- Optimized operations by conceptualizing an automated in-line rejection system utilizing precision vacuum grippers

Optimization of Truck Layout

- Implemented a truck layout optimizer using **DeepPack3D**'s **DQN**[3]-based DRL framework for mixed-load scenarios
- Built a **web app** using **ngrok** to determine optimal truck size, pallet order and generate optimized 3D cargo layouts

COURSE PROJECTS

Reinforcement Learning
Dr. Balaram Ravindran

- Developed an options learning framework using **SMDP**[4], **Intra-option Q learning** to solve the OpenAI gym Taxi Env
- Designed special exploratory options for the agent in the **hierarchical framework** to reliably solve the Taxi domain
- Implemented **MC**[5]**-REINFORCE & DDQN**[6] for continuous cartpole & acrobat env, tuned network hyperparameters

Modern Control Theory
Dr. Kallol Roy

- Modeled the non-linear 4-tank system with ODE[7]s & estimated water heights using **EKF**[8] and **SIR**[9] **Particle Filters**
- Implemented **constrained MPC**[10] for the same, analyzing stability & pole-zero behavior across operating scenarios
- Analyzed the impact of the EKF performance on Model Predictive Control by varying key **Kalman gain parameters**

Algebraic Multigrid Solver
Dr. Kameswararao Anupindi

- Developed a **transient SIMPLE** CFD solver with **Algebraic Multigrid** acceleration to model flow in a lid-driven cavity
- Applied **QUICK** scheme for spatial discretization on finest grid to reduce numerical diffusion and improve accuracy

TECHNICAL PROJECTS

Swarm Intelligence
Research Project

Guide: Dr. Anuj Tiwari, Distributed Intelligence & Robotics Lab, Department of Mechanical Engineering, IIT Madras

- Implemented **MAPPO** based distributed learning drone network, optimized reward function for formation pinning
- Designed an **options framework** for **leader shielding** & **re-elections**, developed **heuristics** for efficient option calls
- Created '**Aviary**' env for **PyBullet** simulations & generalised policy training by **domain randomization** for **sim2real**

AgroBot (LLM)
AI Hackathon

- Built a multi-modal AI agent using **YOLOv8** & **IndicBERT** for plant disease detection & multilingual query handling
- Trained large-scale predictive models on agricultural big data (KCC, AgMarknet) using **PySpark** for agro-forecasting
- Packaged AI pipelines by integrating vision & **NLP** models into a **React** app for image capture & real-time diagnosis

VEHICLE DYNAMICS & CONTROLS MODULE – FORMULA STUDENT – Guide: Dr. Satya Narayanan S, Applied Mechanics, IIT Madras

Vehicle modelling
(May 2024 – December 2024)

- Evaluated various **MATLAB Simulink** models for testing and tuning the car to increase cornering speed & stability
- Iterated over and finalized a **45% Lateral Load Transfer Distribution** to achieve the target of a neutral steering car
- Developed a **Torque Vectoring System** using **model predictive control** and **PI** to dynamically regulate **vehicle yaw**

Progressive Motion Ratio Rocker Design
(April 2023 – October 2023)

- Modelled kinematics of a **double-wishbone** system to track spring-damper actuation through various ride heights
- Designed a **rocker** with **progressive motion ratio** to improve handling and greater adaptability for an FSAE vehicle
- Performed **Finite Element Analysis** and achieved fatigue safety factor of **1.3** after **1.4 million fully-reversed cycles**

POSITIONS OF RESPONSIBILITY

RAFTAR FORMULA RACING (FORMULA SOCIETY OF AUTOMOTIVE ENGINEERS)

Vehicle Dynamics & Controls Engineer
(May 2024 –December 2024)

- Part of a **40+** member team that **designs**, **builds, tests** & **competes** with Formula Student electric race cars yearly
- Used **FMEA** to streamline cost-effective manufacturing methods, pruning costs by **40%** and assembly time by **60%**
- **Integrated** the full car CAD on **Autodesk Inventor** with over **5k+** components from chassis & powertrain modules

Design & Cost Lead
(January 2025 –April 2025)

- Integrated **system goals** of Vehicle Dynamics, Powertrain, Structure, Driver Interface and LV[11] Electronic modules
- Prepared **Gantt** charts, **WBS**[12] charts & **Costed Bill of Material** to ensure vehicle targets were achieved efficiently

EXTRACURRICULARS

Formula Bharat
2025

- Secured an **Overall 2nd Place (Electric)** and **1st place** in the Statics category in the **Nationwide FSAE**[2] **competition**
- **Winner** of the **Engineering Design Challenge, Best Battery Pack Design award** and **Cost & Manufacturing award**
- Won 3rd place in **MathWorks Skidpad Simulation Challenge** for optimized **torque vectoring** & **velocity estimation**

Formula Student Germany
2024

- Represented India at **FSG24** as a **2nd year EV**, qualifying in the **top 10** globally, among 80+ Formula Student teams
- Achieved **4th place** in the **MathWorks Modelling & Simulation Award** and **6th** in the **Cost & Manufacturing Event**

Football

- Represented hostel and won **gold** for two consecutive years in **Dean's Trophy** '23 and '24 from among **10+ teams**
- Selected for the National Sports Organization, Football at IIT Madras from over **200** candidates across the campus

NIDAR
Drone Federation of India

- Implemented **YOLOv8 CNN** framework to detect and label diseased crops, achieving an inference accuracy of **87%**
- Deployed the prediction bundle on a ground station & established comms for live inference, **accurate geotagging**

[1]:National Talent Search Examination [2]:Customer Relevant Quality Standards [3]:Deep Q-Network [4]:Semi-Markov Decision Process [5]:Monte Carlo [6]:Dueling DQN
[7]:Ordinary Differential Equation [8]:Extended Kalman Filter [9]:Sequential Importance Resampling [10]:Model Predictive Control [11]:Low Voltage [12]:Work Breakdown Structure