

# S HARI PREETHAM

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## RESEARCH INTERESTS

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Robotics and Autonomous Systems · Adaptive and Robust Control · Compliant Mechanisms · Sensor Fusion and Perception · Reinforcement Learning

## EDUCATION

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**University College of Engineering, Science & Technology-JNTUH** Aug 2021 – Apr 2026  
Integrated Dual Degree in Mechanical Engineering (Advanced Manufacturing Systems) GPA: 8/10

**Narayana Junior College, Hyderabad** Apr 2019 – Apr 2021  
Intermediate (Mathematics, Physics, Chemistry) Score: 97.2%

## RESEARCH EXPERIENCE

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**Real-Time Vibration Compensation in Low-Cost Laser Steering Systems via Visual-Inertial Fusion and Comparative Control Strategies** Jun 2025 – Present

Link: [Github Repository](#)

Master's Thesis Supervisor: Dr. A. Chennakesava Reddy

- Project aims to develop a line-of-sight stabilization algorithm for laser beam steering applications (e.g., UCAS, precision agriculture laser weeding).
- Designed and fabricated a 2-axis galvo scanner using salvaged Voice Coil Motors (VCMs); CAD modeling and open-loop operation demonstrated.
- Developed a simulation environment (PyQtGraph + OpenGL) to model kinematics, ray-plane intersection, and laser scanning control.
- Built real-time object detection and tracking pipeline using YOLOv8 + DeepSORT for visual servoing.
- Planning implementation of sensor fusion (IMU + camera) and control algorithms (PID, LQR, MPC) for vibration rejection and precision pointing.
- Creating hardware-in-the-loop testing framework to integrate simulated sensors and real camera feedback prior to full hardware deployment.

**Enhancement of Surface Finish and Material Properties of 3D Printed PLA via Vapor Treatment** Nov 2024 – May 2025

Bachelor's Thesis

Supervisor: Prof. G. Krishna Mohana Rao

- Investigated acetone, Dichloromethane (DCM), and chloroform vapor treatments on FDM 3D-printed PLA components.
- Conducted tensile testing (UTM) and surface roughness analysis, achieving a 40% improvement in surface finish and a 15% increase in tensile strength.
- Simulated thermal and fluid flow conditions in ANSYS to optimize treatment uniformity and analyze material phase effects.

## EXPERIENCE

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**Defence Research and Development Organisation, DRDO-DRDL** Hyderabad

Link: [Github Repository](#)

Project Intern

Sept 2023 - Oct 2023

- Under the guidance of Scientist 'F' Shaik Ismail, developed Python-based tools to analyze 13,000+ data points across 25+ parameters for MIRV aerodynamic heating and re-entry thermal assessment.
- Transitioned legacy MATLAB workflows to optimized NumPy/SciPy pipelines, improving computational efficiency and enabling high-fidelity parametric studies of skin temperature and transient heat behavior.
- Implemented PyROOT for advanced data processing and visualization, calculating isentropic flow properties, stagnation temperatures, and standard atmospheric parameters across altitudes.
- Provided actionable insights into thermal protection and trajectory design, supporting validation of re-entry vehicle components.

- Gained hands-on proficiency in CAD modeling, reverse engineering, and design simulations in ANSYS, focusing on structural and thermal performance of components.
- Explored topology optimization and design-for-additive-manufacturing across multiple processes: (FDM, SLA, SLS) to create lightweight, high-strength structures.
- Rapidly prototyped components using multiple 3D printing technologies, validating designs and improving manufacturability for functional testing.
- Applied design-for-3D-printing principles to ensure structural integrity, thermal tolerance, and manufacturability of complex geometries.

## SKILLS

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|-----------------------------|--|
| Programming Languages:      | Python, C++, Javascript  |
| Control & Embedded Systems: | ROS2, Linux (PREEMPT_RT), Microcontroller Programming, Controller Design |
| Simulation & CAD:           | SolidWorks, Fusion 360, ANSYS, Gazebo, 3D Printing                       |
| Other Tools:                | Git, Docker, Mathematical Modeling, System Identification, OpenCV        |

## PROJECTS

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### ROS2 Visual Processor for Real-Time Robotics

Link: [Github Repository](#)

- Developed a low-latency visual perception system in ROS2 for control and vision for remote-operated robotics.
- Integrated a YOLOv8-based ROS2 node using WebRTC for real-time, browser-based object detection visualization.
- Optimized system for deterministic performance on embedded platforms using the Linux PREEMPT\_RT patch.

### Quadruped Spider Robot

Link: [Github Repository](#)

- Designed and built a Bluetooth-controlled quadruped robot using an Arduino Uno and 12 servo motors.
- Implemented inverse kinematics for precise leg positioning and developed multiple gait generation algorithms for stable locomotion.
- Programmed kinematic calculations and control loops for seamless operation via a custom mobile application.

### Low-Cost Motion Capture System for Robotics

- Developed an indoor motion capture system utilizing calibrated high-speed PS3 Eye cameras (operating at 187 fps) to capture motion data.
- Implemented principles of epipolar geometry for accurate and real-time 3D localization of physical markers within the capture volume.
- Applied system identification techniques (e.g., frequency response analysis, impulse response modeling) to derive dynamic characterization and facilitate precise control of associated robotic platforms.