

# S HARI PREETHAM

Hyderabad, India · [hari.preetham.jntuh@gmail.com](mailto:hari.preetham.jntuh@gmail.com) · +91 7013589964 · [Portfolio Website](#)

## RESEARCH INTERESTS

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

## EDUCATION

<b>University College of Engineering, Science &amp; Technology-JNTUH</b> Integrated Dual Degree in Mechanical Engineering (Advanced Manufacturing Systems)	Aug 2021 – Apr 2026 GPA: 8/10
<b>Narayana Junior College, Hyderabad</b> Intermediate (Mathematics, Physics, Chemistry)	Apr 2019 – Apr 2021 Score: 97.2%

## RESEARCH EXPERIENCE

<b>Real-Time Vibration Compensation in Low-Cost Laser Steering Systems via Visual-Inertial Fusion and Comparative Control Strategies</b> <i>GitHub: <a href="https://github.com/GODCREATOR333/SPECTRA">https://github.com/GODCREATOR333/SPECTRA</a></i> <i>Master's Thesis Supervisor: Dr. A. Chennakesava Reddy</i>	Jun 2025 – Present
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- 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.

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

<b>Defence Research and Development Organisation, DRDO-DRDL</b> <i>GitHub: <a href="https://github.com/GODCREATOR333/Simulation_Aerodynamic_Heating">github.com/GODCREATOR333/Simulation_Aerodynamic_Heating</a></i> <i>Project Intern</i>	Hyderabad Sept 2023 - Oct 2023
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- 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.

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## SKILLS

Programming Languages:	Python, C++, MATLAB
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

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## PROJECTS

### **ROS2 Visual Processor for Real-Time Robotics**

*github.com/GODCREATOR333/ROS2\_E2E\_VisualProcessor*

- 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**

*github.com/GODCREATOR333/Quadruped\_robot*

- 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.