



# Robotics

Master of Engineering,  
University of Maryland, College Park

# Mechanical Engineering

Bachelor of Engineering,  
University of Pune

# ADITYA CHAUGULE

ENGINEER . ROBOTICIST



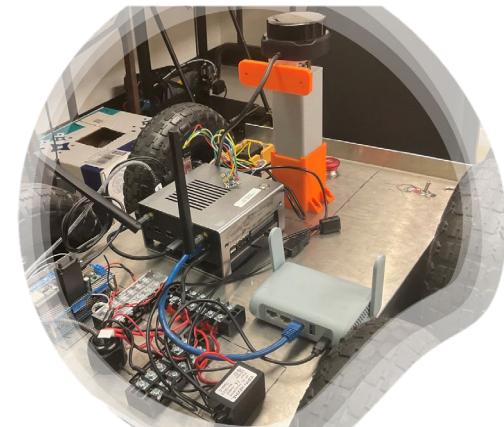
[in/adityachaugule/](https://www.linkedin.com/in/adityachaugule/)



<https://github.com/Tys0nus>



<https://tys0nus.github.io/>



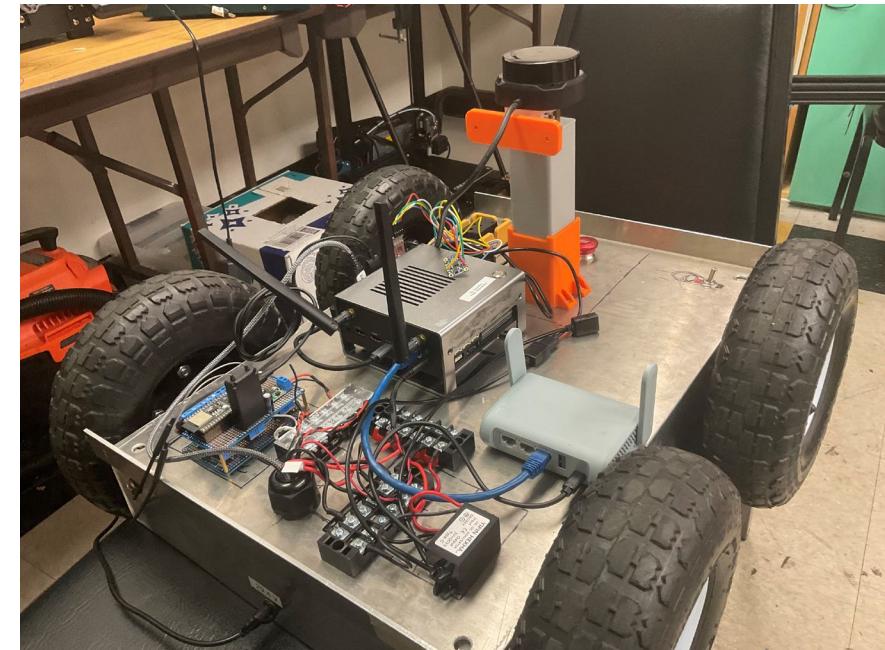
# Robotics Engineer Intern

Kick Robotics

College Park, MD, USA

Validated custom ROS2 software package for SLAM & autonomous navigation, resulting in 20% improved navigation accuracy

Integrated Camera and Lidar sensors, conducted rigorous testing, enhancing client's warehouse monitoring capability



# Mechanical Engineer Intern

Mechatol Engineering Solutions

Pune, India

Utilized Ashby Chart for optimal material selection through MADM-AHP process

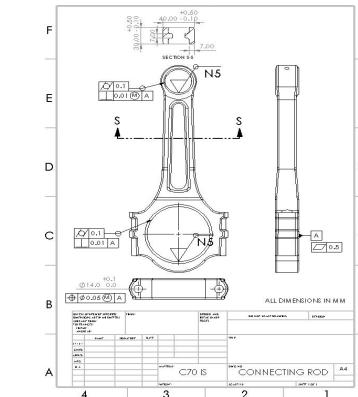
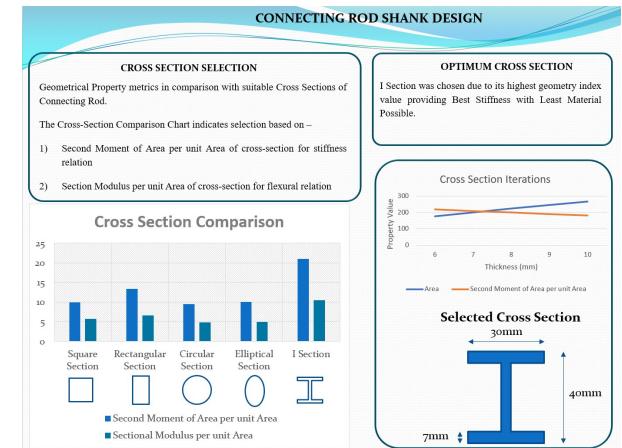
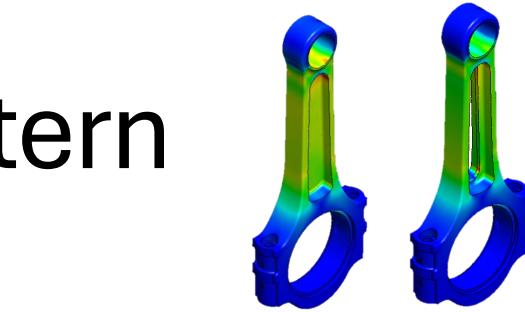
Engineered components through design calculations of Engine Components - Piston, Connecting Rod and Crankshaft

Developed detailed 3D models and assemblies using SolidWorks

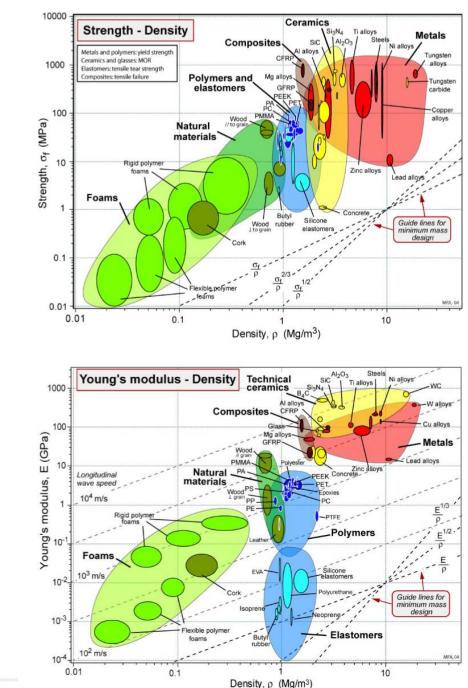
Conducted comprehensive FEA study using SolidWorks for Weight and Topology optimization

Created precise manufacturing drawings

Costing and Estimation & Bill of Material

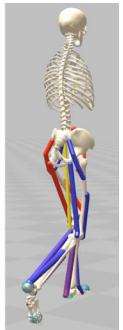
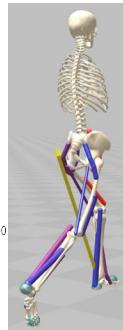
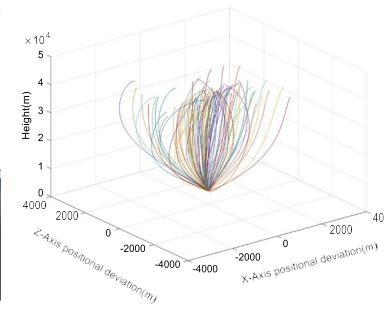
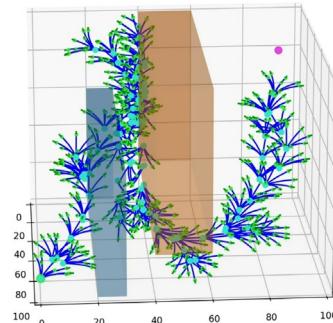
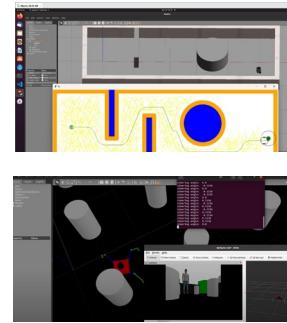


No	Module	Prepared Failure Mode	Failure Mode	Failure Mode of Failure	Prepared Failure of Failure	Failure Mode of Failure	Failure Mode of Failure	Milestones
1	System Level Analysis	Do not consider a primary failure mode	Engage enhanced system level analysis	Change of state of the system	1. Achieve Critical Force build up by optimising weight 2. Increase critical load in fatigue, buckling			
2	Connecting Rod	Inadequate load capacity in connecting rod	Relative motion between piston and connecting rod	Load transfer from the piston to the connecting rod	Load transfer from the piston to the connecting rod	Load transfer from the piston to the connecting rod	Load transfer from the piston to the connecting rod	1. Reduce Contact Surface Area of piston to reduce friction 2. Improve Lubrication
3	Connecting Rod Shank	Shank fails due to buckling	Diameter of the shank fails because the shank is too long	Minimum diameter of the shank fails because the shank is too long	Minimum diameter of the shank fails because the shank is too long	Minimum diameter of the shank fails because the shank is too long	Minimum diameter of the shank fails because the shank is too long	1. Increase Contact Surface Area of piston to reduce friction 2. Improve Lubrication
4	Big End	Fatigue failure	Cracks or pocket holes in the bearing housing	Cracks or pocket holes in the bearing housing	Cracks or pocket holes in the bearing housing	Cracks or pocket holes in the bearing housing	Cracks or pocket holes in the bearing housing	1. Selection of appropriate Triboslip Radii for bearing loads 2. Implementation of surface treatment processes
5	Crack	Connecting Rod Fracture	Crack propagates from the crack tip to cause a brittle fracture	Crack propagates from the crack tip to cause a brittle fracture	Crack propagates from the crack tip to cause a brittle fracture	Crack propagates from the crack tip to cause a brittle fracture	Crack propagates from the crack tip to cause a brittle fracture	1. Reduction of crack length 2. Implementation of surface treatment processes



# Robotics

## Project Highlights



### Quadruped Spiderbot

- Designed a teleoperated Quadruped Spider robot with 8 DOF, 4 arms utilizing DH parameters to model the robot and integrated Camera and LiDAR sensors
- Simulated ROS-enabled robot in Gazebo to emulate inverse kinematics capable of maximum speed of 0.8m/s and a maximum payload capacity of 1kg

### RRT non-holonomic Path Planning in 3D Neurosurgical Environment

- Developed a Rapidly-exploring Random Trees (RRT) path planning algorithm with non-holonomic constraints for steerable bevel-tipped needles in a 3D environment

### Fault Level Diagnosis for estimating Gearbox degradation

- Deployed a LSTM based classification algorithm to identify the gearbox degradation level from a set of triaxial vibration signatures for varied operating conditions of speed and torque achieving a 98% accuracy

### Design of Output Feedback Controllers - LQR, LQG

- Analyzed Controllability and Observability by linearizing the non-linear dual pendulum cart system
- Designed LQR & LQG controllers, ascertained stability of the closed-loop system through Lyapunov stability criterion and simulated system response to reject constant force disturbances

### Predictive Entry Guidance for Vertical Rocket Landing

- Developed a high-fidelity simulation for vertical rocket landing using advanced control system, optimizing the guidance algorithm via Monte Carlo simulations & achieving a landing precision within 10 meters under varied conditions.

### Muscle-Reflex driven Design & Control of Exoskeleton

- Designed and analyzed a simulation of fatigue driven muscle-reflex exoskeleton control system to assist individuals with spinal cord injuries, enhancing gait stability through neuromuscular control and biomechanical analysis

# Powertrain Engineer

Resonance Racing

Pune, India

Conducted detailed strength and material selection calculations for the design of custom gearbox and final drive axles

Streamlined the CAD process for the ATV's full vehicle assembly and sub-assemblies, achieving a 150% improvement in lead time

Collaborated to produce detailed reports, presentations, and spreadsheets for the Final Design Report and Design Evaluation Events



# Powertrain Division Lead

Resonance Racing

Pune, India

Formed and led a high-performing 5-member team, delegating key tasks to junior members to successfully develop a robust Drivetrain Unit for the ATV

Engineered a custom 2-stage reduction gearbox, integrating a Design Verification stage using industry-standard KISSsoft software

Enhanced design validation and testing by implementing SAE and BIS standards, increasing efficacy and failure mode detection by 20%

Directed the cost evaluation of the project, developing comprehensive cost models to optimize budget allocation



# Team Captain

Resonance Racing

Pune, India

Spearheaded 25 Member Team spanning 7 divisions - Technical, Manufacturing & Marketing Departments, led Red- Team reviews and directed a budget of 25,000+ USD, strategically allocating funds to key development initiatives

Regulated administrative functions - reviewing reports, approving expenditures, enforcing rules to ensure goal-oriented

Project Execution improving productivity by 33% & cost-effectiveness by 15%



[Resonance Racing | TITAN 2.0 Journey | BAJA SAE 2020 - YouTube](#)

#Transforming Willpower into Horsepower



# Virtual Dynamics Division Team

BAJA SAEINDIA

India

Conducted IPG CarMaker training sessions for over 800 engineering students, facilitating the creation of digital-twin all-terrain BAJA buggies.

Race commentator for 5000+ live audience for the 15th edition of the BAJA SAEINDIA endurance race



#Strategies Revamped



# Virtual Dynamics Division Lead

BAJA SAEINDIA

India

Led nationwide training for 1000+ engineering students on digital-twin BAJA buggy development, establishing and enforcing comprehensive rules and regulations for electric & combustion vehicle simulation on off-road conditions

Introduced and administered the Validation Event for 170 student teams to corroborate virtual vehicle fidelity with physical vehicle performance through a real-time simulator setup



#Refuel Recharge Reinvent

# Air Brakes Controls Engineer

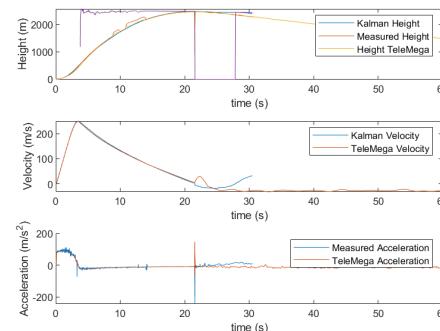
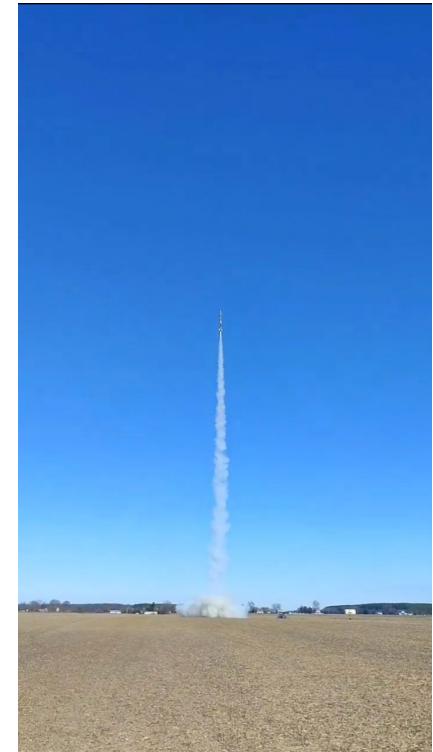
Terrapin Rockets

College Park, MD, USA

Simulated feature parameters to identify, finetune and predict controller performance based on actual flight launches

Developed library packages, including a multivariate Kalman Filter and sensor integration for the team's flight software

Engineered a custom controller design for a high-powered sounding rocket's air brake system, aimed at achieving a target apogee of 10,000 ft



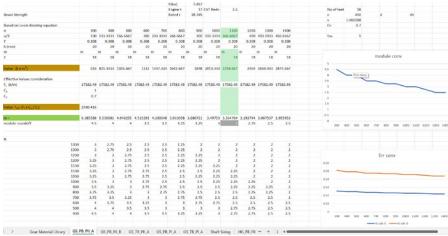
# Technical Showcase

POWERTRAIN	
ENGINE	HIGHLIGHTS
Model	1M12320054-G1
Max Power	10 hp @ 2600 rpm
Max Torque	19.6 N-m @ 2600 rpm
TRANSMISSION	Custom single speed 2-stage reduction gearbox
RR_ORIGINS_1.0 Continuously Variable Transmission	Current: CVT Maximum Shift Ratio 6.5:1 Heavy-Duty AISI 1210 sour gear sets Gear durability 500 hrs - 2000 hrs : High Fatigue Strength AISI 4340 drivelines.
Origins 1.0	3.70 : 1 to 0.75:1
Reduction Ratio	8.669
Low Gear Ratio	32.07 : 1
High Gear Ratio	6.5002 : 1
LAYOUT	Performance Curves
Acceleration	7.2 m/s <sup>2</sup>
Gradiability	90 % (42°)
Drawbar Pull	1500 kg @ 5°
INTEGRATION	System Reliability
Kisssoft Load Spectrum Analysis	Service Life [h]
Lubrication	Engine SAE 15W50 Gearbox SAE 80W90
Tires	2-ply Carlisle 23"x7"10"
Max stress: 256.33 FOS: 2.14	
Max deformation: 0.0213mm Max stress: 459 MPa FOS: 1.56	

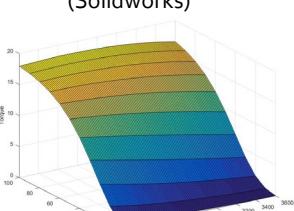
Powertrain System Design  
(Overview)



Full Vehicle CAD Assembly  
(Solidworks)



Powertrain System Calculations



BAJA Engine Mapping



CVT Components



OffRoad Digital Twin Track Design



Data Acquisition & Tuning

## Sponsorships



- Company branding on the vehicle, Team Apparels, College campus, Teams social media sites, commercial banners, posters and various other platforms.
- Association with leading companies at the event, in news and media.
- Brand promotion, Survey events like college cultural and technical fests, technical workshops, SAE programs, vehicle unveiling ceremony.
- Business promotion through various campus activities and promotional showcases of the vehicle in the company premises.
- Company will be associated with various NGO's and community based organisations promoting social initiatives throughout the year.
- Sponsors benefits focus on visibility and networking. Companies will have access to team events in campus and the competition.

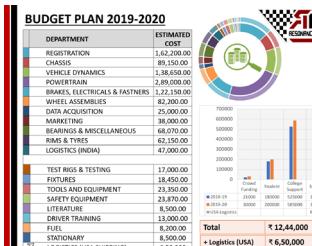
Sponsorships



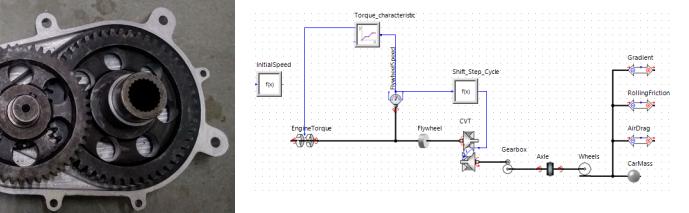
Single speed 2-Stage Gearbox



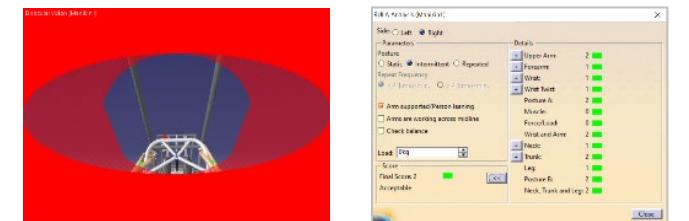
Budgeting



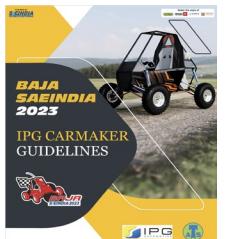
Budgeting



System Level Performance Analysis of ATV



Ergonomics Verification – RULA Analysis



Technical Documentation

# Certifications

## Solidworks

Dassault Systems

**ASSOCIATE**  
Mechanical Design

 SOLIDWORKS

**PROFESSIONAL**  
Mechanical Design

 SOLIDWORKS

**EXPERT**  
Mechanical Design

 SOLIDWORKS

**PROFESSIONAL**  
Sheet Metal

 SOLIDWORKS

**PROFESSIONAL**  
Surfacing

 SOLIDWORKS

**PROFESSIONAL**  
Weldments

 SOLIDWORKS

**PROFESSIONAL**  
Drawing Tools

 SOLIDWORKS

## Lean Six Sigma Green Belt

Accredited by ASCB(E)



# Something More..

