Madhav Joshi

+91 9823289767 | madhavjoshi2819@gmail.com | LinkedIn

Education

- Dr. D Y Patil Institute of Engineering, Management and Research — *Pune, Maharashtra*
  B. Tech in Mechanical Engineering; CGPA: ***8.23*** — *Jul 23 – May 27*

Experience

SAEINDIA eBAJA- 2026

Transmission and High Voltage (HV) Lead — *NATRAX, Indore*

Team Genesis 16 Motorsports — *Mar 25 – Present*

- **Drivetrain Development:** Designed and optimized the complete transmission system with custom CV joint for articulation angle up to 37 deg. (pulley reduction, 2-stage EN36 gearbox, differential integration) for the 2026 eBAJA vehicle.
- **Performance & Structural Analysis:** Conducted gear/shaft load calculations, torque–speed analysis, efficiency mapping, and reliability checks for the drivetrain. Validated both chain-drive and belt-drive systems for performance and reliability.
- **High Voltage System Integration:** Led motor–transmission integration with MCU tuning (throttle curve, FOC parameters, torque limits, regen mapping, ramp-up/down), CAN-based motor calibration, accumulator discharge optimization, BMS tuning, and complete HV safety system setup as per rulebook.

Junior Powertrain Design Analyst — *BVRIT, Hyderabad*

Team Genesis 16 Motorsports, eBAJA 2025 — *Jul 2024 – Feb 2025*

- **Drivetrain Optimization & Technical Ownership:** Led performance-focused refinement of the drivetrain by optimizing pulley ratios, assessing traction and wheel-slip characteristics, and translating test-bench and on-ground insights into measurable efficiency improvements.
- **Cross-Functional Understanding of Motor & BMS Systems:** Developed a strong grasp of PMSM, BLDC, and IPM motor behavior along with BMS operation, enabling informed decision-making in mechanical–electrical integration and contributing to more predictable and responsive power delivery.
- **Coordination & Subsystem Execution:** Supported strategic planning within the powertrain subsystem by structuring tasks, aligning deliverables across teams, and facilitating smooth technical coordination—ensuring consistent progress toward performance and reliability targets.

Manufacturing Sub-Lead — *BVRIT, Hyderabad*

Team Genesis 16 Motorsports, eBAJA 2025 — *Jul 2024 – Feb 2025*

- **Leadership in Manufacturing-Centric Design:** Championed a manufacturing-driven design philosophy, ensuring every component was engineered for production efficiency, structural robustness, and streamlined integration across the vehicle's powertrain and chassis systems.
- **Industrial Exposure Informing Engineering Decisions:** Deepened technical judgement through **MIDC industry outreach**, gaining firsthand experience with machining operations, fabrication workflows, tolerance control, and assembly best practices—translating these insights into higher manufacturing quality within the team.
- **Shop-Floor Leadership & Execution Oversight:** Directed end-to-end manufacturing operations by structuring fabrication plans, delegating tasks, and guiding team members through precision-critical processes, ensuring timely, accurate, and standards-driven execution of all build activities.

Projects

- **Custom CV joint Development**: Designed a custom CV joint through OEM reverse-engineering and material evaluation, achieving a ***27°→37°*** articulation improvement to support *an extra inch* of wheel travel in full-droop conditions, while integrating it directly with the gearbox output shaft to eliminate external CV joint assembly.
- **CFD-Driven Forced Convection Cooling System:** Led the design of an active air-cooling solution for the transmission using advanced CFD simulations in **ANSYS Fluent** and **COMSOL Multiphysics**, optimizing airflow and thermal dissipation to significantly reduce overheating and enhance drivetrain efficiency.

- **MCU Tuning for better Powertrain Performance:** Performed advanced MCU tuning involving throttle-curve calibration, FOC parameter refinement, torque-limit setting, regenerative-braking mapping, and ramp-up/down adjustments to enhance overall vehicle dynamics. Have **hands-on experience tuning the IRP Systems Evver Dynamic 6 motor controller with the Elektrocatalyst eIPM-11 motor**, using the **Peak CAN system** and **TrueDRIVE software by IRP Systems** to optimize performance for competitive racing conditions.
- **Optimized Belt Drive System:** Engineered a high-efficiency belt-drive setup by calculating and refining pulley ratios to minimize wheel slip and traction loss across varying gradients, enabling improved torque delivery, faster acceleration, and enhanced climbing capability.
- **Laser-Based Acceleration Measurement Kit:** Developed a laser-based acceleration measurement system using **Raspberry Pi, Node MCU, SolidWorks, Arduino IDE** for high-precision vehicle dynamics assessment. Created Python/MATLAB scripts to process sensor data, generate acceleration profiles, and derive performance metrics. Implemented noise-filtering and signal-smoothing techniques to ensure accuracy in off-road conditions. Designed vibration-isolated mounting fixtures for stable measurement and logged real-world acceleration data to evaluate drivetrain response, torque delivery, and overall performance.
- **Vehicle Attitude DAQ System**: Developed a DAQ system to measure real-time roll, yaw, and pitch using an ESP32 and MPU6050 IMU for analyzing vehicle behavior under rigorous off-road conditions. Implemented sensor fusion and filtering algorithms to improve attitude accuracy and reduce noise. Designed a stable mounting configuration for the IMU and logged dynamic response data to evaluate stability, handling characteristics, and chassis performance.
- **Suspension Travel DAQ System:** Developed a suspension-travel DAQ system using a **linear potentiometer** mounted on the damper and interfaced with an **ESP32** for real-time data logging. Integrated the setup with our **custom-designed springs** with calculated spring rates to accurately quantify damper compression, wheel travel, and the distribution of forces within the wheel assembly. Captured and analyzed suspension-motion data to evaluate damping efficiency, load transfer, and overall off-road ride dynamics.

Achievements And Responsibilities

- **1st Position- SIH Hardware Track (College Level)**: Achieved first place for designing and developing an *EPLA Smart Helmet*, integrating advanced safety sensors, onboard electronics, and real-time monitoring features. Utilized **lightweight EPLA material** to enhance comfort and usability, demonstrating strong innovation in hardware design during the Smart India Hackathon internal round.
- **1st Position-Lightest vehicle**: Responsible for engineering a light-weight and optimized electric ATV for eBAJA 2025 season as a Junior Powertrain engineer and Manufacturing sub-lead.

Skills & Interests

- **Leadership & Management**: Leading the Powertrain department, driving effective management and inter-department coordination to maximize team productivity, with a long-term interest in transitioning into product management and broader product leadership roles.
- **CAN Communication for Motor Tuning:** Skilled in using CAN communication tools to tune motor controllers, extract performance parameters and optimize overall powertrain response for racing conditions as per the driver feedbacks.
- **Design for Manufacturing**: Driven by a manufacturing-first design approach, focusing on cost-effective and production-friendly components, supported by practical exposure during BAJA vehicle fabrication.
- **Software**: For designing- SolidWorks, CATIA. For FEA- Ansys. And MS Excel, MS PowerPoint and MS Word, also comfortable with Arduino IDE. TrueDRIVE for tuning motor and it's controller.
- **Vehicle Dynamics:** Gaining practical understanding of off-road dynamics by analyzing traction limits, weight transfer, suspension kinematics, steering behavior, and brake-bias effects, and applying these insights to tune powertrain response and overall vehicle performance.