Shubhendra Pratap Singh (Curriculum Vitae)

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PROFESSIONAL SUMMARY

Mechanical Engineer and Product Innovator with 8+ years of hands-on experience in rapid prototyping, additive manufacturing, mechanical system design, and automation. Adept at bridging concept to production with demonstrated success in pilot-scale implementation, multi-domain collaboration, and lean design methodology. Known for a diverse project portfolio spanning automotive emissions systems, rural water purification, service robotics, battery diagnostics, and humane wildlife tagging devices. Strong advocate of applied engineering—merging digital design, human-centered innovation, and manufacturing efficiency for scalable impact. Experienced across academic research labs, startup ecosystems, and industrial test environments, with a deep focus on design for manufacturability, 3D printing, and system integration.

EDUCATION

Clemson University — *M.S., Mechanical Engineering | Aug 2023 – Aug 2025 (Expected)*
GPA: 3.83 | CEDAR Lab | Advisor: Dr. Cameron Turner

- **Thesis**: *Exploring Bio-Inspired Design Analogies Using Critical Chain and LLMs*
- Engineered a **cassette-based vitrification system**, designed in SolidWorks, iterated through 3D printing, and structured for automation and robotic handling.
- Designed and tested a **humane whale-tagging prototype** using bio-inspiration and cross-institutional collaboration, aimed at non-invasive marine tracking.
- Developed a **custom 2D FEA solver in MATLAB** to predict structural stress-strain response and validated it using mesh refinement techniques.
- Designed and executed a full-scale **Design for Manufacturing (DFM)** innovation study, including teardown analysis, functional modeling, Boothroyd analysis, and material/process optimization for an ultrasonic room diffuser system—resulting in a **25% cost reduction** and **efficiency improvement from 63.2% to 88.7%**.
- Engineered a **diagnostic framework for lithium-ion batteries**, integrating hybrid electrical-thermal modeling in MATLAB/Simulink. Developed an **Extended Kalman Filter (EKF)**-based observer for fault detection and isolation in automotive battery management systems.
- Supported instruction and grading for undergraduate and graduate mechanical engineering courses, including mechanical design and advanced design methodologies.

JECRC University — *B.Tech, Mechanical Engineering | Aug 2012 – Aug 2016*

- **Founder, JU Automotive Club (JECRC)**: Led student teams to national design competitions such as Eco-Kart, Effi-Cycle, Quad Bike, and Formula Student. Fostered innovation and teamwork through hands-on automotive projects.

RELEVANT COURSEWORK

Advance Design Methodology, Engineering Optimization, Statistics with R, Data Visualization, On-Board Diagnostics, Material Selection, Design of Automation, Modeling and Simulation, Design for Manufacturing, Finite Element Formulation

TECHNICAL SKILLS

CAD: SolidWorks, Fusion 360, Inventor, ANSYS.
Rapid Prototyping & Fabrication: 3D Printing (FDM/SLA), Laser Cutting, Jig/Fixture Design, Product Assembly
Automation & Design Tools: DFMEA, Tolerance Analysis, Design for Manufacturing (DFM), Function-Based Modeling
Programming & Simulation: MATLAB, Simulink, Python, C++, R, Visual Studio, D2T Morphee
Testing & Diagnostics: Engine Dyno, Climate Chambers, Emission Testing, Thermal/NVH Analysis
Platforms & Systems: ETAS INCA, Cummins Calterm, Horiba MEXA, SCADA, PLC, Arena PLM
Other: Embedded Systems, Internet of Things (IoT), Lean Prototyping, Design Thinking

PROFESSIONAL EXPERIENCE

FEV India – Project Engineer | Nov 2017 – Apr 2021 | Pune, India
(Global-leading engineering service provider)

- Managed **pilot testing and calibration** of Euro-6 diesel engines, SCR emission systems, and hybrid off-road engines.
- Designed **macro-based data automation tools** that improved throughput in test cycles by 20%, saving $180,000/project.
- Coordinated **product development teams**, driving emissions compliance, NVH evaluations, and validation workflows using AVL, Horiba, and MATLAB tools.
- Contributed to physical integration of **test rigs, sensor arrays**, and embedded diagnostics in lab-to-field testing setups.

Club First – Research Associate | Jul 2016 – Nov 2017 | Jaipur, India
(Robotic Company)

- Designed 12+ engineering solutions, notably **IWPVS**—an IoT-enabled Instant Water Purification & Vending System deployed in rural India.
- **3D printed prototypes**, performed iterative validation in humidity-prone, power-variable environments.
- Engineered **mechanical structures for serving robots**, combining modularity with structural optimization (FEA-based).
- Delivered **workshops and guest lectures** on **rapid prototyping and robotic dynamics** to students and junior engineers.
- Wore multiple hats across engineering, sales, client management, and field deployment, boosting startup agility.

Honda Cars India – Engineering Intern | Jan 2016 – Jun 2016 | Greater Noida, India
(Auto Car Manufacturer)

- Designed **universal engine fixture** for petrol/diesel lines, reducing assembly time by 2 minutes/unit.
- Conducted FEA and DFMEA; optimized line planning using PERT and rapid prototyping models.
- **Final-year project with Honda Cars India** received one of the highest scores in university history and was **nominated for the Best Innovation Award**.

SELECTED PROJECTS & RESEARCH

- **Bio-Inspired Design Tool:** Developed a framework using black-box models and LLM-based analogy extraction for design exploration.

- **IWPVS System:** Designed IoT-enabled rural water dispensers, addressing voltage fluctuation, filtration speed, and humidity resilience.
- **Whale-Tagging Device:** Prototyped humane, long-duration marine tracking systems with cross-institutional collaboration.
- **Emission Cycle Automation (FEV)**: Developed testing automation tool still in use, saving over 1,000 test hours per project.
- **Serving Robot:** Engineered kinematics and structure using CAD/FEA; integrated modular designs for healthcare and hospitality.
- **Lithium-ion Battery Diagnostics**: Modeled thermal-electrical BMS faults using EKF in Simulink for early fault detection.
- **2D-FEA Solver**: Coded a solver in MATLAB for stress analysis with custom mesh processing and visualization tools.
- **ECU IP Theft Detection:** Designed proof of concept (PoC) methodology with Georgia Tech to highlight security flaws in ECU reverse engineering.

LEADERSHIP & OUTREACH

- **Guest Lecturer & Workshop Host, Club First**: Delivered practical training sessions on **rapid prototyping** and **robot dynamics**, mentoring aspiring engineers and school students in STEM fields.
- **Wildlife Photographer & Conservation Volunteer**: Actively involved with **Tiger United**, contributing to animal conservation efforts and awareness campaigns. Documented wildlife through field photography to support humane tracking research and conservation education.
- **Aquascaping Entrepreneur**: Designed and sold **low-cost custom water filtration systems** (UV + CO_2) for aquarists. Provided consultation to hobbyists across India, blending mechanical design with ecology.
- **Cultural Explorer**: Traveled to **17 Indian states**, learning from local communities and integrating cultural sensitivity and empathy into design perspectives and user-centric engineering.

Visit my webpage at: https://ceoss625.github.io/Shubhendra/