BISHAL DUTTA

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PROFESSIONAL SUMMARY

A Mechanical Engineering student specializing in Robotics, IoT, and Automation, with a proven track record in **end-to-end** system development. Combines deep mechanical design (CAD, FEA) with strong software (Python, C++, ROS 2), and embedded systems (STM32, Raspberry Pi) expertise to **build and deploy** practical robotic and IoT solutions. Demonstrated leadership in delivering an AI-powered SCARA robot from concept to functional prototype. Aspiring to bridge robotics design, control, and AI for developing intelligent industrial automation systems.

Key Strengths: Collaborative Problem-Solving | System-level Design | Agile Prototyping | Effective Communication

WORK EXPERIENCE

Robotics & Automation Intern — **Bishnu Engineering, Assam| June 2025 – July 2025**

- Designed and developed a low-cost, AI-driven **4-DOF SCARA** robot for automated sorting and pick-and-place.
- Engineered the mechanical structure (Fusion 360) and conducted kinematic/dynamic simulations to optimize performance.
- Implemented C++ firmware on an ESP32 controller with **inverse kinematics** for precise joint control.
- Integrated a computer vision pipeline (Python, OpenCV, Raspberry Pi) for **object detection and localization**.
- **Result:** Achieved **±2mm** positional accuracy and **<5s** cycle time per object.

Mechanical Maintenance Intern — **IOCL Guwahati Refinery | January 2025 – February 2025**

- Gained hands-on exposure to maintenance protocols for critical industrial equipment, including centrifugal pumps, compressors, and heat exchangers.
- Observed troubleshooting procedures for operational inefficiencies within a thermal power station environment.

Summer Research Intern — **IIEST Shibpur | June 2024 – July 2024**

- Conducted Finite Element Analysis (FEA) in ANSYS on **12 TPMS lattices,** comparing structural integrity and stress distribution for aerospace/biomedical use.
- Contributed data-driven findings to a research paper focused on optimizing strength-to-weight ratios in additively manufactured components.

PROJECTS

SOLSYNC: Solar-Driven Attendance System

- Architected a standalone, solar-powered attendance system for off-grid environments, leveraging **edge computing** on a Raspberry Pi and hardware integration with an ESP32.
- Implemented a secure authentication protocol using **biometric hashing (SHA-256)** and **geofencing** to ensure data integrity in remote locations.
- Built a full-stack solution featuring a React-based admin dashboard and a **cloud-synced MySQL** database for real-time monitoring and reporting

Secure IoT Automated Pump Control

- Developed a secure IoT system for remote water pump control to prevent wastage and unauthorized use.
- Implemented end-to-end **TLS** encryption on **MQTT** communications (ESP32 to server) to prevent **MITM** attacks.
- Designed a mobile app with **role-based access** for remote monitoring, leak alerts, and shutdowns.
- **Projected Outcome**: 15% reduction in water wastage and 40% faster response to critical events.

TECHNICAL SKILLS

Robotics & Simulation: ROS 2, Gazebo, RViz, MATLAB, Simulink, ANSYS.

Mechanical Design: SolidWorks, Fusion 360, AutoCAD.

Version Control & OS: Git, Linux (Ubuntu)

Embedded Systems: STM32, Raspberry Pi, Arduino, ESP32

Programming & AI Tools: Python, Java, OpenCV, NumPy, Pandas.

IoT & Networking: MQTT, SCARA, Cloud Integration Protocols (UART, I2C, SPI)

EDUCATION

Bachelor of Technology in Mechanical Engineering — Jorhat Engineering College

CGPA: 7.72 / 10.0 — 2022 - 2026

ACHIEVEMENTS & CERTIFICATIONS

Finalist, Boeing Aeromodelling Competition | IIT Kharagpur 2024

1st Place, Sustainathon 2024 | Tezpur University

3rd Place, Col. Guru Prasad Das Hackathon 2025 | Jorhat Engineering College

Certification: Aerial Robotics (University of Pennsylvania via Coursera) , Industrial Robotics (NPTEL) , Additive manufacturing , ROS2 (Udemy)