

Shivam Bhardwaj

SENIOR AI-AUGMENTED ROBOTICS & AUTOMATION ENGINEER

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PROFESSIONAL SUMMARY

6+ years bridging **Mechanical Design** (Siemens NX), **Software** (Python/ROS/C++), and **Operations**. Specialist in **AI-Accelerated Engineering**—leveraging LLMs and modern AI stacks to rapidly deploy full-stack automation tools, reducing development cycles from weeks to days. Proven track record delivering critical hardware for **Meta, Applied Materials, Amazon Robotics, and Saildrone**.

EXPERTISE

AI & Robotics: C++, Rust, Python, ROS/ROS2, LLM Integration, CV (OpenCV, YOLO)

Hardware/CAD: Siemens NX (Open API), SolidWorks, Rhino3D, GD&T, Prototyping

Automation: Industrial IoT, PLC (Beckhoff), LabView, Sensor Fusion

Process/Tools: 5S Methodology, ERP Integration, Git, Jira, Wiring/Harnessing

EXPERIENCE

Mechatronics Engineer | Design Visionaries

May 2023 – Present

Clients: Applied Materials, Saildrone, Industrial IoT

- **AutoCrate Design Engine:** Invented a parametric design engine by reverse-engineering **Siemens NX Expressions** (bypassing slow NX Open API), reducing design time from **5 days to <1 hour**. Built a **React/Python** GUI to generate ASTM-compliant drawings, increasing custom crate adoption from **20% to 50%**.
- **AR Glasses Electronics:** Designed a **10-layer Flex PCB** for AR glasses, integrating an **Ambiq MCU**, USB power delivery, micro-projector data path, and **I2C** ambient light sensing within a compact form factor.
- **Harness Production Scaling:** Scaled harness production from **25 to 70 units/day** (2.8x increase) and reduced RMA rate from **70% to 10%** by implementing lean manufacturing systems and optimizing assembly workflows.
- **Custom Instrumentation:** Invented a real-time **Laser/LDR** soil leveling sensor for slurry injection, solving a critical feedback gap where CV failed. Developed an automated metrology machine for recycled metal classification.
- **MBD & GD&T:** Transitioned a major semiconductor lab (Plasma ALD) from 2D drawings to **Model-Based Definition (MBD)** in NX, defining **GD&T** and PMI directly in 3D models to meet critical deadlines.

Engineering Manager | Advanced Engineering Services

Oct 2022 – Apr 2023

Clients: Meta (Reality Labs), Applied Materials, Hummingbird EV, AAA

- **Multi-Modal Robotic Forensics:** Architected a robotic workcell for counterfeit detection in server systems, integrating **RF, Thermal (+/- 0.5°C), Capacitance, and Optical** (85mm industrial lens) sensing to achieve **0.5% repeatability**.
- **EV Conversion & Simulation:** Led the mechanical reverse-engineering for a **Class-8 Diesel-to-Electric** conversion (AAA); executed **3D scan post-processing** and **Harmonic Analysis** to validate structural integrity and transient response of mounting systems.
- **AR Hardware Development:** Managed the mechanical and industrial design of a **Waveguide Frame** for a semiconductor research lab; coordinated with vendors for high-fidelity finishing (painting/3D printing) to meet **tight tolerance specifications** for executive demos.
- **Feasibility & Automation:** Conducted feasibility studies for **containerized ad-hoc EV charging** and **datacenter server pin testing automation**, delivering technical roadmaps for niche industrial problems.

Senior Robotics Engineer | Velodyne Lidar

Jan 2021 – Sep 2022

R&D Software Team Lead

- **Next-Gen Lidar Validation:** Validated next-generation LiDARs (including **Velarray directional** sensors) at highway cruising speeds. Engineered custom 80-20 testing jigs for diverse platforms, ensuring robust data collection for **all product lines**.
- **Infrastructure Automation (SaaS Deployment):** Pioneered the deployment strategy for Velodyne's **first-ever SaaS compute stack**. Developed **Ansible** playbooks to automate the provisioning of the **Vella vision stack** on **Jetson-based NRU** controllers, enabling scalable customer deployments.
- **Sensor Integration & Development:** Developed onboard IMU capabilities and implemented Precision Time Protocol (PTP) synchronization. Built data collection platforms integrating RTK GPS for high-fidelity georeferencing.

- **Field Engineering & Operations:** Led 7+ standardized IEAB tests at GoMentum Station. Generated massive data annotation pipelines for **Scale AI**, supporting the training of perception models across the entire product line.
- **Strategic Technical Partnerships:** Acted as a **Hardware-Software Liaison** for key accounts (**Ford**, **Amazon Scout**, **Knightscope**). For **Bluecity** (Smart Cities), conducted **3D blindspot analysis** to optimize Lidar placement and maximize coverage efficiency.

Robotics Software Engineer | ARI

Surgical Robotics & Compliance

Jan 2020 – Dec 2020

- **Surgical Registration Algorithm:** Developed a **C++** registration algorithm using **VTK** and **PCL**, processing **10,000+ points** to compute the transformation matrix between a patient's femur and a surgical drill. Implemented **Iterative Closest Point (ICP)** to align **OptiTrack** motion capture data with MRI-based 3D point clouds.
- **High-Performance Metrics:** Achieved **0.1mm translation** and **0.3° rotation accuracy** with a registration time of **300ms** (data collection: 20s), directly enabling precise robotic milling of the femur head.
- **Robot Control System:** Engineered the control logic for a **6-DOF Kuka Robot** using **Beckhoff PLC**, orchestrating **100%** of the surgical workflow from registration to execution with **1ms** cycle times.
- **FDA Compliance:** Performed system-level risk analysis and contributed to design validation documentation for **FDA 510(k)** submission, ensuring **100%** safety-critical software compliance under **IEC 62304** standards.
- **Data Pipeline Architecture:** Implemented **DDS** middleware and **Protobuf** serialization to process and feed real-time sensor data into the **Computer Vision (CV)** pipeline with **<5ms latency**, ensuring seamless integration between subsystems.
- **Industry Impact:** Pioneered "**Active Milling**" (autonomous cutting), moving beyond standard "jig-holding" robotics. This key innovation drove **Zimmer Biomet's acquisition of Monogram** in late 2025 to challenge industry leaders.

Visiting Researcher | AI4CE Lab (NYU)

Advisor: Prof. Chen Feng

Jun 2019 – Dec 2019

- **Autonomous Construction:** Researched **Collective Robotic Construction (CRC)**, developing algorithms for multi-agent systems to build structures autonomously.
- **Computer Vision:** Implemented **SLAM** and object detection pipelines for real-time site monitoring and robot localization in dynamic environments.
- **Research Publication:** Contributed to research findings on **topological structural analysis** for robotic assembly, laying groundwork for future lab publications.

Graduate Research Assistant | NYU Tandon School of Engineering

M.S. in Mechatronics & Robotics

Aug 2017 – May 2019

- **Mechatronics Systems:** Designed and fabricated a **Miniature Wall-Climbing Robot** using magnetic adhesion and compliant locomotion, achieving vertical traversal speeds of 5cm/s.
- **Embedded Control:** Developed real-time control firmware on **STM32** microcontrollers for multi-DOF robotic arms, implementing PID control for precise trajectory tracking.
- **Teaching Assistant:** Mentored 30+ students in "Introduction to Robotics," leading lab sessions on **ROS**, python scripting, and sensor integration.

EDUCATION

M.S. Mechatronics & Robotics , New York University - Research: AI4CE Lab – Real-time visual localization using Deep Learning (SLAM without GPS)

B.Tech Electronics , I.P. University, Delhi - Award: Top 3 University Projects – Developed ArduPilot-based Autonomous Drone