

# Shivam Bhardwaj

LEAD INTEGRATION ENGINEER | HARDWARE-SOFTWARE SYSTEMS & COMPLIANCE

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## PROFESSIONAL SUMMARY

**Lead Integration Engineer** (6+ years) owning **hardware-software integration, system bring-up, and regulatory compliance** for shipping robotics and embedded products. Currently leading **Stretch 4** launch validation and **FCC certification** at **Hello Robot**. Prior: **LiDAR/IMU/GNSS** validation at **Velodyne**, surgical robotics at **ARI** (acq. **Zimmer Biomet**), and consulting for **Apple, Meta Reality Labs, Tesla, Saildrone**.

## EXPERTISE

<b>Robotics &amp; AI:</b>	C++ (14/17), Python, Systems Integration & Debugging, LiDAR Validation & Test, Point Clouds (PCL), Sensor Fusion / State Estimation, Motion Planning & Controls, ROS/ROS2, OpenCV, ORB-SLAM, COLMAP
<b>Hardware &amp; CAD:</b>	Siemens NX (Open API), FEA Analysis, SolidWorks, Rhino3D, GD&T (ASME Y14.5), DFMA, Rapid Prototyping (CNC, laser cutting, waterjet, 3D printing)
<b>Embedded &amp; EE:</b>	EMC/FCC Compliance (conducted/radiated, mitigation), Regulatory Test Protocols, Embedded C/Rust, PCB Design (Altium, KiCad), Microcontrollers (STM32, ESP32, Ambiq), Interfaces (I2C, UART, CAN), Industrial (EtherCAT, Modbus)
<b>Software &amp; DevOps:</b>	Rust (Tokio, Axum), Linux, DDS, Protobuf, Time Sync (PTP), PoE, RTK GPS/GNSS, Edge Compute (NVIDIA Jetson), Docker, Kubernetes, Ansible, GitHub Actions, AWS IoT Core

## EXPERIENCE

**Lead Integration Engineer** | Hello Robot, Martinez, CA May 2026 – Present

*Stretch 4 launch | hardware characterization, production validation, EMC/FCC certification*

- **Stretch 4 Launch Characterization:** Leading hardware performance characterization for Hello Robot's next-gen mobile manipulator; defining **motor duty-cycle limits, payload/speed envelopes, and end-of-life specs** to inform product datasheets and customer-facing capability claims.
- **Production Acceptance Testing:** Building a **motion-capture-based** kinematic validation rig to verify every Stretch 4 unit off the production line meets positional accuracy and repeatability spec, moving from sample-based QA to **100% automated inspection**.
- **EMC/FCC Compliance:** Owning regulatory test protocols and certification roadmap for Stretch 4; driving **conducted and radiated emissions** testing with external accredited labs and **leading on-board mitigation** (ferrite chokes, shielding, layout/cabling fixes) to bring failing rails within FCC limits.

**Lead Mechatronics Engineer** | Design Visionaries, San Jose, CA May 2023 – Dec 2025

*Design house | technical lead (mechatronics, CAD automation, electronics) | Apple, GoPro, Applied Materials, Saildrone*

- **AutoCrate Design Engine:** Reverse-engineered **Siemens NX Expressions** to build a parametric design engine (bypassing slow NX Open API), cutting design time from **5 days** → **<1 hour**. Shipped a **React/Python** GUI that generated ASTM-compliant drawings, increasing custom crate adoption from **20%** → **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 (Saildrone):** Scaled harness production from **25 to 70 units/day** (2.8x increase) and reduced RMA rate from **70% to 10%** by implementing **5S** and lean manufacturing systems and optimizing assembly workflows.
- **Custom Instrumentation:** Invented a real-time **Laser + LDR (photodiode)** soil leveling sensor for slurry injection, closing a critical feedback gap where computer vision failed. Built an automated **metrology** machine for recycled metal classification.
- **MBD & GD&T:** Transitioned a semiconductor lab from 2D drawings to **NX Model-Based Definition (MBD/PMI)**, defining **GD&T** directly in 3D to meet critical deadlines.

**Technical Lead** | Advanced Engineering Services, San Jose, CA Oct 2022 – Apr 2023

*R&D firm | technical lead (simulation, contract manufacturing) | Meta Reality Labs, Tesla, Applied Materials, HummingbirdEV*

- **Multi-Modal Robotic Forensics:** Architected a robotic workcell for counterfeit detection in server systems, integrating **RF, thermal ( $\pm 0.5^\circ\text{C}$ ), capacitance, and optical** (85mm industrial lens) sensing to achieve **0.5% measurement repeatability**.
- **EV Conversion & Simulation:** Led mechanical reverse-engineering for a **Class-8 diesel-to-electric** conversion (HummingbirdEV; AAA trucks); executed **3D scan post-processing** and **harmonic/modal analysis** to validate mounting integrity and vibration response.
- **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 EV charging** and **data center server pin-test automation**, delivering technical roadmaps for niche industrial problems.

**Senior Robotics Engineer | Velodyne Lidar, Alameda, CA**

Jan 2021 – Sep 2022

*R&D software development | sole robotics engineer*

- **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 provision the **Vella vision stack** onto **NVIDIA Jetson-based industrial edge 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/GNSS** for high-fidelity georeferencing.
- **Field Engineering & Operations:** Led **7+ standardized acceptance tests** at GoMentum Station. Built large-scale data collection/labeling pipelines with **Scale AI**, supporting perception training across the product line.
- **Powerline Detection Validation:** Led field data collection and validation for LiDAR-based powerline identification (thin-structure returns), improving dataset coverage and quality for downstream model training.
- **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 (C++) | ARI, Sunnyvale, CA**

Jan 2020 – Dec 2020

*Computer vision at stealth surgical robot startup*

- **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 control logic for a **6-DOF KUKA robot** using a **Beckhoff PLC**, orchestrating 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 an **FDA 510(k)** submission, aligning safety-critical software artifacts with **IEC 62304**.
- **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) at ARI (stealth), moving beyond standard "jig-holding" robotics. This innovation was key to ARI's acquisition by **Monogram**, which was subsequently acquired by **Zimmer Biomet** in 2025.

**Visiting Researcher | AI4CE Lab (NYU), Brooklyn, NY**

Jun 2019 – Dec 2019

*Advisor: Prof. Chen Feng*

- **GPS-Denied Visual Localization:** Built an end-to-end pipeline (video → frame extraction → blur filtering → **COLMAP/ORB-SLAM** 3D reconstruction) to recover **6-DoF** camera pose vectors in urban environments.
- **Single-Image Relocalization (Transfer Learning):** Fine-tuned a pre-trained neural network to predict position + orientation from a single photo, achieving **~10 cm** relocalization accuracy and **~8 deg** orientation error on a typical Brooklyn block (**demo available**).
- **Experimental Rigor:** Automated dataset generation, reconstruction runs, and evaluation loops on **Linux**, enabling repeatable comparisons of frame filtering and model variants.

**Graduate Leadership & Research | NYU Tandon School of Engineering, Brooklyn, NY**

Aug 2017 – May 2019

*Dept: Mechanical and Aerospace Engineering*

- **Self-Driving VIP (Founder/Lead):** Founded NYU's Self-Driving VIP team; secured dean funding and led a **12-person** group to **1st** in Novel Design and **3rd** overall at the **26th IGVC**, building a ROS-based autonomy stack (RRT\*, A\*, PID).

## EDUCATION

**M.S. Mechatronics & Robotics (2019)**, *New York University* - Research: Visual localization (COLMAP, ORB-SLAM); swarm robotics

**B.Tech Electronics (2016)**, *I.P. University, Delhi* - Award: Top-3 Projects; built ArduPilot autonomous drone

## OPEN SOURCE

**Rerun, Qiskit, ROS2, HuggingFace Tokenizers, hello-robot/stretch\_ai.**

Work Authorization: Active H-1B through Feb 2028, transferable without lottery.