

NIKHIL KHANDELWAL

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PROFESSIONAL SUMMARY

Mechatronics Engineer with hands-on experience designing precision electromechanical systems, automated test infrastructure, and multi-domain hardware platforms. Proven ability to take systems from concept through prototype validation — integrating SolidWorks CAD, ANSYS FEA, PLC controls, and Python data pipelines. Delivered a microfluidic diagnostic platform generating 22,000+ uniform droplets/cycle. Fluent across the full product lifecycle: requirements → mechanism design → DFM → validation → cross-functional handoff.

CORE TECHNICAL SKILLS

CAD & Design	SolidWorks (proficient), Fusion 360, AutoCAD; GD&T, tolerance stack-up, DFM, enclosure & sealing design, load-path evaluation, BOM management
Analysis & FEA	ANSYS (stress, thermal, modal), hand calculations, bearing life, static/dynamic load cases, COTS trade studies, make-vs-buy analysis
Prototyping	FDM/SLA 3D printing, waterjet, mill, lathe, sheet metal; rapid iteration from concept to functional prototype
Electronics & Lab	Oscilloscopes, logic analyzers, protocol analyzers, DMM; analog/digital I/O, signal integrity, PCB bring-up support, 24VDC/120VAC wiring & harness debug
Controls & PLC	Allen-Bradley Studio 5000 / CompactLogix, Siemens TIA Portal S7-1200, Ladder Logic, Structured Text, HMI/SCADA, I/O validation & commissioning
Software & Data	Python (NumPy, Matplotlib, automated pipelines), FIJI/ImageJ, ROI segmentation, validation reporting, SOP development
Quality & Ops	Root cause analysis (RCA), hardware validation planning, GLP/GMP compliance, commissioning documentation, alarm triage

PROFESSIONAL EXPERIENCE

Mechatronics Engineer — R&D Systems | New York University & NYU Langone | *New York, NY* | Feb 2025 – Present

- **Architected full electromechanical platform** – Designed mechanical architecture, mounting interfaces, and structural components in SolidWorks; performed load-path evaluation that achieved zero structural failures across 200+ validation cycles in a critical-care setting.
- **Delivered 22,000+ uniform droplets/cycle** – Designed and fabricated microfluidic chip and fixture systems, optimizing channel geometry and sealing interfaces to hit $\pm 2\%$ droplet uniformity required for translational cancer research.
- **Cut prototype failure rate by ~35%** – Led material selection, sealing strategy, and tolerance definition; applied I/O validation under thermal and fluidic loads to catch failure modes before system-level testing.
- **Built and validated multi-domain platform** – Integrated thermal, fluidic, vacuum, sensor, and motion subsystems into a single ruggedized bench unit capable of sustained high-temperature operation over 8-hour experimental windows.
- **Reduced manual analysis time by 60%** – Developed automated fluorescence quantification pipeline in Python (FIJI + NumPy/Matplotlib), replacing manual ImageJ workflows and improving droplet classification consistency.
- **Improved assembly efficiency 25%** – Applied DFM principles through iterative 3D-printed prototyping, reducing part count and eliminating 3 assembly steps across two design revisions.
- **Validated sensor systems end-to-end** – Integrated and calibrated analog/digital sensors using oscilloscopes and DMMs; resolved noise and grounding issues to achieve $<1\%$ signal drift over thermal cycles.
- **Zero unplanned downtime during critical trials** – Independently diagnosed hardware failures, performed root cause analysis, and implemented corrective design changes under 48-hour experimental deadlines.
- **Enabled cross-functional clinical deployment** – Collaborated with neurosurgery, pathology, and research staff to deploy and optimize experimental systems, generating real-time data acquisition for active IRB-approved studies.

Mechatronics & Mechanical Engineer | Flexible AI-Enabled Mechatronic Systems Lab | *New York, NY (Contract)* | May 2024 – Jan 2025

- **Miniaturized endoscopic platform for clinical use** – Developed compact SolidWorks assembly integrating precision motion components within a $<12\text{mm}$ envelope, reducing device footprint by 30% vs. prior iteration.

- **Validated structural integrity via FEA** – Conducted ANSYS stress and alignment analysis; design adjustments eliminated 2 identified failure modes prior to physical prototype build.
- **Improved positional accuracy by 40%** – Iteratively optimized actuation assemblies to reduce backlash and increase repeatability across 500-cycle endurance testing.
- **Selected for ISMIT 2025 Conference presentation** – Recognized for innovation in miniaturized electromechanical medical device design; presented system at Washington, DC.

Automation Engineer | Mitigation Robotics and Automation | Gujarat, India (Internship) | May 2023 – Jul 2023

- **Programmed Allen-Bradley PLCs from scratch** – Developed Ladder Logic and HMI interfaces in Studio 5000 / RSLogix 5000 for custom industrial automation systems; delivered full design-through-commissioning on 2 machine control programs.
- **Tuned PowerFlex VFDs to cut machine downtime 15%** – Optimized Allen-Bradley VFD motion profiles for actuator sequences, reducing unplanned stoppages across production floor equipment.
- **Increased system throughput 20%** – Implemented coordinated actuator logic that reduced cycle time and improved production ramp-up during FAT/SAT testing phases.
- **Built UL 508A-compliant control panels** – Designed and wired industrial control enclosures to UL 508A standards; led on-site commissioning and system handover to customer operations team.
- **Resolved real-time PLC and field device faults** – Performed live troubleshooting of I/O, drives, and field devices on the shop floor; collaborated cross-functionally with mechanical and electrical teams to validate integration before handover.

EDUCATION

Master of Science, Mechatronics & Robotics

New York, NY | May 2025

New York University — Tandon School of Engineering

Bachelor of Technology, Mechatronics Engineering

Mumbai, India | May 2023

Narsee Monjee Institute of Management Studies — Dean's Meritorious List

KEY PROJECTS

SAE BAJA 2022 — All-Terrain Vehicle Design (Jun 2021 – May 2022)

Ranked 8th in Design Event | 31st Overall — SAE BAJA India 2022

- **Designed full vehicle architecture in SolidWorks** – Modeled chassis, suspension, and drivetrain assemblies; performed motion simulations to validate steering and suspension kinematics across off-road load cases.
- **Optimized strength-to-weight ratio via FEA** – Conducted structural analysis in ANSYS Workbench and multi-body dynamics simulation in Lotus Suspension Analysis (MBD), reducing chassis weight while maintaining safety factors.
- **Integrated real-time sensor DAQ system** – Instrumented vehicle with speed, vibration, and load sensors; analyzed performance data post-testing to drive iterative design improvements.
- **Fabricated and tested full vehicle to race-ready condition** – Participated in manufacturing, assembly, and track testing; diagnosed and resolved mechanical failures under live race conditions.

Paint & Go – Automated Paint Brush Cleaner

- **Architected high-throughput cleaning system** – Designed complete mechanical architecture for a batch-based appliance capable of processing 15–25 brushes/cycle at >300 brushes/hour throughput.
- **Engineered baffled cylindrical flow tank** – Designed pitched-blade turbine impeller geometry to generate uniform low-shear axial circulation, preventing vortex formation and uneven cleaning zones.
- **Designed modular wet/dry subsystem separation** – Developed custom mechanical coupling architecture to isolate motors and electronics from the fluid environment, improving long-term reliability.
- **Created detachable TPU brush-fixturing system** – Engineered handle-based vertical loading fixtures supporting multiple brush geometries while protecting fragile bristles during cleaning cycles.
- **Integrated full sealing strategy** – Specified O-rings, silicone gaskets, detachable tank assemblies, and modular interfaces to simplify maintenance and hit production cost targets under constrained BOM budget.