

# SAMEERJEET SINGH CHHABRA

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## EDUCATION

### Arizona State University

M.S. Mechatronics, Robotics & Automation Engineering — GPA: 3.83/4.0

Tempe, USA

Graduating May 2026

### Chhattisgarh Swami Vivekanand Technical University

B.Tech Mechanical Engineering — GPA: 3.49/4.0

India

Graduated July 2022

## TECHNICAL SKILLS

**Simulation:** MuJoCo, Gazebo, MATLAB/Simulink, Isaac Lab (familiar), URDF/MJCF modeling

**Control Systems:** Model Predictive Control (MPC), PID, Kalman Filter, Inverse/Forward Kinematics, Rigid Body Dynamics

**Programming:** Python, C++, ROS2/ROS, Git/GitHub

**ML & Perception:** PyTorch, TensorFlow, Reinforcement Learning, OpenCV, YOLOv8, Open3D (point clouds)

**Hardware:** Arduino, Raspberry Pi, Jetson Nano, IMU, LiDAR, Stereo Depth Cameras

**Design:** SolidWorks, Creo Parametric, 3D Printing

**Industrial Automation & Robotics:** Allen Bradley PLC, Connected Components Workbench, Ignition, FANUC ROBOGUIDE

**Certifications:** Deep Learning Specialization, IBM ML & Data Science, SACA Certified

## PROJECTS

### PLC-Controlled Semiconductor Automation System | SCARA & 6-DoF Robots

Spring 2026

- Integrated SCARA and 6-DoF collaborative robots, conveyor automation, infrared sensors, and Allen Bradley Micro820 PLC for autonomous semiconductor wafer handling.
- Developed Python-based Ethernet/TCP robot communication, dynamic waypoint generation, and inverse kinematics for real-time multi-robot coordination and motion control.
- Built PLC ladder logic, HMI controls, and relay-based industrial I/O interfacing, while designing custom 3D-printed end effectors and fixtures.

### Foldable Grasshopper-Inspired Walking Robot | MuJoCo Sim-to-Real Validation

Fall 2025

- Fabricated a bio-inspired four-bar linkage walking robot using laminated cardboard mechanisms and SG90 servo actuation with zero off-the-shelf structural parts.
- Performed system identification experiments to extract stiffness, damping, friction, and servo dynamics; embedded measured parameters directly into a MuJoCo physics model.
- Executed parameter sweeps and simulation-based gait optimization, predicting real hardware performance within 5–22% sim-to-real error across locomotion metrics.

### Project Eleven | Bipedal/Quadruped Robot — MuJoCo Simulation & MPC Control

May 2025 – Present

- Designed a 20 cm bipedal/quadruped robot from scratch in SolidWorks with 3-DoF per leg (hip, knee, ankle); exported to URDF, compiled to MuJoCo MJCF with tuned joint limits, actuators, damping, and stiffness.
- Configured full sensor suite (IMU site, contact sensors) and validated ground-contact physics for future sim-to-real deployment.

### MuJoCo Robotic Arm Depth Reconstruction | 3D Perception Pipeline

March 2025 – April 2025

- Built a 6-DoF arm environment in MuJoCo with a stereo end-effector depth camera (90° FoV) on a linear slider; transformed depth images from 50+ camera poses into world-frame point clouds using calibrated intrinsics, extrinsics, and forward kinematics.
- Fused 100k+ 3D points and executed Poisson surface reconstruction in Open3D to recover accurate scene geometry under simulated range-dependent noise.

### Voice-Operated Mobile Manipulator | ROS2 Full-Stack Integration

January 2025 – May 2025

- Integrated TurtleBot4 and myCobot 280 arm using ROS2, MoveIt2 motion planning, and YOLOv8 object detection at 92% accuracy; deployed SLAM with Monte Carlo localization achieving  $\pm 5$  cm positioning accuracy.
- Embedded speech-to-text voice command pipeline achieving 85% recognition accuracy in live unscripted operation.

### 6-DoF Robotic Arm | Custom IK Solver & Computer Vision

August 2024 – December 2024

- Derived and implemented a Newton-Raphson inverse kinematics solver from scratch achieving  $\pm 0.2$  mm end-effector positioning accuracy across full workspace.
- Integrated real-time OpenCV vision pipeline with A\* path planning; solved physical maze course with 95% success rate across 20+ trials.

## PROFESSIONAL EXPERIENCE

### Physics Teaching Aide – Arizona State University

Tempe, AZ, January 2025 – Present

- Independently run 8 hrs/week of lab sessions for 96 students across University Physics 1 & 2 covering mechanics, E&M, and experimental data analysis.

### Data Scientist – ANYTHINGAI Cyber Pvt. Ltd.

Hyderabad, India, July 2023 – March 2024

- Reduced data pipeline runtime by 98% via Python automation (Selenium, BeautifulSoup, APIs); deployed ML inference systems on AWS achieving 30× throughput improvement.

### CAD Design Intern – Design Center Pvt. Ltd.

Bhilai, India, June 2021 – July 2021

- Modeled 10+ production mechanical components (gears, tires, assemblies) in Creo Parametric from engineering drawings, improving prototype-to-production accuracy by 15%.

## ACHIEVEMENTS & RECOGNITION

- Honeywell × ASU Hackathon 2026:** 3rd place, \$2,500 — developed an intelligent robotic tube insertion system for heat exchangers using chamfered alignment, vibration-based self-alignment, and linear actuation; validated with 3D-printed prototypes.
- Los Alamos National Laboratory × ASU Hackathon 2025:** 2nd place, \$5,000 — designed automated mechanical unpacking and sequencing system for MinION Flow Cells under time constraints.
- Publication:** Cable-Suspended Parallel Robot (FarmPet), IJRASET, Feb 2023.
- GHOST Lab ASU:** Hands-on operation of Fetch, YuMi, Husky, UR5, and TurtleBot platforms for HRI research.