

# SAMEERJEET SINGH CHHABRA

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## EDUCATION

### Arizona State University

Master of Science in Mechatronics, Robotics, and Automation Engineering; GPA: 3.94/4.0

Tempe, USA

Graduating May 2026

### Chhattisgarh Swami Vivekanand Technical University

Bachelor of Technology in Mechanical Engineering; GPA: 3.49/4.0

Bhilai, IN

Graduated July 2022

## PUBLICATIONS

Design and Inverse Kinematics Analysis of Cable-Suspended Parallel Robot 'FarmPet' for Agriculture, International Journal for Research in Applied Science & Engineering Technology (IJRASET), Feb 2023

## TECHNICAL SKILLS

**Programming & Simulation:** Python, C++, MATLAB/Simulink, Git/GitHub, MuJoCo, Isaac Sim, Isaac Lab, Gazebo, ROS/ROS2

**Robotics & Control:** Model Predictive Control (MPC), Spring Loaded Inverted Pendulum (SLIP), Zero Momentum Control, Impedance Control, Torque Control, Inverse/Forward Dynamics, LQR, PID, Kalman Filter, Spatial vector arithmetic, Rigid body dynamics, Rigid body trees

**Mechanical & Hardware:** Gear mechanisms (Planetary, Harmonic drives, Belt drives, Magnetic gears), Motor integration, Heat transfer systems, Arduino, Raspberry Pi, Jetson Nano, IMU, LiDAR, cameras, servos, motors

**Design & Manufacturing:** SolidWorks, CATIA, Inventor, Creo Parametric, AutoCAD, Ansys FEA, 3D Printing (FDM, SLA, SLS, DMLS)

**Machine Learning:** TensorFlow, PyTorch, Reinforcement Learning, OpenCV, Pandas, NumPy

**Certifications:** Deep Learning Specialization, IBM Machine Learning and Data Science Specialization

## PROFESSIONAL EXPERIENCE

### Physics Teaching Aide – Arizona State University

Tempe, AZ, January 2025 – Present

- Mentor and guide 72 students in physics labs, teaching advanced mechanics and electromagnetism while fostering problem-solving skills.

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

Hyderabad, India, July 2023 – March 2024

- Data Extraction: Developed Python automation systems reducing data processing time by 98% using APIs and web scraping frameworks.
- Machine Learning Implementation: Built predictive models and deployed ML-powered systems on AWS with real-time processing capabilities.
- Algorithm Optimization: Enhanced system performance through data analysis and algorithmic improvements, achieving 30x performance gain.

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

Bhilai, India, June 2021 – July 2021

- Mechanical Design: Converted engineering drawings into precise 3D models for complex mechanical components and assemblies.
- Component Development: Designed and modeled 10+ gears, tires, and other parts, improving prototype accuracy and production by 15%.
- Kinematic Analysis: Performed motion analysis and surface modeling to optimize mechanical system performance and accuracy.

## PROJECTS

### Project Eleven — Robotic Quadruped CAD & Simulation

May 2025 – Present

- Designed bipedal/quadruped robot assemblies in SolidWorks with independent mirrored parts, explicit joint axes, and simulation-ready kinematic structure.
- Exported CAD to URDF, and compiled to MuJoCo XML, configuring joint limits, actuators, damping, and stiffness for physics simulation.
- Implemented initial model-based (MPC-style) joint control in Python to validate stability, balance, and motion feasibility in MuJoCo.

### Foldable Grasshopper-Inspired Walking Robot — MuJoCo Simulation

Fall 2025

- Designed a bio-inspired four-bar linkage walking robot using foldable laminated cardboard mechanisms and SG90 servo actuation.
- Identified stiffness, damping, friction, and servo dynamics experimentally and incorporated parameters into a MuJoCo physics model.
- Performed parameter sweeps and simulation-based optimization to achieve stable walking gait, predicting physical performance within 5–22% sim-to-real error.

### Voice Operated Mobile Manipulator — ROS2 Integration

January 2025 – May 2025

- Combined TurtleBot4 with myCobot 280 using ROS2, MoveIt2 motion planning, and YOLOv8 object detection (92% accuracy).
- Integrated SLAM navigation with Monte Carlo localization achieving  $\pm 5\text{cm}$  positioning accuracy.
- Embedded voice command processing using a speech-to-text API, achieving 85% recognition accuracy.

### 6-DOF Robotic Arm — Kinematics & Computer Vision

August 2024 – December 2024

- Engineered custom inverse kinematics solver using Newton-Raphson method achieving  $\pm 0.2\text{mm}$  positioning accuracy.
- Scripted URDF model and applied real-time vision pipeline with OpenCV, A\* path planning, achieving 95% maze solving success rate.
- Established camera-to-robot coordinate mapping with homogeneous transformations and PID torque control.

### Cable Suspended Parallel Robot — Precision Agriculture System

August 2021 – July 2022

- Led team developing 4-cable CDPR achieving 0.5mm accuracy over  $1\text{m}^3$  workspace with custom inverse kinematics solver.
- Programmed Arduino-based control system with 50Hz real-time motion control supporting 0.2kg payload.

## ACHIEVEMENTS

- PU Automations Hackathon 2025 (by Los Alamos National Laboratory): Awarded 2nd place (\$5,000) for developing an automated system to unpack 105mm x 23mm x 16mm MinION Flow Cells through hard shell and soft pack layers and integrate them into the Nanopore sequencing device.
- GATE Exam 2022 by Indian Institute of Technology India: Qualified in Mechanical Engineering (92.22 percentile, 90,000 candidates) and Engineering Sciences (85.6 percentile, 15,000 candidates).
- GHOST Lab ASU Volunteering: Operate Fetch, YuMi, Husky, UR5 and TurtleBots for human robot interaction research.