Vishavjit Singh Khinda

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EDUCATION

Master of Science in Robotics and Autonomous Systems August 2024 - May 2026
Arizona State University, Tempe, AZ GPA: 4.00/4.00

Bachelor of Technology in Mechanical Engineering August 2019 - May 2023
National Institute of Technology, Jalandhar, India GPA: 7.75/10.00

PROJECTS

Machine Learning Based Generative Modeling of Airfoil Geometries | ASU Fall 2025

- Replaced computationally expensive airfoil CFD simulations with ML-based generative model using autoencoder and inverse neural network in PyTorch, reducing airfoil design iteration time from hours to seconds.
- Processed and standardized 200 airfoil simulations from AirfRANS dataset using CST parameterization, training autoencoder to compress 18D geometry space to 6D latent representation with 0.018 validation MSE loss.
- Successfully generated airfoil designs from target aerodynamic parameters (drag/lift coefficients, pressure) by mapping 1007-dimensional performance space to 6D latent codes using inverse neural network with 0.3106 validation MSE loss.

Embedded Temperature Control System with Disturbance Rejection | ASU Fall 2025

- Developed real-time feedforward + PID temperature control system in Simulink for TCLab heater with 5V dc fan acting as measurable disturbance, deployed to Arduino via automatic code generation with 0.5s sampling rate.
- Performed open loop system identification with 40% heater power and developed first-order thermal model to characterize heater dynamics and calculated feedforward gain from measured cooling effect by fan.
- Achieved 50% reduction in disturbance using feedforward + PID as compared to baseline PID control.

Smart IIOT Manufacturing System for Predictive Quality Control | ASU Fall 2025

- Architected and deployed a complete 5-layer IIOT system for real-time semiconductor wafer defect detection, using wafer dataset as device layer, integrating MQTT messaging, edge-based ML inference and PostgreSQL database as cloud layer.
- Created streamlit-based interactive dashboard acting as application layer, with real-time process parameter visualization, defect prediction, alert acknowledgment with multi-line production status resulting in enhanced operator decision-making.
- Achieved 87% wafer defect prediction accuracy with 70% recall value by training and deploying an edge-based XGBoost model on historical wafer data with <50ms inference latency.

Autonomous Line Following Drone | ASU Spring 2025

- Modeled an efficient control architecture in Simulink, using RGB color space conversion to create binary image for enhanced detection of colored line. Implemented custom submatrix blocks to analyze specific pixel regions of binary image coming from the drone's camera for navigation decisions (left, right, forward).
- Implemented blob analysis block for circle detection, and used the area of the circle as a threshold parameter for landing signal. Incorporated a state flow machine with five different states for path planning.
- Achieved autonomous blue line tracking and center-circle landing with an accuracy of ±2 mm using limited computational resources on the mambo drone platform, demonstrating robust performance in real-world flight conditions.

3 DOF Robotic Arm with Kinematic Modeling | ASU Fall 2024

- Collaborated with a team of five members to design a low cost, programmable, 3 DOF robotic arm to perform autonomous pick-and-place operation of a small cubical object.
- Designed the links and gripper parts in SOLIDWORKS, 3-D printed using PLA and PETG materials, and integrated MG5465 servo motors and electro-mechanical control interfaces for precision joint actuation.
- Developed a robust inverse kinematic algorithm in Python that actuated the servo motors using PWM signals from a Raspberry Pi 5 microcontroller to execute the task with 98% accuracy and repeatability.

WORK EXPERIENCE

Rail Coach Factory, Kapurthala, India: Manufacturing Engineering Intern June 2022 - July 2022

- Assisted in operating CNC machines and other automated manufacturing equipment on a high-volume rail bogie production line (200 units/month), gaining hands-on exposure to industrial controls and automation.
- Worked with cross-functional engineering teams on production planning, work-flow optimization leading to 6% improvement in production line efficiency through data-driven process analysis.
- Helped troubleshoot issues in HVAC, pneumatic, and sensor systems on coaches using standard diagnostic procedures and checklists, supporting compliance with factory quality and safety standards.

TECHNICAL SKILLS

CAD and Simulation Tools: SOLIDWORKS, Simulink, COMSOL, ANSYS, Mujoco
Programming & Documentation: C, C++, Python, SQL, MATLAB, ROS, PLC, Microsoft office (Excel, Word, PowerPoint)
Manufacturing & Prototyping: 3D printing, Lean six sigma, Geometric Dimensioning and Tolerance
Microcontrollers & Control theory: Raspberry Pi, Arduino, PID, State estimation, Sensor fusion, Motion control

Machine learning: Scikit-learn, NumPy, Pandas, Matplotlib, Pytorch
Industrial protocols: MQTT, HTTP, Ethernet, Modbus TCP/IP, Profinet, OPC UA, MT Connect, SECS/GEM, Ignition (SCADA), Automation Studio
Interpersonal skills: Collaborative team-work, Leadership, Problem solving, Time management, Effective communication