

# Kunal Kumar

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## Education

### Cornell University

- Master of Science, Systems Engineering, Rob and Sara Blackall Fellowship
- Graduate Research Assistant- Organic Robotics Lab, Bio-Inspired Fluid Lab

Ithaca, NY  
May 2024

### Punjab Engineering College

- Bachelor of Technology, Mechanical Engineering

Chandigarh, India  
Jul 2022

## Relevant Courses

- **Graduate-** Model-Based Systems Engineering | Autonomous Mobile Robots | Design with Embedded OS | Project Management for Complex Systems | Systems Analysis, Behavior and Optimization | Innovative Product Design
- **Undergraduate-** C++ | Industrial Automation & Robotics | Automobile Engineering | CAD/CAM | Kinematics of Machine | Basics of Electrical Sciences | Manufacturing Processes | Strength of Materials Maintenance Engineering | Production Engineering | Engineering Analysis & Design
- **Certifications-** Coursera: [Deep Learning Specialization](#) | [Big Data Specialization](#) | [Self-Driving Cars Specialization](#), [Manufacturing Process with Autodesk Fusion 360](#) | [Six Sigma Advanced Analyze Phase](#) | Cornell: [Leading from Strengths](#) | [ASEP](#) (Associate Systems Engineering Professional)

## Technical Skills

Robotic System Design & Integration, Verification and Validation, Functional Analysis, Requirements Allocation, Interface Definition, Cost-Risk Analysis, SysML, Technical Planning, MATLAB, LabView, PID Control, Sensor Fusion.

## Relevant Experience

### Cornell Cup MiniBot Robotics System

#### Systems Engineering Lead

Ithaca, NY  
Sep 2022 – May 2023

- *Systems Design and Analysis:* Applied advanced systems engineering tools, including Requirements Analysis, Use Case Diagrams, Goal-Question Matrices, and House of Quality, to define system requirements and design. Conducted Failure Mode and Effects Analysis (FMEA), Fault Tree Analysis (FTA), and Verification Cross-Reference Matrices (VCRM) to ensure system reliability and compliance.
- *Integration and Benchmarking:* Developed subsystem matrices, Interface N2 Charts, and system process diagrams to map interactions across subsystems. Designed a rating system to benchmark performance against existing products, ensuring alignment with technical, schedule, and cost constraints. [Report Link](#)

### Advanced Bio-Robotics System for Agricultural Automation

#### Team Lead, Machine Learning and Hardware Integration

Ithaca, NY  
Feb 2024 – Aug 2024

- *Autonomous System Engineering:* Developed and validated a complex mechatronic system incorporating electromechanical actuators, PID controllers, and multiple sensor arrays for high-precision, autonomous agricultural tasks. Designed robust sensor fusion and actuation mechanisms to support plant identification and trimming, prepared the system for competitive demonstration, and used FMEA to identify and mitigate failure risks. [News Article](#)
- *Component and System-Level Testing:* Conducted thorough performance testing and data analysis to validate system functionality. Worked with team members to refine design elements based on test results, ensuring precision in motion and enhancing component reliability for field applications.

### Tendon and Pneumatic Actuated Robotic Tongue

#### Mechatronics Research Engineer

Ithaca, NY  
May 2024 – Sep 2024

- *Hybrid Actuation System Engineering:* Engineered a custom actuation system combining tendon-driven mechanics and pneumatic controls to emulate biological muscle movements for physiological research. Integrated pressure sensor feedback and PWM-controlled solenoid valves for precise motion control, emphasizing system reliability, cost-effective design, and alignment with performance requirements.

### Lab Research Technician - Mechatronics

#### System Dynamics (MAE 3260)

Ithaca, NY  
Sep 2024 – Current

- *Experimental Design & System Validation:* Designed and refined control system validation experiments using LabView for PID testing and rotor dynamics analysis. Simulated system response in MATLAB and trained students on oscilloscopes, Bode plots, and diagnostic tools for stability analysis.
- *Equipment Management & Safety Protocols:* Oversaw handling, maintenance, and troubleshooting of lab equipment, including actuators, amplifiers, and safety interlock systems, to ensure safe and reliable operation. Assisted students in troubleshooting and performing experiments safely, fostering a strong foundation in lab safety and diagnostics.