Rajiv V. Joshi

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Education:

Carnegie Mellon University — Pittsburgh, PA
Master of Science in Mechanical Engineering - Research | GPA: 4.0/4.0 — May 2026

Virginia Tech — Blacksburg, VA
Bachelors of Science in Mechanical Engineering - Robotics and Mechatronics | GPA: 3.64/4.0 — May 2024
Bachelors of Science in Mechanical Engineering - Mechanical | GPA: 3.64/4.0 — May 2024

Coursework:

Masters: ADV Mechatronics (TA) | Haptic Design Interfaces | Modern Control Theory | Computer Vision for Engineers(In-Progress) | ML and AI for Engineers (In-Progress)

Undergraduate: Robotics and Automation | Kinematics | Differential Equations | Deforms | Dynamics

Skills:

Software/Firmware: SolidWorks | Fusion 360 | ANSYS | KiCAD | Arduino | Serial Communication Protocols

Hardware: Embedded Systems | PCB Design | Soldering | Rapid Prototyping | 3-D printing | Machining

Programming Languages: Python | C/C++ | MATLAB | Linux

Research Experience:

MetaMobility Lab at Carnegie Mellon University — Pittsburgh, PA
Knee Exoskeleton – MS Research Project — April 2025 - Present

- Coordinated and led a team of 5 students in research, design, and manufacturing a lightweight knee exoskeleton capable of delivering 20 Nm of torque directly to knee joints for people suffering from osteoarthritis or gait impairment
- Designed custom BOA ratcheting straps and orthotic cuffs utilizing **SolidWorks** and **3D-printing** strategies for tighter mounting to user, preventing hardware shifting during gait and improving torque transfer to joint by 10%
- Utilized a Teensy 4.1 to implement **SPI** protocol, in **C/C++**, with **IMU sensors** using CAT6 connectors and twisted pair cable to **shield signal from noise**, increasing the gait cycle estimator loop frequency from 100Hz to 500Hz

MetaMobility Lab at Carnegie Mellon University — Pittsburgh, PA
Hip Exoskeleton – MS Research — May 2024 - Present

- Optimized hip exoskeleton hardware for improved fitting to users using **human biomechanics** concepts, **SolidWorks**, and **3D printing**, yielding comfortable motor-joint alignment and 25% reduced system weight
- Redesigned circuit schematics and **PCB designs** integrating embedded systems such as **MCUs**, **IMUs**, and **FSRs** via **KiCAD**, reducing connections from 8 to 4 while maintaining robust connections and signal integrity
- Communicated with various **global manufacturers** for pricing and outsourcing manufacturing of Carbon Fiber and Nylon based parts designed in **SolidWorks** considering basic **DFM** and **DFA** concepts
- Integrated **CAN bus** and **I2C** protocols, in **Python** and **C/C++**, with motors encoders and **IMUs**, enabling gait cycle estimation for controllers and hardware torque control upwards of 18 Nm, cutting user hip work by 20% to 30%

Academic Projects:

Carnegie Mellon University — Pittsburgh, PA
Haptic Design Interfaces: 2 DoF Haptic Hand Interface – Course Project — April 2025 - May 2025

- Developed a open-source compact haptic fingers device, with a team of 6 graduate students, meshing **STM32 MCU**, 4 low torque motors, and 3D-printed parts as a teaching tool for **robot kinematics**, **biological sensors**, and **haptics**
- Visualized a finger joint workspace in **MATLAB** to define the mechanical operational range of a capstan-driven end-effector, which was controlled in **C/C++** using **PID** and **forward kinematics** to successfully render virtual 3D objects.

Carnegie Mellon University — Pittsburgh, PA
ADV Mechatronics: Embedded System Game Design – Course Project — November 2024 - December 2024

- Demonstrated depth of knowledge in mechatronic system design by creating a robust arcade game with custom **PCB design**, **H-bridge motor control**, **PWM + timer interrupts**, **state machines**, and a **GUI** for seamless user interaction