Cole Griffin Welcher

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Education

Worcester Polytechnic Institute (WPI) | Worcester, MA *August 2021 – Present*

Bachelor of Science in Robotics Engineering, GPA 3.97 May 2025

Bachelor of Science in Computer Science, GPA 3.97 May 2025

Master of Science in Robotics Engineering, GPA 4.00 Expected Graduation May 2026

Related Coursework: Computer Aided Design, Unified Robotics 1,2,3 & 4, Algorithms, Embedded Computing in Engineering Design, Operating Systems, Controls Engineering, Software Engineering, Robot Controls

Honors & Awards: Tau Beta Pi Eng'g Honor Society – Member; Robotics Engineering Outstanding Junior, Robotics Engineering Outstanding Senior

Experience

***Robotics Engineering Intern* | AiM Medical Robotics | Worcester, MA** *May – August 2025*

- Developed and integrated DDS communication interface between GUI and embedded surgical robot system, replacing legacy OpenIGTLink and NI-based protocols.
- Designed and implemented the robot's full state control architecture, enabling modular work phases with deterministic transitions and integrated safety logic, contributing to research and prototyping of an MRI-compatible surgical robot.
- Built a custom Python GUI using CTk to interface with neurosurgical robot for testing and command transmission.
- Modeled and validated FK and IK for a 4-DoF neurosurgical robot using D-H parameters and Jacobian-based solvers.

***Systems Engineering Intern* | General Dynamics Mission Systems | Taunton, MA** *May – August 2024*

- Automated system testing for TCN Lights, developing an Electronic Diagnostic Testing (EDT) tool using Qt and C++ with Sync framework integration, improving diagnostic efficiency.
- Streamlined vendor communication and baseline management by creating an automated vendor survey detecting EOL.

***Biomechanical Engineering Intern* | Aperture LLC| Signal Hill, CA** *June – August 2023*

- Designed a new research zone to run accident reconstruction testing.
- Created and maintained a test database for accurate recall of previous biomechanical testing.

Projects

Modular 6-DoF Robotic Surgical Instrument *October – December 2024*

- Developed and prototyped a 6-DoF surgical robotics instrument in collaboration with KUAS, featuring modularity and flexible transmission system to enhance precision and adaptability for Robotics Assisted Minimally Invasive Surgery.
- Lead author on a research paper accepted for presentation at the 30th International Symposium on Artificial Life and Robotics (AROB 2025), focusing on the 6-DoF surgical robotic instrument and user interface.

Brigham & Women's Kiosk Collaboration with CS3733 *March – May 2024*

- Collaborated as an Assistant Lead Software Engineer with a 10-person team to develop a cloud-based web application prototype employing Agile Methodologies for Mass General Brigham Hospital.
- Spearheaded development of pathfinding algorithms, directions assistant, and a map editing page using React.js, Typescript, Shadcn, Express, Prisma ORM, and PostgreSQL, facilitating efficient hospital navigation and interactive map customization.

TurtleBot3 Field Mapping Robot *October – December 2023*

- Implemented Pure Pursuit and Expanding Edge Wavefront Detection algorithm for path tracking, mapping, localization, and path planning functionalities.
- Integrated these algorithms into a TurtleBot3 robot equipped with LiDAR sensors, running on ROS, to map a field, explore unknown regions, and autonomously navigate back to its starting position.

4-DoF Robotic Arm Manipulation *August – October 2023*

- Led design and implementation of a robotic pick and place sorting system integrating concepts from forward and inverse kinematics, trajectory generation, and differential kinematics.
- Implemented computer vision system for object identification and localization within the robot's coordinate system, enabling precise control of the robot's end effector to perform sorting task autonomously.
- Produced a comprehensive IEEE-style conference paper, descriptive video, and well documented code.

Skills

Programming Languages: Java, Typescript, C++, C, MATLAB, Racket, HTML, Node.js, Python

Software Frameworks: React.js, AWS (EC2, RDS), Tailwind CSS, Express, ROS, OpenCV, tRPC, PrismaORM

Other Software: Autodesk Inventor, PMKS+, SolidWorks (Associate), Cloud Compare, MS Office, PostgreSQL, Figma