

# Justin Dugan

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## Objective

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Computer Engineering student with hands-on experience in embedded systems, control algorithms, and real-time software. Seeking a Summer 2026 robotics internship to further develop skills in motion control, sensor integration, and systems-level programming.

## Education

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**Georgia Institute of Technology | Atlanta, GA**

Aug 2025 – Present

Bachelor of Science in Computer Engineering, Minor in Mathematics, GPA 3.85

Expected Graduation, May 2029

## Skills

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**Programming:** C++, Java, C#, Python, GLSL

**Robotics & Control:** State-space control, trajectory generation, odometry, autonomous systems

**Scientific Computing:** Numerical integration, optimization, scientific computing

**Systems & Tooling:** Linux, Docker, Git, Teensy, Raspberry Pi

## Experience

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**RoboJackets (Georgia Tech) | Atlanta, GA**

Sep 2025 – Present

**Micromouse Software Lead**

*Autonomous robotics team competing in Micromouse and other embedded challenges.*

- Designed maze-solving and motion-control algorithms for a Micromouse robot; competed at APEC 2026
- Implemented timing-critical embedded interfaces; I<sup>2</sup>C for gyro, IR sensors, motor encoders/drives
- Contributed to robot and sensor-system design under cost and performance constraints

**FIRST Robotics Competition (Team 1640 "Sab-BOT-age") | Exton, PA**

Sep 2022 – Aug 2025

**Lead Programmer, Team Captain, Drive Team**

*International high school robotics competition*

- Sole architect and primary contributor to the 2023–2025 robot control stack, including state-space control, autonomous routines, and vision-based pose estimation and odometry
- Designed a novel swerve drive control algorithm improving driver input-to-module state mapping, reducing oscillation and significantly improving controllability in competition
- Led software development under strict competition deadlines, coordinating testing, iteration, and deployment
- Awarded Innovation in Control (World Championship, 2025) and Autonomous Award (World Championship, 2024)

**The Robot Collective VIP (Georgia Tech) | Atlanta, GA**

Jan 2026 – Present

**Undergraduate Researcher**

- Designed a battery monitoring system for multi-robot platforms
- Trained and optimized a YOLOv5 object detection model for identifying robots in multi-agent environments; exported to ONNX for deployment on Raspberry Pi

**Mathnasium | West Chester, PA**

Aug 2023 – Aug 2025

**Instructor**

*After-school mathematics learning center providing individualized instruction from arithmetic through calculus.*

- Provided individualized and small-group math instruction to 5–25 students, adapting to diverse skill levels in real time
- Collaborated with instructors and center leadership to coordinate lesson pacing and instructional strategies

## Projects

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**Fractal Renderer / Expression-to-GLSL Compiler | Personal**

May 2025 – Present

**Designer & Developer**

*Renders fractals from arbitrary user-defined math expressions in real time.*

- Built a custom expression parser and GLSL code generator to compile user-defined math into GPU shaders at runtime
- Enabled real-time exploration by dynamically recompiling GPU shaders from modified expressions without restart
- Improved numerical stability and precision by implementing a custom complex arithmetic library and hi-lo floating-point representation, increasing accuracy at deep zoom levels

**6502 Breadboard Computer | Personal**

2024

**Designer & Developer**

- Designed and assembled a functional 6502-based computer on a breadboard, including clocking, memory, and I/O.
- Debugged timing, signal integrity, and bus contention issues at the hardware level to achieve stable operation.
- Wrote 6502 assembly programs to verify bus timing, memory mapping, and I/O functionality

**Physics Simulator & Numerical Optimizer | Personal**

2024–2025

**Designer & Developer**

*Charged-particle dynamics simulator with evolutionary trajectory optimization under electromagnetic fields*

- Derived and implemented differential equation models for charged-particle motion under magnetic and electrostatic forces
- Designed a differential evolution optimizer evaluating 600k–2M parameter configurations per run to optimize trajectories
- Accelerated simulation throughput using multithreading and JIT compilation, reducing runtime by ~20x