Stephen Welch

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Education

B.S. in Computer Engineering
Virginia Polytechnic Institute

GPA (In-major): 3.31 / Class of 2023 - Focus in Controls, Robotics, and Autonomy, Minor in Computer Science
Aug. 2019 - Present

Relevant Courses: Machine Learning (CS 4824), Applied Software Design (ECE 3574), Software Design and Data Structures (CS 3114)

Battlefield High School
Battlefield High School

Information Technology Program
Aug. 2015-2019

GPA: 4.38

Skills

Tools	Git, Gradle, IntelliJ IDEA, Visual Studio, GNUPlot, LaTeX, Solidworks
Frontend	JavaFX, Swing, Qt, ASP.NET
Languages	C++, Python, Java 8, Kotlin, C#, SQL

Work Experience

Machine Learning Intern
Alexandria, VA

Heron Systems
Dec. 2020-Present

- Trained reinforcement learning agents to track fixed-wing drone flight paths in JSBSim using a custom **PyTorch**-based reinforcement learning framework
- Designed and developed multi-agent simulation framework used throughout 50+ employee division in **Python** in collaboration with senior engineers and other interns
- Trained reinforcement learning agents in **RLLib** to engage in air-to-air combat scenarios as fixed-wing UAVs simulated in JSBSim. Implemented weapon engagement zones and rules of engagement for combat environment
- Created **Lua** plugin synchronizing X-Plane with Tacview replays to help F-22, F-35, F-16 pilots evaluate air-to-air engagements with autonomous agents
- Engineered features and contributed to development of multi-agent reinforcement learning systems for the Air Force Golden Horde program

Enterprise Applications Intern
Herndon, VA

Serco North America
Mar. 2020 - Aug. 2020

- Wrote utilities to verify website integrity using **Java**, **JavaFX**, **Swing**, and **Selenium** with interactive graph visualizations
- Performed bugfixes and quality-of-life changes on widely used TA/NDA request web application built using **C#**, **ASP.NET** and a **SQL** database
- Eliminated time-consuming manual labor for Contracts department using **PowerShell** scripts to automatically update macro-enabled spreadsheets

Volunteer Researcher
Blacksburg, VA

Terrestrial Robotics Engineering and Controls Lab
Jan. 2020 - Present

- Worked on integrating Arduino and TI microcontrollers running **C++** with an EtherCAT-based communication bus
- Tested LIDAR and stereo camera systems using ROS and the IHMC humanoid robotics stack
- Implemented operating mode for verifying force and position tracking for brushless linear actuators using the **Java**-based IHMC humanoid robotics stack

Controls Subteam Member
Blacksburg, VA

VT BOLT - Electric Motorcycle Team
Aug. 2019 - Present

- Wrote **C** interface for TI C2000 DAC
- Used **C** to write performant memory-constrained (< 204KB RAM) 32-bit precision lookup tables for the TI C2000 microcontroller
- Created **Python** and **Matplotlib**-based GUI featuring 3-dimensional lookup table visualizations

Software Team Lead
Haymarket, VA

ILITE Robotics - FIRST Robotics Team 1885
Jun. 2017 - Jun. 2019

- Developed **Java** software for feedback controls, state machines, logging mechanisms, and graphical interfaces for competition robots
- Led and trained team of 6-8 programmers, coordinated development of **Git** version-controlled 12,000+ line codebase integrated with **Gradle** and **Travis CI**
- 3-time District competition winner, District Championship winner, 2-time World Championship division quarterfinalist

Sales Associate
Haymarket, VA

Staples *Jun. 2018 - Dec. 2019*

- Responsible for restocking shelves, cashiering, and helping customers

Volunteer Coach
Haymarket, VA

ILITE Robotics - FIRST Robotics Team 1885 *Aug. 2015 - Jun. 2019*

- Taught STEM summer camps of 20 elementary and middle school students
- Created programming curriculum for Scratch and PBASIC
- Assisted with teaching CyberPatriot camp (Introduction to CyberSecurity)

Team Member - Windows Operating Systems
Haymarket, VA

AFA CyberPatriot Team *Aug. 2015 - Jun. 2019*

- Worked with a team of 6 fellow high school students to perform OS hardening on Windows and Ubuntu OSes
- Wrote scripts to perform OS hardening on Windows operating systems using **Batch**, **PowerShell** to perform Registry and Group Policy configuration
- 2-time National Semifinalist – Platinum division

Projects

Multi-Agent Heron Manager

Heron Systems *2021*

- **Python** framework enabling multi-agent interaction with multi-threaded and distributed compute capability
- Designed in collaboration with senior engineers and developed with 2 fellow interns
- Integrates with open-source and in-house reinforcement learning libraries
- Implements multi-agent air-to-air combat environment using JSBSim and RLLib
- Actively maintained in-house

FRC Robot Codebase

ILITE Robotics - FIRST Robotics Team 1885 *2017-2019*

- Led development and Git version-control of 12,000+ line **Java** codebase integrated with **Gradle** and **Travis CI**
- Created **JavaFX** client-side GUIs for displaying robot odometry data in real-time, specifying constraints for autonomous decision-making, and editing system control parameters in real-time
- Used open-source libraries to implement robot trajectory generation and following using arc-approximated splines and high-frequency PID controllers in **Java**

Robot Arm

Personal Project *2019*

- Designed and 3D printed low-cost 2 degree-of-freedom robot arm using SOLIDWORKS
- Wrote **C++** Arduino code receive commands from PC over serial and drive stepper motors
- Created **Qt** graphical interface in **C++** to control arm over serial
- Implemented inverse kinematics algorithm for arm

2D Space Sim

Personal Project *2018-2019*

- Wrote a 2D space simulation with Newtonian physics in **Java** using LibGDX and Box2D libraries
- Created serializable “immediate mode” rendering configuration system using JSON file format

Driver Signaling System – FIRST Robotics Team 1885

ILITE Robotics - FIRST Robotics Team 1885 *2016-2017*

- Created driver signaling system to display robot game and error states
- Used **Java** and **C++** to facilitate communication over an I2C bus between Linux robot controller, Arduino, and WS2812 addressable LEDs

Accomplishments

2018-2019	**Advanced Computer Studies Student of the Year**, Battlefield High School	*Haymarket, VA*
2018-2019	**Dean’s List**, Northern Virginia Community College	*Haymarket, VA*
2017-2019	**National Semi-Finalist**, CyberPatriot	*Haymarket, VA*
Apr. 2018	**Presenter for *Effective Student Leadership in the FIRST Robotics Competition***, FRC World Championship	*Detroit, MI*
Apr. 2022	**Author for *A Mapping Approach to Achieve Torque Control for Parallel-Actuated Robotic Systems***, ASME 2022	*TBD*