Ralph Quartiano

Phone: 516-660-3270
Email: ralphquartiano@gmail.com

Education

Bachelor's of Science in Aerospace Engineering
Penn State University

Skills

Programming Languages: C++, Python, MATLAB, Julia, SQL
Software Tools: Tensorflow, PyTorch, Docker, Simulink, Verilog

Engineering Experience

❖ *Software Engineer for Advanced Computing (AI Division), Carnegie Mellon Software Engineering Institute (August 2023 to Present)*

❖ *GNC Engineering Intern (Starshield), SpaceX (May 2023 to July 2023)*

- Performed single & multi-component **fault tolerance testing** of Starshield satellite **attitude determination & control** systems (ADCS) using **Monte Carlo simulation** techniques
- Identified attitudes in which **magnetorquer**-based angular momentum desaturation system is underactuated and orbital trajectories in which **star tracker** attitude determination system has severely reduced visibility using **6 degree of freedom simulations** in **C++**
- Analyzed angular momentum and torque envelopes of Starshield satellites in various **reaction wheel** failure cases in order to update flight computer state transition thresholds with **MATLAB**
- Redesigned, programmed, **unit-tested**, and simulated performance of C++ **flight software** state transition algorithms to better reflect survivability of reaction wheel failure cases.

❖ *Software Developer Intern (AI Division), Carnegie Mellon Software Engineering Institute (January 2023 to May 2023)*

- Deployed YOLO **object detection** algorithm on low-SWaP **FPGA** as tech demonstration for **edge machine learning** applications.
- Implemented **RISCV** processor on handheld Lattice IceStick FPGA using **Verilog HDL**.
- Evaluated and tested structure, size, and performance of YOLO, tinyYOLO, and other single shot detector algorithms in order to determine feasibility on edge platforms.
- Utilized network optimization and **quantization** tools in **Tensorflow** to reduce size of algorithms by over a factor of 4, and to convert models from Python scripts into C++ executables.

❖ *Autonomy & Artificial Intelligence Intern, Palski & Associates (May 2022 to August 2022)*

- Programmed **autonomous** satellites for capture-the-flag in geostationary orbit (GEO) to simulate military rendezvous-proximity operations (RPOs) using the **Julia** programming language.
- Designed simulation environment with realistic **orbital mechanics** and satellite performance, allowing agents to autonomously find desired orbit trajectories and calculate thruster burns required to enter them.
- Utilized **reinforcement learning** algorithms in a Markov Decision Process (MDP) framework to improve agent decision-making through training (i.e. DeepQLearning, Proximal Policy Optimization, and Soft Actor Critic).
- Combined Julia's **multi-processing** capabilities with **Linux virtual machines** running on company servers to reduce training times by over 50% and allow for longer training runs while out of the office.
- Created 3D visualization software to demonstrate agent behavior to engineers and defense stakeholders.

❖ *Dynamics & Controls Researcher, Penn State Air Vehicle Intelligence and Autonomy Laboratory (January 2022 to January 2023)*

- Developed **momentum wheel** based stabilization system for an **inverted pendulum.** Used for live concept demonstration in AERSP 460: Aerospace Control Systems.
- Modeled system dynamics in **Simulink** using both linearized **transfer functions** and direct nonlinear physics simulations.
- Designed and tuned **PID controller** in MATLAB using **root locus method** and other analytical techniques. This controller was implemented in C++ and run on an Arduino Mega.
- Manufactured and assembled inverted pendulum system for testing and operation.

❖ *Software Engineer, Sauron (HackPSU AI and Overall Best Hack Winner, April 2022)*

- Constructed data pipeline for the automated collection, analysis, and distribution of geographical information during humanitarian crises in real time.
- Utilized Linux-based virtual machines running on **Google Cloud Platform** for the development and implementation of **Python** scripts.
- Wrote anomaly insertion script for verification of **computer vision** algorithm using **OpenCV**.
- Programmed backend server allowing for image upload to **MySQL** database using **Flask**.

❖ Project Manager and Systems Engineer, NASA BIG Idea Challenge 2020 Finalist (November 2019 to January 2021)

- Lead and managed a team of **20+ engineers** developing a space-grade laser **spectroscopy instrument**.
- **Budgeted $145,000** of NASA funds in order to design, manufacture, and test system.
- Utilized systems-engineering methodology and documentation throughout design life cycle while adhering to strict NASA requirements
- Orchestrated **environmental testing** in order to minimize cost and risk to both equipment and researchers while yielding actionable data

❖ *Lab Manager, Penn State Student Space Programs Laboratory (May 2020 to May 2021)*

- Oversaw daily research operations including equipment maintenance, testing, and **proposal writing**.
- Established a **systems-engineering** based workflow on several research projects.
- Educated incoming students via direct mechanical, electrical, and software engineering training as well as promoting involvement in ongoing projects.
- Collaborated with research groups and professors from Penn State, other universities, and national laboratories for manufacturing equipment, testing facilities, and knowledge transfer.

❖ *Mechanical Engineer, Respiraworks Inc (February 2020 to June 2020)*

- Volunteered for non-profit founded to create an **open source** improvised **ventilator system** for use in rural South America during COVID-19 Pandemic.
- Evaluated and designed **flow measurement** instruments including linear pneumotachograph, venturi tube, and wire anemometer.
- Created system requirements and **quality assurance** practices that adhered to national and international safety and reliability standards.

Work Experience

❖ *NYS Certified Emergency Medical Technician (May 2021, Ongoing)*

- Acquired medical knowledge, practical first-aid skills, and an understanding of incident management operations through intensive and accelerated training.
- Provided pre-hospital medical care and transportation to emergency patients while cooperating with other EMTs, first responders, and law enforcement.
- Trained with and utilized firefighting and vehicle extrication equipment to rescue victims while minimizing risk to first responders and property damage.

❖ *USA Hockey Referee (November 2018 to June 2019)*

- Officiated amateur and competitive ice hockey matches with players aged 12-16.
- Coordinated with coaches, parents, and other referees to ensure matches are safe and fair while promoting a fun and competitive atmosphere for the players.