SARAH AGUASVIVAS MANZANO

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EDUCATION

PhD Student, Computer Science *August 2017 - Present*
University of Colorado, Boulder Expected Graduation: December 2021
Department of Computer Science, Correll Lab GPA: 4.0/4.0

Master of Science, Aerospace Engineering *August 2015 - August 2017*
The Pennsylvania State University GPA: 3.6/4.0
Minors: Computational Science, Electrical Engineering
Thesis: *"Performance and Parsimony in Training Deep Neural Networks"*

Bachelor of Science, Aerospace Engineering *August 2013 - May 2015*
The Pennsylvania State University Class Rank: 4/103
Thesis: *"Corrections to the BEMT Method for Highly Loaded Wind Turbine Blades"* GPA: 3.9/4.0

WORK EXPERIENCE

University of Colorado Boulder Jan 2018- Present
Graduate Research Assistant

◇ Design, manufacture and perform experiments (hardware end to software end) on online prediction and controls in robotic composite materials with embedded sensors, actuators and computers using advanced signal processing and artificial intelligence. ◇ Mentor undergraduate and master students towards team-oriented research (*MS: Cooper Simpson, Ankit Srivastava. Undergraduates: Aaron Parker, LeeLee Graham. High School: Jackson Moody*).

Google Jun 2021 - Present
Research Intern

◇ Open-ended computer science research for a Google internal, unpublished platform.

National Renewable Energy Lab (NREL) May 2019- August 2020
Graduate Research Intern

◇ Proposed, built and deployed *KFlow*: an OpenAI gym and set of stand-alone utilities that introduce the Dynamic Bicycle Model (with variable tire models) into the SUMO/TraCI API for continuous steering and acceleration control for the purpose of reinforcement learning.

NIST — PREP Fellowship April 2018- September 2018
Guest Researcher

◇ *Theoretical Quantum Computing:* Parallelized a Python package for numerical quantum state tomography on a single qubit, thus reducing computation time (up to 20X in HPC cluster) and improved the numerical computation with the help of statisticians, physicists and applied mathematicians. ◇ *PREP Student Payroll Database:* Developed user interface for financial information based on Access, SQL and VBA.

The Pennsylvania State University August 2015-December 2017
Graduate Teaching Assistant

The Pennsylvania State University May 2017-August 2017
PSU ICS Cluster Tech

The Pennsylvania State University 2014-2015
Undergraduate Research Assistant

◇ Created CFD (Computational Fluid Dynamics) animations of wind turbines using FieldView, MATLAB and OpenFOAM ◇ Formulated a correction factor to the BEMT Method in a Penn State produced wind turbine solver called PSU-XTurb

JOURNAL PUBLICATIONS

Tripp, C., **Aguasvivas Manzano, S.**, *et. al.*. Autonomous Vehicle Trajectory Tracking via Model-Free Deep Reinforcement Learning. IEEE Transactions on Intelligent Transportation Systems. **Under Review**.

Ly, K., Mayekar, J., **Aguasvivas Manzano, S.**, *et. al.*. Electro-hydraulic Rolling Soft Robot: Design, Hybrid Dynamic Modeling and Model Predictive Control. IEEE Transactions on Robotics. **Under Review**.

CONFERENCE PROCEEDINGS

Aguasvivas Manzano, S., *et. al.*. High-bandwidth nonlinear control for soft actuators with recursive network models. International Symposium of Experimental Robotics (ISER, Malta 2020). Link to arxiv.

Aguasvivas Manzano, S., *et. al.*. Embedded Neural Networks for Robot Autonomy. International Symposium on Robotics Research (ISRR Hanoi, 2019). Link to arxiv.

Basu, K., Melton, R., **Aguasvivas Manzano, S.** Time-Optimal Reorientation using Neural Networks and Particle Swarm Formulation. AAS/AIAA Astrodynamics Specialist Conference Columbia River Gorge, Stevenson, WA (2017). Link to publication in AIAA

Aguasvivas Manzano, S., Hughes, D., Correll, N. Wireless Online Impact Source Localization on a Composite. 4th International Conference on System-Integrated Intelligence (2018). Link to movie

SKILLS

Open-ended research ◇ Python ◇ C/C++ ◇ Teaching ◇ Core Aerospace Concepts ◇ HPC ◇ OOP ◇ MATLAB ◇ Linux ◇ Engr. Mechanics ◇ Math/Numerical Methods ◇ Neural Networks ◇ OpenAI ◇ SUMO ◇ SWIG ◇ Rust

TEACHING EXPERIENCE

CSCI 1320	CU Boulder	Introduction to Programming for Engineering Students
CMPSC 200 and 201	Penn State	Intro to MATLAB and Intro to C++
AERSP 430	Penn State	Spacecraft Propulsion
AERSP 497I/597I	Penn State	Spacecraft-Environment Interactions
AERSP 313	Penn State	Aerospace Analysis (Numerical Analysis in MATLAB)
AERSP 305W	Penn State	Aerospace Technology Laboratory: Aerodynamics Lab

RELEVANT PROJECTS

NREL Connected Autonomous Vehicles

Project currently being carried out with NREL to investigate the performance of reinforcement learning based control of acceleration and steering in multiple self-driving car scenarios. Developed multiple state of the art classical controllers like nonlinear MPC, Stanley, Pure Pursuit and linear time variant MPC to be used in a 2D car driving simulation.

***nn4mc*: Neural Networks for Microcontrollers (Open Source)**

Open source compiler and set of command line tools that translate neural network trained model file binaries into embedded C code to be used in a microcontroller. Link to repository.

Nonlinear Output Tracking Technique for Soft Actuators

In collaboration with the Organic Robotics Lab at Cornell University. Proposed, developed, deployed and published novel output tracking technique for soft actuators that achieved millimeter-accurate control with less than 2.22kB of flash memory required.

Terrain Sensitive Tire in Autonomous Driving Car

Worked on a team that developed a ROS based controller for autonomous driving in a hallway. Developed a method to determine the static friction coefficient between the cars tire and multiple terrains using a convolutional neural network in Keras with inputs from embedded piezoelectric strip sensors at the tire. Link to code

ACTIVITIES, HONORS AND AWARDS

◇ Mentor and Aerospace Judge at 2020 NASA SpaceApp Challenge Santo Domingo

◇ Women's team jiu jitsu coach at 10th Planet Boulder

◇ Science Judge and Score Keeper 2020 Virtual Colorado Regional High School Science Bowl (Link to media.)

◇ 2020 Berkeley Rising Stars Workshop Participant

◇ 2nd Place: Unearthed Denver Hackathon (2017). Team Roosters (Link to rankings)

◇ NIST PREP Fellow

◇ CU Boulder Deans Assistantship Award

◇ PSU Dean's List all semesters coursed

◇ Member of Sigma Gamma Tau (invitation only)

◇ Most Innovative Concept Award. NASA BigIdea Challenge (Link to media)

◇ Volunteered for STEMrev (http://stemrev.org/) and Make4Covid sewing team (≈ 50 backstraps sewn)

◇ CU Research Expo Award Winning Poster and Publication Recognition Award

◇ Member of Black in AI

Invited speaker at CU Boulder Robotics Summer Seminar Series

PEER REVIEW

Conferences: IEEE International Conference on Robotics and Automation (ICRA), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS),

Journals: Robotics and Autonomous Systems, Sensors