

# SARAH AGUASVIVAS MANZANO

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## EDUCATION

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### PhD Student, Computer Science

University of Colorado, Boulder

Department of Computer Science, Correll Lab

*August 2017 - Present*

Expected Graduation: December 2021

GPA: 4.0/4.0

### Master of Science, Aerospace Engineering

The Pennsylvania State University

Minors: Computational Science, Electrical Engineering

Thesis: *"Performance and Parsimony in Training Deep Neural Networks"*

*August 2015 - August 2017*

GPA: 3.6/4.0

### Bachelor of Science, Aerospace Engineering

The Pennsylvania State University

Thesis: *"Corrections to the BEMT Method for Highly Loaded Wind Turbine Blades"*

*August 2013 - May 2015*

GPA: 3.9/4.0

## PUBLICATIONS

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**Aguasvivas Manzano, S.**, Xu, P., Ly, K., Shepherd, R., Correll, N. Control of Soft Bodies with Arbitrary Embedded Soft Sensor Placement. International Symposium of Experimental Robotics (ISER 2020). **Submitted.**

**Aguasvivas Manzano, S.**, Hughes, D., Simpson, C., Patel, R., Correll, N. Embedded Neural Networks for Robot Autonomy. International Symposium on Robotics Research (ISRR 2019). Link to arxiv.

**Aguasvivas Manzano, S.**, Correll, N. In-situ Deep Learning for Prediction and Controls in Smart Composites. 22nd International Conference on Composites Materials (2019). Presentation

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

**Aguasvivas Manzano, S.**, Lavelly, A., Vijayakumar, G., Brasseur, J., Schmitz, S. Nonsteady Wind Turbine Loading Response to Passage of Daytime Atmospheric Turbulence Eddies. Annual Meeting of the APS Division of Fluid Dynamics 68 (2015). Link to movie

**Aguasvivas Manzano, S.**, Jha, P., Plummer, J., and Schmitz, S. "Turbulent Transport in the Wakes of Wind Turbines." Annual Meeting of the APS Division of Fluid Dynamics 67 (2014). Link to movie

Hava, H., Zhou, L., Lombardi, L., Cui, K., Joung, H., **Aguasvivas Manzano, S.**, et.al. SIRONA: Sustainable Integration of Regenerative Outer-space Nature and Agriculture. Part I. Architecture and Technology Session. International Conference on Environmental Systems (2019). Link to publication.

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

## SKILLS

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C/C++ ◊ Python ◊ Teaching ◊ Core Aerospace Concepts ◊ HPC ◊ OOP ◊ MATLAB ◊ Linux ◊ Engr. Mechanics ◊ Math/Numerical Methods for Engineers ◊ Neural Networks ◊ OpenAI ◊ SUMO

## TEACHING EXPERIENCE

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

## WORK EXPERIENCE

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**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 (*Mentees: Cooper Simpson, Aaron Parker, LeeLee Graham, Ankit Srivastava*).

**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 ◊ Developed classical, model-based controller and other state of the art controllers in an in-house PyGame 2D driver (*KRoad*) simulator on the path following task.

**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*: IT services for a database with financial information for the PREP Fellowship awardees 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*

◊ Tech support and customer interaction on the usage of a medium-sized HPC cluster called ICS for researchers. ◊ Developed wikis, tutorials and how-to guides for parallelization in MATLAB, Python and for Linux scripts

**The Pennsylvania State University** 2014-2015  
*Undergraduate Research Assistant*

◊ Created CFD (Computational Fluid Dynamics) animations of wind turbines at varying atmospheric settings using FieldView (by Intelligent Light), MATLAB and OpenFOAM Formulated a correction factor to the BEMT Method in a Penn State produced wind turbine solver called PSU-XTurb

## RELEVANT PROJECTS

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### **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.

### **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](#).

### **Neural Predictive Controller for Soft Block with Embedded Optical Lace Sensors**

In collaboration with Robert Shepherds lab at Cornell. Currently developing multiple input multiple output (MIMO) controller that uses neural networks for system plant identification for a soft robotic morphing wing. [Link to repository](#).

### **Wireless Online Impact Source localization**

Developing a distributed algorithm to localize the source of an impact by assuming the position of individual sensors are unknown [Link to repository](#).

### **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

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- ◇ Science Judge and Score Keeper 2020 Virtual Colorado Regional High School Science Bowl
- ◇ 2nd Place. Unearthed Denver Hackathon (2017). Team Roosters ([Link to rankings](#))
- ◇ CU Boulder Deans Assistantship Award
- ◇ NIST PREP Fellow
- ◇ Member of Sigma Gamma Tau
- ◇ Most Innovative Concept Award. NASA BigIdea Challenge ([Link to media](#))
- ◇ Volunteered at STEMrev (<http://stemrev.org/>)
- ◇ Volunteered for Make4Covid ( $\approx$  50 backstraps sewn)
- ◇ Mentor of 6 teams at NASA SpaceApp Challenge Hackathon Santo Domingo

## PEER REVIEW

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*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