Emily A. Reed
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Education

University of Southern California — *August 2017 - Present*
Ph.D. Electrical and Computer Engineering, NSF Fellow — GPA 3.82 (4.00 scale)
Master's Electrical Engineering — *Graduated May 10, 2019*
The Ohio State University — *Graduated Magna Cum Laude May 7, 2017*
B.S. Electrical and Computer Engineering — GPA 3.897 (4.00 scale)
Honors Research Distinction in Electrical and Computer Engineering
French Minor and Global Engineering Distinction

Major Awards

Best Student Paper Award Finalist, IEEE Engineering in Medicine and Biology	July 2020
National Science Foundation Graduate Research Fellowship	September 2019 - September 2022
National Defense Science & Engineering Graduate Fellowship (2% acceptance)	(Declined Award)
USC Annenberg Fellowship	August 2017 - May 2021
USC Women in Science and Engineering Top-Off Fellowship	August 2017 - May 2019
Ohio State Ross Scholar	August 2014 - May 2017
Ohio State Provost Scholarship	August 2013 - May 2017

Publications and Technical Reports

E.A. Reed, G. Ramos, P. Bogdan, and S. Pequito. "Minimum Structural Sensor Placement for Switched Linear Time-Invariant Systems and Unknown Inputs." Submitted to *Automatica.* In Review.

E.A. Reed, G. Ramos, P. Bogdan, and S. Pequito. "A scalable distributed dynamical systems approach to compute the strongly connected components and diameter of networks." Submitted to *Transactions on Automatic Control Special* Issue for Learning and Control. In Review.

E.A. Reed, P. Bogdan, and S. Pequito. "Fractional Dynamical Stability of EEG Signals and its Implication on Motor Control." Submitted to *International Journal of Robust and Nonlinear Control Special Issue on Control-Theoretic Approaches for Systems in the Life Sciences.* In Review.

E.A. Reed, M.A. Pereira, F.J. Valero-Cuevas, E.A. Theodorou. "Sampling-Based Nonlinear Stochastic Optimal Control for Neuromechanical Systems." *42nd Annual International Virtual Conferences of the IEEE Engineering in Medicine and Biology Society in conjunction with the 43rd, Annual Conference of the Canadian Medical and Biological Engineering Society*, July, 2020.

M.A. Pereira, Z. Wang, T. Chen, **E.A. Reed**, E.A. Theodorou. "Feynman-Kac Neural Network Architectures for Stochastic Optimal Control Using Second-Order FBSDE Theory." Learning for Dynamics and Control Virtual Conference. June 11-12, 2020.

E.A. Reed, M. Messerle. "Robotic Surgery in Medicine and Dentistry: On the Cutting Edge of Ethics." Technical Report. April 2019.

E.A. Reed, A.D. McKinnon. "Cyber-physical Security Education and Outreach." U.S. Department of Energy Archive. Aug. 2017.

E.A. Reed, A. Gupta, J.K. Wang. "Improvement of Reliability Indices in a Micro-grid System involving Renewable Generation and Energy Storage". Honors Undergraduate Research Thesis, The Ohio State University, Columbus, Ohio USA. May 2017.

E.A. Reed, A.D. McKinnon. "Cyber-physical Security Educational Demonstration using Raspberry Pi Computers." U.S. Department of Energy Archive. Aug. 2016

Research and Industry Experience

USC Cyber Physical Systems Group *January 2020 - present*
Los Angeles, California **Graduate Research Assistant**
Supervisor: Professor Paul Bogdan

- Statistically comparing the controllability index of both artificial and real-world large-scale networks when describing these networks with two different dynamical models, namely linear and fractal dynamics
- Mathematically modeling brain dynamics from several epileptic patient datasets to determine seizure onset by employing fractional calculus and devising control-theoretic strategies to autonomously identify key features of the model
- Designed, programmed, and analyzed a novel algorithm using concepts from consensus-protocols that improved the run-time both analytically and experimentally of finding the strongly connected components and finite diameter of large-scale networks by a minimum of 20% compared to the state-of-the-art in three different kinds of random networks
- Collaborating with a global team of students, post-docs, and professors to publish a tutorial paper on robust quantum control to introduce the quantum computing to control theorists and ease new researchers into the field

Georgia Institute of Technology Autonomous Control & Decision Systems Lab *July 2019 - December 2019*
Atlanta, Georgia **Visiting Scholar**
Supervisor: Professor Evangelos Theodorou

- Published research that was accepted at the 2020 Learning for Dynamics and Control Conference by developing a new stochastic optimal control theoretical framework to manipulate nonlinear high-dimensional dynamical systems, including a quadcopter, and by successfully demonstrating the algorithm's performance in simulation on a GPU

Tools: Python, PyCuda, TensorFlow, MATLAB

USC Brain and Body Dynamics Lab *April 2018 - December 2019*
Los Angeles, California **Graduate Research Assistant**
Supervisor: Professor Francisco Valero-Cuevas

- Nominated as a Finalist for the Best Student Paper award (10 selected out of 198) at the 2020 IEEE Conference on Engineering in Medicine and Biology for the publication of my research in collaboration with Georgia Tech that compared the performance of three optimal control algorithms that aimed to control a human index finger in simulation
- Presented virtually and fielded questions from a panel of six professors and an audience of over 700 people at the Student Paper Competition for the IEEE Conference on Engineering in Medicine and Biology on July 9, 2020.

Northrop Grumman James Webb Space Telescope *May 2018 - July 2018*
Redondo Beach, California **Attitude Control Systems Engineering Intern**

- Ensured mission critical power supply for the James Webb Space Telescope by designing and programming an algorithm in MATLAB that determines the position of the telescope's solar cell
- Presented culminating technical project report to 12 engineers, including the Attitude Control Systems Senior Engineer

Tools: MATLAB

U.S. Department of Energy Pacific Northwest National Laboratory *June - August 2016, June - August 2017*
Richland, Washington **Undergraduate Intern and Researcher**
Supervisor: David McKinnon, Ph.D.

- Demonstrated the importance of cyber-physical security to 25 Middle School students by creating a web-interface that uncovers the vulnerabilities of a model town, which includes an electric grid, two autonomous vehicles, a power plant, a missile defense system, and a wind farm, that was built with Raspberry Pi Computers and was programmed in Python
- Presented my outreach project at two Department of Energy research symposiums
- Submitted two technical reports detailing my outreach project to the Department of Energy archive

Tools: Python, Raspberry Pi, Arduino, Redhat, Scalar Vector Graphics

The Ohio State University Power System Analysis Research Group *January 2015 - May 2017*
Columbus, Ohio **Honors Undergraduate Research Assistant**
Supervisor: Professor Jiankang Wang

- Published and defended my undergraduate honors research thesis focusing on improving reliability indices in distribution systems and microgrids with renewable generation by using energy storage systems
- Presented my project to the Ohio State research community at the Denman and Spring Forums

- Improved the reliability of microgrids with renewable generation by 73% (previously 27% to 100% reliable) during select peak hours by enabling energy storage usage

Tools: CVX MATLAB, Gurobi, LaTeX

Biosand Filter Grey Water Recycle Design Project *January - June 2015*
Panajachel, Guatemala
Supervisor: Professor Kevin Passino

- Designed, built, and tested a ten-gallon biosand filter that recycles grey water for reuse in pilas, which are used in the homes of indigenous Mayan families for laundry, hand washing, and dish washing
- Earned a grant to travel to Guatemala for one week to implement the grey water recycling system for a nonprofit organization that assists Mayan families

Wind Turbine Design Project *January - April 2014*
Nueva Esperanza, Honduras
Supervisor: Professor Edgar Casale

- Designed, built, and tested a 450-Watt wind turbine that provides sustainable electricity for outdoor lighting at an orphanage in rural Honduras
- Traveled to Honduras for one week to implement the wind turbine system for an orphanage that assists children with HIV and AIDS

Presentations and Posters

USC Women in Science and Engineering STEM Bytes Seminar "Characteristics of the brain and their implications for controlling neural behavior"	March 25, 2021
Finalist Best Paper Nominee Presentation at IEEE EMBS Conference "Sampling-Based Nonlinear Stochastic Optimal Control for Neuromechanical Systems"	July 9, 2020
Annenberg Symposium Poster Forum at the University of Southern California	April 23, 2020
Moderator for Faculty Panel on Navigating Graduate Research and Academics during COVID-19	April 14, 2020
Next Generation Ethics Conference at the University of Southern California	April 26, 2019
Annenberg Symposium Poster Forum at the University of Southern California	April 18, 2019
Computing Research Association Grad Cohort Poster Session, Chicago, IL	April 12, 2019
Explore Aerospace Poster Forum Northrop Grumman, Redondo Beach, CA	July 18, 2018
James Webb Space Telescope Technical Presentation Northrop Grumman, Redondo Beach, CA	July 12, 2018
Digital Control Design Project Presentation at the University of Southern California	April 27, 2018
Pacific Northwest National Laboratory Research Presentation Symposium, Richland, WA	August 1, 2017
Denman Undergraduate Research Poster Forum at The Ohio State University	March 29, 2017
Pacific Northwest National Laboratory Research Presentation Symposium, Richland, WA	August 4, 2016
Panelist College of Engineering Scholarship Luncheon at The Ohio State University	April 23, 2016
Spring Undergraduate Research Poster Forum at The Ohio State University	March 30, 2016
Biosand Filter Grey Water Recycle Design Project Presentation, Panajachel, Guatemala	June 12, 2015
Work Standards Presentation Eaton Corporation, Brooklyn, OH	July 28, 2015
Wind Turbine Design Project Presentation, Nueva Esperanza, Honduras	March 21, 2014

Skills

Cuda, **Python**, **C**, **Java**, **C++**, **MATLAB**, **CVX**, **LaTeX**

French *Work Proficient*

- Studied French at Université Laval in Québec City, Canada and lived with a native French speaker for two months July - August 2014 during a French Immersion Program
- Earned a minor in French from The Ohio State University

Awards

USC Women in Science and Engineering Qualcomm Top-Off Fellowship	August 2020 - May 2021
USC Ethical Decision Making Campus-wide Student Competition Award Winner	April 2019
Computer Science Competition Award Winner Northrop Grumman	October 2017
Maggie McHugh Service Award Winner	May 2017
Benjamin Banneker Civic Engagement Award	October 2016
IEEE Eta Kappa Nu	April 2016
Bockstiegel Merit Scholarship The Ohio State University	August 2016 - May 2017
Mortar Board Alumni Merit Scholarship The Ohio State University	August 2016 - May 2017
Second Year Transformational Program Grant	May 2015
Tau Beta Pi	April 2015
Computer Science Competition Award Winner The Ohio State University	November 2015
Phi Kappa Phi	October 2014
Phi Kappa Phi Vern A. Vandamark Outstanding First Year Student Award	October 2014
Arthur P. Grasser Merit Scholarship The Ohio State University	August 2014 - May 2017
Make Your Dreams Come True Scholarship The Ohio State University	May 2014
Bohner Memorial Scholarship The Ohio State University	May 2014
Chuck Elgin Industrial Systems Engineering Merit Scholarship The Ohio State University	August 2014 - May 2015
Women In Engineering Scholarship The Ohio State University	August 2014 - May 2015

Campus Involvement/Volunteer Work/Community Service

USC Summer High School Intensive Next-Generation Engineering Program *June 2021 - July 2021*
University of Southern California, Los Angeles, CA **Paid Mentor**

- Taught and mentored a high school student to complete a research project and poster on analyzing and mathematically modeling epileptic data to identify and uncover key features in the model to predict when a seizure will start

Women in Science and Engineering Ph.D. Advisory Board *August 2018 - Present*
University of Southern California, Los Angeles, CA **Mentorship Chair**

- Created and supervise the WiSE mentorship program including a professional development series of four workshops for over 300 female Ph.D. students in science, engineering, and math to build community and rapport across the university

School on Wheels *January - April 2018, July 2020 - present*
University of Southern California, Los Angeles, CA **Volunteer**

- Taught six homeless teenage girls about engineering by completing weekly STEM projects with them for four months
- Tutor a 2nd grade student once per week for an hour on reading and comprehension starting in July 2020

Engineers For Community Service *August 2015 - May 2017*
The Ohio State University, Columbus, Ohio **Project Leader**

- Led a team of 25 students to design a temporary shelter for homeless individuals in Columbus, Ohio

Humanitarian Engineering Scholars Program *August 2014 - April 2015*
The Ohio State University, Columbus, Ohio **President**

- Led a nine person council that planned volunteer, educational, and social activities
- Started the first annual Engineering Design Challenge Day, where 45 students designed and built a temporary shelter for homeless individuals in need in Columbus, Ohio

College of Engineering Ambassador Program *January 2014 - May 2017*
The Ohio State University, Columbus, Ohio **Ambassador and Tour Guide**

- Represented the university at recruitment and alumni events, including leading weekly tours of the College of Engineering to prospect students and their parents

Invited Workshops

NSF Advanced Studies Institute in Robust Control of Quantum Networks, Cardiff, Wales	June 24 - June 30, 2019
Computing Research Association Grad Cohort, Chicago, IL	April 10 - 12, 2019

PhD Coursework

Network Flows and Combinatorial Optimization
Robust Multivariable Control
Large Scale Optimization and Machine Learning
Nonlinear and Adaptive Control
Estimation Theory
System Identification
Net-Centric Power System Control
Linear System Theory
Optimization for the Information and Data Sciences
Random Processes in Engineering
Introduction to Digital Signal Processing
Digital Control Systems
Linear Control Systems
Linear Algebra for Engineering
Probability for Electrical and Computer Engineers