Emily A. Reed

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Education

University of Southern California
Ph.D. in Electrical and Computer Engineering — August 8, 2023
Thesis: *Theoretical Foundations and Design Methodologies for Cyber-Neural Systems*
Advisors: Paul Bogdan and Sérgio Pequito
M.S. in Electrical Engineering — May 10, 2019

The Ohio State University
B.S. in Electrical and Computer Engineering (*Magna Cum Laude*), GPA 3.897 (4.00 scale) — May 7, 2017
Honors Research Distinction in Electrical and Computer Engineering
French Minor and Global Engineering Distinction

Positions

Assistant Professor in Electrical & Computer Engineering at Texas Tech Univ.	Starting August 2024
Postdoctoral Fellow in Biomedical Engineering at Johns Hopkins University	August 2023 - July 2024
Graduate Research Assistant at the University of Southern California	August 2022 - July 2023
Machine Learning Research Intern at Morgan Stanley	June 2022 - August 2022
NSF Graduate Research Fellow at the University of Southern California	September 2019 - August 2022
Attitude Control Systems Engineering Intern at Northrop Grumman	May 2018 - July 2018
Annenberg Fellow at the University of Southern California	August 2017 - August 2019
Intern at U.S. Department of Energy Pacific Northwest National Laboratory	June - August 2016, June - August 2017
Honors Undergraduate Research Assistant at The Ohio State University	January 2015 - May 2017

Major Awards

Rising Star in Electrical Engineering and Computer Science	November 2022
USC Ming Hsieh Institute Scholar	October 2022
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	(Declined Award)
USC Annenberg Fellowship	August 2017 - May 2021
Ohio State Provost Scholarship	August 2013 - May 2017

Invited Workshops

Electrical Engineering & Computer Science Rising Stars, University of Texas at Austin	October 26-28, 2022
Future Faculty Workshop, University of Notre Dame, South Bend, IN	May 2-4, 2022
Future Faculty Program, Auburn University, Virtual	Fall 2021
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

Conference Proceedings

E.A. Reed, G. Ramos, P. Bogdan, S. Pequito. "Mitigating Epilepsy by Stabilizing Linear Fractional-Order Systems." *Proceedings of the IEEE American Control Conference.* San Diego, California. May 2023.

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. 66% acceptance rate.

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. 65% acceptance rate.

Journal Publications

E.A. Reed, G. Ramos, P. Bogdan, S. Pequito. "The Role of Long-Term Power-Law Memory in Controlling Large-Scale Complex Dynamical Networks." *Nature Scientific Reports.* Impact Factor 5.0.

E.A. Reed, S. Chatterjee, G. Ramos, P. Bogdan, S. Pequito. "Fractional cyber-neural systems–a brief survey." *Annual Reviews in Control Analysis and Control Design for Neurodynamics: Special Section.* July 2022. Impact Factor 9.15.

E.A. Reed, G. Ramos, P. Bogdan, and S. Pequito. "A scalable distributed dynamical systems approach to learn the strongly connected components and diameter of networks." *Transactions on Automatic Control Special Issue for Learning and Control.* May 2023. Impact Factor 7.41.

E.A. Reed, G. Ramos, P. Bogdan, and S. Pequito. "Minimum Structural Sensor Placement for Switched Linear Time-Invariant Systems and Unknown Inputs." *Automatica.* September 2022. Impact Factor 5.944.

E.A. Reed, P. Bogdan, and S. Pequito. "Quantification of Fractional Dynamical Stability of EEG Signals as a Bio-Marker for Cognitive Motor Control." *Frontiers in Control Engineering.* November 2021.

C.A. Weidner, **E.A. Reed**, J. Monroe, B. Sheller, E. Maas, E. Jonckheere, F.C. Langbein, S.G. Schirmer. "Robust Quantum in Closed Loop and Open Systems: Theory and Practice." Submitted to *Automatica.* Under Review. Impact Factor 6.

Research and Industry Experience

Johns Hopkins Neuromedical Control Systems Lab August 2023 - Present
Baltimore, Maryland **Postdoctoral Fellow**

- Developing and applying novel control-based tools to uncover new insights into neurological diseases, such as epilepsy

USC Cyber Physical Systems Group January 2020 - August 2023
Los Angeles, California **Graduate Research Assistant**

- Published and presented a control-theoretic seizure mitigation strategy by deriving properties of discrete-time linear fractional-order systems, which model brain dynamics from electrocorticographic measurements of 10 epileptic patients
- Designed, programmed, and analyzed a novel distributed algorithm using concepts from consensus protocols that improved the run-time 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 two different kinds of random networks
- Collaborated 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

Morgan Stanley Machine Learning Research Group June - August 2022
New York, New York **Machine Learning Research Intern**

- Tested and tuned graph neural networks and other deep learning and machine learning algorithms on one month of Morgan Stanley's employee email data to predict the next week's new connections between employees with 99% Average Precision and classify employees based on their position with 78% Average Precision using PyTorch
- Formulated an optimization problem to solve a liquidation scheme involving dark pools with time delays

Georgia Institute of Technology Autonomous Control & Decision Systems Lab July 2019 - December 2019
Atlanta, Georgia **Visiting Scholar**

- 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

USC Brain and Body Dynamics Lab April 2018 - December 2019
Los Angeles, California **Graduate Research Assistant**

- 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**

- Developed a calibration tool 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

U.S. Department of Energy Pacific Northwest National Laboratory June - August 2016, June - August 2017
Richland, Washington **Undergraduate Intern and Researcher**

- 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 U.S. Department of Energy archive

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

- Published and defended my undergraduate honors research thesis, which improved the reliability of microgrids with renewable generation by 73% (previously 27% to 100% reliable) during select peak hours by enabling energy storage
- Presented my project to the Ohio State research community at the Denman and Spring Poster Forums

Skills

Python, **PyTorch**, **MATLAB**, **CVX**, **LaTeX**,

Awards

Society for Neuroscience Trainee Professional Development Award	November 11, 2023
USC Women in Science and Engineering Leadership Award	April 21, 2022
USC Women in Science and Engineering Qualcomm Top-Off Fellowship	August 2020 - May 2021
USC Women in Science and Engineering Top-Off Fellowship	August 2017 - May 2019
USC Ethical Decision Making Campus-wide Student Competition Award Winner	April 2019
Ohio State Ross Scholar	August 2014 - May 2017
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

Presentations and Posters

Society for Neuroscience Conference Presentation	November 11, 2023
Invited Seminar at Uppsala University	May 22, 2023
American Control Conference Proceedings Presentation	June 1, 2023
Invited Seminar at the University of Albany SUNY	April 10, 2023
Invited Seminar at the University of Michigan	March 15, 2023
Invited Seminar at Texas Tech University	March 9, 2023
Invited Seminar at Johns Hopkins University	January 19, 2023
Invited Seminar at the University of Texas at Austin	November 28, 2022
EECS Rising Stars Poster Presentation University of Texas at Austin	October 26, 2022
Invited Seminar at The Ohio State University	October 21, 2022
Invited Seminar at the University of Notre Dame	October 5, 2022
Institute Defense Analyses Center for Computing Sciences Interview Presentation	November 18, 2021
USC Women in Science and Engineering STEM Bytes Seminar	March 25, 2021
Finalist Best Paper Nominee Presentation at IEEE EMBS Conference	July 9, 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
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
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

Volunteer Work

Peer Reviewer **Volunteer**

- Reviewed papers for IEEE Control System Letters, American Control Conference, IMA Journal of Mathematical Control & Information, AAAI Conference, IEEE Design & Test, IEEE Transactions on Automatic Control, European Control Conference

USC Center for Undergraduate Research in Viterbi Engineering Program August 2021 - Present
University of Southern California, Los Angeles, CA **Paid Mentor**

- Teaching and mentoring two undergraduate students to complete a research project and poster on analyzing and mathematically modeling electrocorticographic data from 10 patients with epilepsy to identify and uncover key features in the model to predict seizure onset

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 electrocorticographic data

Women in Science and Engineering Ph.D. Advisory Board August 2018 - December 2021
University of Southern California, Los Angeles, CA **Mentorship Chair**

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

School on Wheels January - April 2018, July 2020 - December 2021
Los Angeles, CA **Volunteer**

- Taught six homeless teenage girls about engineering by completing weekly STEM projects with them for four months
- Tutored three elementary through high school-aged students weekly on reading, writing, and math

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