Alexandra Porter

EDUCATION

PH.D. IN COMPUTER SCIENCE 2022 Exp. | Stanford University
Thesis Title: Graph Algorithms for Systems Design, Advisors: Prof. Mary Wootters and Prof. Jure Leskovec
B.S. COMPUTER SCIENCE AND B.S. IN MATHEMATICS 2017 | Arizona State University
Honors Program, Minor in Music performance, 4.0 GPA

RESEARCH POSITIONS

GRADUATE RESEARCH ASSISTANT Sept 2017 - Present | Stanford University
Advisors: Prof. Mary Wootters and Prof. Jure Leskovec
RESEARCH & DEVELOPMENT INTERN May 2016 - Present | Sandia National Laboratories
Discrete Mathematics & Optimization Department
RESEARCH & DEVELOPMENT INTERN May 2015 - May 2016 | Sandia National Laboratories
Verification & Validation Department
UNDERGRADUATE RESEARCH ASSISTANT Jan 2016 - May 2017 | Arizona State University
Advisor: Andrea Richa

INDUSTRY EXPERIENCE

CHANNEL PLANNING FOR WIFI NETWORKS March 2020 – Present | Stanford University
Designing and analyzing algorithms for assigning channels in Wifi networks. Collaborating with an internet service startup to construct a realistic model and test algorithms on data from real-world deployments.
Advisors: Mary Wootters, Jure Leskovec

STREAMING ALGORITHMICS FOR EMERGING HPC HARDWARE May 2016 - Present | Sandia National Laboratories
Developed, analyzed, and implemented data streaming benchmark for HPC machines using C/C++ and an MPI-based streaming message passing system. Designed program layouts to optimize use of machine architecture.
Implemented a distributed streaming algorithm for connected components in network data and performed efficiency and validation experiments.
Developing a streaming benchmark application for new massively parallel processor designs, including the Graphcore IPU.
Collaborators: Jonathan Berry, Cynthia Phillips

RESEARCH EXPERIENCE

MACHINE LEARNING ON NETWORK DATA April 2018 – Present | Stanford University
Designed and implemented a method for selecting significant patterns in temporal network data by identifying statistically significant motif occurrences.
Analyzed algorithms for reducing redundant computation in graph neural networks and designed more efficient approximation heuristics.
Advisor: Jure Leskovec

ERROR CORRECTING CODES FOR DISTRIBUTED STORAGE Sept 2017 – March 2020 | Stanford University
Designed and analyzed error correcting codes to improve the reliability of distributed storage systems. Introduced and characterized load-balanced fractional repetition codes for efficient repairs in distributed storage and embedded index codes for simultaneous information sharing among distributed nodes.
Advisor: Mary Wootters

SELF-ORGANIZING PARTICLE SYSTEMS Jan 2015 – May 2017 | Arizona State University
Designed, implemented, and tested algorithms for distributed computation on simulated self-organizing particles representing asynchronous nodes with limited compute and communication capacity and the ability to move along a 2-dimensional grid.
Advisor: Andrea Richa

INTERNET OF THINGS CO-SIMULATION Oct 2015 – May 2016 | Arizona State University
Designed, programmed, and tested simulations of a self-navigating wheelchair combining a commercial robotics simulation and an open source network simulation environment.
Advisor: Umit Ogras

PUBLICATIONS AND PRESENTATIONS

PEER-REVIEWED CONFERENCE PUBLICATIONS

Alexandra Porter and Mary Wootters. On greedy approaches to hierarchical aggregation. In 2021 IEEE International Symposium on Information Theory (ISIT), July 2021

Alexandra Porter and Mary Wootters. Embedded index coding. In 2019 IEEE Information Theory Workshop (ITW), 2019

Alexandra Porter, Shashwat Silas, and Mary Wootters. Load-balanced fractional repetition codes. In 2018 IEEE International Symposium on Information Theory (ISIT), pages 2072–2076, June 2018

Alexandra Porter and Andrea Richa. Collaborative computation in self-organizing particle systems. In International Conference on Unconventional Computation and Natural Computation, pages 188–203. Springer, 2018

Zahra Derakhshandeh, Robert Gmyr, Alexandra Porter, Andréa W Richa, Christian Scheideler, and Thim Strothmann. On the runtime of universal coating for programmable matter. In International Conference on DNA-Based Computers, pages 148–164. Springer, 2016

PEER-REVIEWED JOURNAL PUBLICATIONS

Alexandra Porter and Mary Wootters. Embedded index coding. IEEE Transactions on Information Theory, 67(3):1461–1477, 2020

Joshua J Daymude, Zahra Derakhshandeh, Robert Gmyr, Alexandra Porter, Andréa W Richa, Christian Scheideler, and Thim Strothmann. On the runtime of universal coating for programmable matter. Natural Computing, 17(1):81–96, 2018

PREPRINTS AND OTHER PRESENTATIONS

Jonathan Berry, Cynthia Phillips, and Alexandra Porter. Connected components for infinite graph streams: Theory and practice. Under review.

Jonathan Berry and Alexandra Porter. Stateful streaming in distributed memory supercomputers. Chesapeake Large-Scale Analytics Conference, 2016

Alexandra Porter, Md Muztoba, and Umit Ogras. Human-machine communication for assistive iot technologies. CODES+ISSS Special Session Presentation, 2016

TEACHING EXPERIENCE

MACHINE LEARNING WITH GRAPHS | Teaching Assistant

September 2021 - Present | Stanford University | Instructor: Jure Leskovec

Held office hours and discussion sections and answered student questions about homework and lecture content.

MINING MASSIVE DATA SETS | Head Teaching Assistant

April 2021 - Jun 2021 | Stanford University | Instructor: Jure Leskovec

Led seven member TA team by communicating with the instructor and administration, organizing grading sessions, and other course tasks. Held office hours and discussion sections and answered student questions online.

ALGEBRAIC ERROR CORRECTING CODES | Teaching Assistant

Jan 2021 - March 2021 | Stanford University | Instructor: Mary Wootters

Held office hours and graded assignments.

DESIGN AND ANALYSIS OF ALGORITHMS | Teaching Assistant

Jan 2017 - May 2017 | Arizona State University | Instructor: Guoliang Xue

Held office hours and assisted with review sessions as undergraduate TA.

HONORS AND AWARDS

2017 NSF Graduate Research Fellowship

2017 Charles Wexler Mathematics Prize for Outstanding Senior Undergraduate Mathematics Student at Arizona State Univ.

2016 Computing Research Association Outstanding Undergraduate Researcher Award Finalist