Natasha Jarus

Address: 212 Emerson Electric Company Hall, Rolla, MO 65409
Phone: (573) 202–1013
Email: jarus@mst.edu
Website: adjoint.space

Education

Expected 2021 | Ph.D. in Computer Engineering
Missouri University of Science and Technology, Rolla, MO
Graduate Assistantships in Areas of National Need Doctoral Fellow
Advisor: Dr. Sahra Sedigh Sarvestani
Thesis: Sound Metamodeling Foundations for Complex Hybrid Systems
Thesis proposal/Comprehensive exam passed Jan 2021
Gpa: 4.0/4.0

December 2013 | B.S. in Computer Science
Minor in Mathematics
Missouri University of Science and Technology, Rolla, MO
Office for Undergraduate Research Experience Scholar
Advisor: Dr. Sriram Chellapan
Gpa: 3.7/4.0

Research Interests

Applications of Formal Methods, Abstract Algebra, Type Theory, and Category Theory to Model Transformation
Stochastic Modeling of Complex Networked Systems
Critical Infrastructure Protection and Dependability Analysis
Prediction and Analysis of Failures in Embedded Systems

Experience

Jan 2014 – present | Graduate Research Assistant at **Missouri S&T**
Advisor: Dr. Sahra Sedigh Sarvestani
Carrying out doctoral research on modeling and analysis of complex systems, including smart power grids and embedded system peripherals. Mentoring several undergraduate and graduate students working on related projects.

Aug 2018 – Dec 2018 | Graduate Instructor at **Missouri S&T**
Haskell Special Topics — Computer Science 4000
Taught details of the Haskell programming language, including types, typeclasses, common data structures, and algebraic abstractions. Also discussed aspects of lambda calculus, type theory, and applications of the Curry-Howard correspondence. Developed course curriculum as a readings class based on a textbook and supplemented by academic and industry articles. Full responsibility for instruction and evaluation of 4 students.

Sept 2018 – Nov 2018 | Graduate Instructor at **Missouri S&T**
Trigonometry — Math 1160
Taught lectures on trigonometric functions, identities, and applications of trigonometry, including solving triangles, calculating distances and bearings, and complex numbers. Full responsibility for instruction and evaluation of two classes of 50 freshman and sophomore students each.

Jan 2018 – May 2018 & Jan 2017 – May 2017
Graduate Teaching Assistant at **Missouri S&T**
Object-Oriented Numerical Modeling in C++ — Computer Science 5201
Taught lectures on memory safety, the curiously recursive template pattern, and modern C++ features, including lambdas, closures, and combinators provided in the standard library. Graded projects and provided feedback on program design and implementation for classes of 30 and 45 senior and graduate students.

Aug 2017 – Dec 2017
Graduate Teaching Assistant at **Missouri S&T**
Introduction to Operating Systems — Computer Science 3800
Developed homework assignments covering multithreaded programming, diagnosing and fixing deadlock, memory allocation, and process scheduling. Developed a small kernel for students to use as a basis for class projects. Graded homework assignments for two classes of 60 sophomore and junior students.

Summer 2017
Graduate Instructor at **Missouri S&T**
Discrete Mathematics — Computer Science 1200
Taught logic, mathematical induction, number and set theory, probability and combinatorics, and graph theory. Full responsibility for instruction and evaluation of a class of 7 freshman and sophomore students.

Summer 2017 & Jan 2016 – May 2016
Graduate Instructor at **Missouri S&T**
Data Structures Laboratory — Computer Science 1001 (now 1585)
Taught program debugging, performance analysis, scripting, and version control. Developed course curriculum, including topic selection, instructional materials, and student exercises. Full responsibility for instruction and evaluation of three classes totaling 80 freshman and sophomore students. This class is a pilot run of a lab that is required for new students.

Aug 2016 – Dec 2016
Graduate Instructor at **Missouri S&T**
Introduction to C++ Programming — Computer Science 1570
Taught basics of computer programming, including object-oriented programming, in C++. Full responsibility for instruction and evaluation of two classes of 50 freshman and sophomore students.

Aug 2015 – Dec 2015
Graduate Teaching Assistant at **Missouri S&T**
Calculus II Laboratory — Math 1215
Guided groups of freshman and sophomore students through solving problems in an inquiry-based learning environment. Taught three classes of 30 students each. Provided tutoring assistance to students and proctored and graded exams for the associated lecture.
These classes are a pilot run of a new calculus laboratory format. Provided input on problem selection and wrote solutions for the exercises.

Jan 2015 – May 2015
Graduate Instructor at **Missouri S&T**
Digital Network Design — Computer Engineering 5410
Taught principles of computer networking beginning from physical media and continuing through each layer of the OSI stack. Shared responsibility with Mark Woodard for instruction and evaluation of a course of 45 senior and graduate students.

Aug 2014 – Dec 2014
Grader at **Missouri S&T**
Digital Network Design — Computer Engineering 5410

Jan 2012 – Dec 2013
Undergraduate Research Assistant at the **Missouri S&T EMC Lab**
Advisor: Dr. Sahra Sedigh Sarvestani
Developed software-based instrumentation and analytical models for detection and analysis of the effects of electrostatic discharge on an embedded system. Modified Linux drivers to gather hardware state information. Developed methods for analyzing state information to statistically determine if a sequence of states demonstrates electrostatic discharge.
Work resulted in one journal and one conference publication.

Aug 2013 – Dec 2013
Software Developer at **Lumate**, Rolla
Designed and developed a platform to facilitate data sharing between large heterogeneous databases.

Jan 2010 – Dec 2013 | System Administrator at **Missouri S&T Information Technology**
Developed a FUSE filesystem wrapper to support advanced Linux filesystem operations on a network filesystem. Developed and integrated a system for real-time 3D visualization of large data sets. Developed software to convert a generic dataset to a specific format for the visualization system. Supported research projects with both hardware and software.
Managed all campus Linux machines. Migrated campus Linux distribution from Red Hat to Ubuntu.

Aug 2010 – Dec 2012 | Tutor at **Missouri S&T**
Introduction to C++ — Computer Science 1570 and 1971
Taught programming concepts, answered questions, and provided homework guidance to freshman and sophomore students.

Summer 2013 | Software Development Engineering Intern at **Amazon**, Seattle
Developed an Identity Broker service to vend temporary resource access credentials to clients based on their identity. Deployed service to production and configured monitoring and alarms.

Summer 2012 | Software Development Engineering Intern at **Amazon**, Seattle
Deployed to production a self-service scaling web service that reduced developer time spent on new clients. The service also predicted hardware requirements each quarter based on individual client growth estimates. Developed a MapReduce log parsing system to monitor actual service use and provide real-life scaling data for better accuracy.

Summer 2011 | Software Engineering Intern at **Garmin International**, Kansas City
Modified the map routing algorithm to log better statistical data. Created software to analyze generated routes and determine overall fitness of the routing algorithm. Developed a system to allow other engineers to easily test routing algorithm changes.

Summer 2010 | Software Engineering Intern at **Softek Solutions Inc.**, Kansas City
Developed an Android application that queried a REST web interface. Developed an Android library for future company applications.

Publications

2020 | **N. Jarus**, A. Sabatini, P. Maheshwari, and S. Sedigh Sarvestani.
"Software-Based Monitoring and Analysis of a USB Host Controller Subject to Electrostatic Discharge".
In *Proc. of the Int'l. Symposium on Real-Time and Embedded Systems and Technologies (RTEST)*, pp. 1–7

2019 | **N. Jarus**, S. Sedigh Sarvestani, and A. Hurson.
"Towards Refinement and Generalization of Component State-Based Reliability Models".
In *Resilience Week 2019 Symposium*, pp. 153–159

N. Jarus, S. Sedigh Sarvestani, and A. Hurson.
"Formalizing Cyber-Physical System Model Transformation via Abstract Interpretation".
In *Proc. of the 19th IEEE Int'l. Symposium on High Assurance Systems Engineering (HASE), Hangzhou, China*, pp. 107–114

2018 | **N. Jarus**, S. Sedigh Sarvestani, and A. Hurson.
"Facilitating Model-Based Design and Evaluation for Sustainability".
In *Proc. of the 9th IEEE Int'l. Green and Sustainable Computing Conference (IGSC), Pittsburgh, PA, USA*, pp. 1–2

2017 | **N. Jarus**, M. Woodard, K. Marashi, S. Sedigh Sarvestani, J. Lin, A. Faza, and P. Maheshwari.
"Survey on Modeling and Design of Cyber-Physical Systems".
Submitted to *ACM Transactions on Cyber-Physical Systems* in Feb. 2017.

2016 | **N. Jarus**, S. Sedigh Sarvestani, and A. Hurson.
"Models, Metamodels, and Model Transformation for Cyber-Physical Systems".
In *Proc. of the 7th IEEE Int'l. Green and Sustainable Computing Conference (IGSC), Hangzhou, China*, pp. 1–8.

2015 | **N. Jarus**, A. Sabatini, P. Maheshwari, and S. Sedigh Sarvestani.
"Detection, Analysis, and Prediction of the Effects of Electrostatic Discharge on USB Peripherals".
Submitted to *IEEE Transactions on Electromagnetic Compatibility* in Oct. 2015.

2014 | M. Albasrawi, **N. Jarus**, K. Joshi, and S. Sedigh Sarvestani.
"Analysis of Reliability and Resilience for Smart Grids".
In *Proc. of the 38th IEEE Int'l. Computer Software and Applications Conference (COMPSAC), Vasteras, Sweden*, pp. 529–534.
Selected for inclusion in the 2nd 2015 issue of the *NSA Science of Security Index of Significant Research in Cyber Security.*

2013 | A. Sabatini, **N. Jarus**, P. Maheshwari, and S. Sedigh.
"Software Instrumentation for Failure Analysis of USB Host Controllers".
In *Proc. of the IEEE Int'l. Instrumentation and Measurement Technology Conference (I^{2}MTC), Minneapolis, MN, USA*, pp. 1109–1114.

2012 | **N. Jarus**.
"Old Ideas in a New Age: Descartes' Influence on Modern Animal Farming".
In *Missouri S&T Undergraduate Research Conference.*
First place in Arts and Humanities

Honors and Awards

Jan 2019 – present | US Department of Education:
Graduate Assistantships in Areas of National Need (Gaann) Fellowship (covered all educational expenses and need-based stipend) ($30,000)

Oct 2018 | Institute of Electrical and Electronic Engineers:
9th Int'l. Conference on Green and Sustainable Computing Travel Grant ($1200)

Aug 2015 | NSA Science of Security Initiative:
"Analysis of Reliability and Resilience for Smart Grids" cited as significant research in cyber security

Mar 2015 | Institute of Electrical and Electronic Engineers:
13th Int'l. Conference on Pervasive Computing and Communication Travel Grant ($500)

Jan 2014 – Aug 2015 | US Department of Education:
Graduate Assistantships in Areas of National Need (Gaann) Fellowship (covered all educational expenses and need-based stipend) ($30,000)

Sept 2012 – May 2014 | Missouri S&T:
Office for Undergraduate Research Experience (Oure) Scholarship ($2,000)
Access Missouri Scholarship ($2,200)

Apr 2012 | Missouri S&T:
"Old Ideas in a New Age: Descartes' Influence on Modern Animal Farming" awarded First Place in Arts and Humanities section of the Missouri S&T Undergraduate Research Conference

Sept 2009 – May 2014 | Missouri S&T:
Bright Flight Scholarship ($10,000)

Sept 2009 – May 2013	Missouri S&T: Curators' Scholarship ($14,000) Excellence Scholarship ($4,000) First Robotics Scholarship ($2,000) Miner Alumni Association Silver Scholarship ($5,000)
Sept 2009 – May 2010	Missouri S&T: Dean's Scholarship ($750) Computer Science Dept. Scholarship ($250)

Technical Skills

Languages	C++, Python, Rust, Haskell, C, Ruby, Java, Javascript, Shell Scripting
Software	LaTeX, Pandoc, Git, Docker, Make, Matlab/Octave, Linux
Hardware	KiCad, Soldering, Oscilloscopes/Signal Generators/&c., ESD/EMI sources including Transmission Line Pulsers, Micrometers/Dial Indicators/&c.

Professional Development

2020	Missouri S&T Center for Advancing Faculty Excellence — Student Learning and Assessment in 2020
2018	Missouri S&T Center for Advancing Faculty Excellence — Authentic Assessment Techniques Missouri S&T Student Diversity Initiatives — Safe Space Training
2015	Missouri S&T Mathematics Graduate Teaching Seminar
2014	Presenting Data and Information Workshop by Edward Tufte Missouri S&T Graduate Teaching Assistant Workshop

Professional Service and Affiliations

Memberships	Institute of Electrical and Electronic Engineers IEEE Eta Kappa Nu Honors Society Association for Computing Machinery American Mathematical Society Association for Women in Mathematics
Conferences	13th IEEE Int'l. Conference on Pervasive Computing and Communication (PerCom) 2015 — Volunteer
Peer Review	IEEE Int'l. Conference on Software Quality, Reliability & Security (QRS) 2020 Resilience Week Symposium 2019 Int'l. Symposium on High Assurance Systems Engineering (HASE) 2019 Int'l. Conference on Computing, Networking, and Communications (ICNC) 2018 Int'l. Conference on Computing, Networking, and Communications (ICNC) 2017 39th IEEE Int'l. Computers, Software & Applications Conference (COMPSAC) 2015 IEEE Int'l. Conference on Software Quality, Reliability & Security (QRS) 2015 Int'l. Workshop on Model-Based Design for Cyber-Physical Systems (MB4CP) 2015 (in conjunction with the 45th IEEE Int'l. Conference on Dependable Systems and Networks (DSN)) 16th IEEE Int'l. Conference on Information Reuse and Integration (IRI) 2014

Outreach and Community Engagement

2020	Missouri S&T Council of Graduate Students — ECE Department Representative
2019	SWE — "It's Electrifying" Soldering Workshop
2018	Expanding Your Horizons — Microcontroller Programming Workshop SWE — "It's Electrifying" Soldering Workshop Phelps County Master Gardeners — Earth Day Booth on Native Flora
2017	Expanding Your Horizons — Microcontroller Programming Workshop SWE — "It's Electrifying" Soldering Workshop ACM — Presentation on Linux Basics EcoGirls — Presentation on Cyber-Physical Systems Missouri S&T Biological Sciences — Local Pollinator Conservation Project
2016	Introduction to the CS Department for Prospective Students

Selected Original Projects in addition to graduate research

Tools for Programmers textbook	This lab textbook teaches computer science and engineering students practical computer and software engineering skills that empower them to understand what their software is doing and enable them to effectively use the tools at their disposal when programming. It serves as both an introduction to and a reference for topics including version control, debugging, and memory safety. Students leave this course prepared for industry work, challenging coursework, and personal projects. learnyousome.computer
Assigner software	This tool for instructors automates creating and managing git repositories for homework assignments. With just a few commands, instructors can create a repository complete with necessary files for an assignment, assign that homework to their students, collect submissions, and much more. Repositories are created using GitLab, giving students experience with industry-standard tools. It also integrates with the Canvas LMS, allowing instructors to sync their course roster and upload grades. github.com/redkyn/assigner
Hashpipe software	Hashpipe is an Internet Relay Chat client which is designed to be used with Unix pipes. It sets up the connection to the IRC server and offers both a simple user interface for sending messages to channels and receiving channel and private messages as well as a more advanced user interface providing access to the underlying protocol commands. It is an essential tool for conducting Serious Business with friends as well as automated IRC server management. github.com/linuxmercedes/hashpipe
Shredded Wheat electronics	Serial that is high in fiber. A fiber-optic transceiver designed for transmitting serial UART signals in harsh EMI environments. These devices are low cost, EMI-robust, and capable of transmitting and receiving any binary signal between 0 and 50 megabaud. They have been tested to withstand, with appropriate shielding, a 135 kV/m field while communicating with an unshielded device exposed to the same field. github.com/sendecomp/shredded-wheat