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TAYLOR T. JOHNSON

BRIEF BIOGRAPHY

Dr. Taylor T. Johnson, PE, is A. James and Alice B. Clark Foundation Chancellor Faculty Fellow, Associate Dean for Graduate Education, Director of Graduate Studies (DGS), and Associate Professor in the Department of Computer Science (CS) in the College of Connected Computing (CCC) at Vanderbilt University. He directs the Verification and Validation for Intelligent and Trustworthy Autonomy Laboratory (VeriVITAL), is a Senior Research Scientist in the Institute for Software Integrated Systems (ISIS), holds a secondary appointment as Associate Professor of Electrical and Computer Engineering (ECE) in the Vanderbilt University School of Engineering (VUSE), and is a Faculty Affiliate of the Data Science Institute (DSI). Dr. Johnson was previously an Assistant Professor of Computer Science and Engineering (CSE) at the University of Texas at Arlington (UT-Arlington). Dr. Johnson earned PhD and MSc degrees in Electrical and Computer Engineering (ECE) from the University of Illinois at Urbana-Champaign, where he worked in the Coordinated Science Laboratory with Prof. Sayan Mitra, and earlier earned a BSEE from Rice University. Dr. Johnson worked in industry for Schlumberger at various times between 2005 and 2010 developing novel embedded control systems for downhole tools.

Dr. Johnson's research focus is developing methods to enable safe, secure, and trustworthy artificial intelligence (AI), with applications ranging from autonomous cyber-physical systems (CPS) to biotechnology and security. Dr. Johnson develops formal verification techniques and software tools in his work, focusing most recently on AI and machine learning (ML) systems, such as neural networks and neurosymbolic methods used for tasks such as sensing/perception through planning/control in autonomous CPS, as well as in medical imaging analysis (segmentation) and cybersecurity (malware classification). Dr. Johnson has published over 140 papers on these methods and their applications across domains, such as power and energy systems, aerospace and avionics systems, automotive systems, transportation systems, biotechnology, robotics, and security, four of which were recognized with Best Paper Awards, and two of which were awarded Best Software Artifact or Repeatability Awards. These publications have appeared in conference venues such as AAAI, CAV, ECAI, EMSOFT, FM, FORMATS, FORTE, HSCC, ICCPS, ICDCS, ICDM, ICSE, IJCAI, MEMOCODE, NDSS, NeuS, NFM, SPIN, RTSS, RV, and UAI and journals such as AIAA JAT, ACM TCPS, ACM TECS, IEEE TAC, IEEE TEC, IEEE TIE, IEEE TII, IEEE TNNLS, IEEE TSG, STTT, TCS, SIAM SICON, and DEDS, among others. Dr. Johnson is a 2018 and 2016 recipient of the AFOSR Young Investigator Program (YIP) award, a 2015 recipient of the National Science Foundation (NSF) Computer and Information Science and Engineering (CISE) Research Initiation Initiative (CRII) award, and his research is / has been supported by AFRL, AFOSR, ARO, CEA, DARPA, DOE, NSA, NSF (CISE CCF/FMitF, CISE CCF/SHF, CISE CNS/CPS, ENG ECCS/EPCN), MathWorks, NVIDIA, ONR, Toyota, and USDOT, totaling $\sim \$34.5$ million in sponsored research projects. Dr. Johnson has served on program committees and in different organizational roles for venues such as AAAI, CAV, CVPR, EMSOFT, FORMATS, HSCC, ICCPS, ICCV, IJCAI, NFM, SAIV, SPIN, RTSS, UAI, among many others, is Associate Editor of Software Tools for Technology Transfer (STTT) and Annals of Mathematics and Artificial Intelligence (AMAI), is co-founder of the International Symposium on AI Verification (SAIV), the Verification of Neural Networks Competition (VNN-COMP), and the International Competition on Verifying Continuous and Hybrid Systems (ARCH-COMP) category on Artificial Intelligence and Neural Network Control Systems (AINNCS). Mentees and alumni of Dr. Johnson's research group have received awards such as DoD NDSEG, DOE CSGF, AFOSR YIP, NSF CAREER, NSF CRII, among others, and hold roles in industry (Amazon, Google, Meta, Mathworks, Visa, etc.) and academia (Augusta, Lancaster, Mizzou, U Dayton, UNL, USF, UTPB, etc.). Dr. Johnson is a member of AAAI, AAAS, ACM, AIAA, IEEE, and SAE, and is a registered Professional Engineer (PE) in Tennessee, license number 122259.

EDUCATION

2013 **PhD, Electrical and Computer Engineering**, *University of Illinois at Urbana-Champaign*, Urbana, IL.
- Dissertation: *Uniform Verification of Safety for Parameterized Networks of Hybrid Automata*
- Committee: Sayan Mitra (Adviser), Tarek Abdelzaher, William H. Sanders, Mahesh Viswanathan

2010 **MSc, Electrical and Computer Engineering**, *University of Illinois at Urbana-Champaign*, Urbana, IL.
- Thesis: *Fault-Tolerant Distributed Cyber-Physical Systems: Two Case Studies*
- Adviser: Sayan Mitra

2008 **BSEE, Electrical and Computer Engineering**, *Rice University*, Houston, TX.
- Senior Project: *Sensorless Synchronous Motor Control in Downhole Tools* (with Frank Havlak and Elica Skorcheva at Rice, and Fadi Abousleiman, Farès Hantous, and Slim Besbes at Supélec, Gif-sur-Yvette, France)
- Advisers: Albert Hoefel and Peter Swinburne (Schlumberger); J.D. Wise and Fathi H. Ghorbel (Rice)

ACADEMIC AND RESEARCH POSITIONS

8/2021 – Present **Associate Professor**, *Vanderbilt University*, Computer Science, Nashville, TN.
- Associate Dean for Graduate Education (2025-on)
- Associate Chair of Computer Science (2024-2025)
- Director of Graduate Studies (DGS) in Computer Science (2023-on)
- Director of Master of Engineering (MEng) Program in Cyber-Physical Systems (2021-on)
- A. James and Alice B. Clark Foundation Chancellor Faculty Fellow (2022-on)
- Senior Research Scientist in the Institute for Software Integrated Systems (ISIS)
- Director of VeriVITAL: The Verification and Validation for Intelligent and Trustworthy Autonomy Laboratory

8/2016 – 8/2021 **Assistant Professor**, *Vanderbilt University*, Electrical Eng. and Computer Science, Nashville, TN.
- Appointments in Computer Science (CS), Computer Engineering (CmpE), and Electrical Engineering (EE)

9/2013 – 8/2016 **Assistant Professor**, *University of Texas at Arlington*, Computer Science and Eng., Arlington, TX.
- Courtesy Appointment: Electrical Engineering

5/2015-5/2016 **Adjunct Faculty**, *University of Connecticut*, UTC Institute for Advanced Systems Engineering.
- Supervised capstone projects for two teams, SE 5309: Capstone Projects for Embedded Systems.
- Taught an all online summer 2015 graduate course for UTC engineers, SE 5302: Formal Methods.

Summers 2014 and 2015 **Visiting Research Faculty**, *AFOSR Summer Faculty Fellowship Program (SFFP) and AFRL Visiting Faculty Research Program (VFRP), Information Directorate, Air Force Research Laboratory*, Rome, NY.
- Research with Steven Drager and Stanley Bak to develop formal verification methods for hybrid systems and apply them to Air Force CPS, resulting in papers [C9,C10,C11,C13,J4] and software tools [S3,S5].

8/2008 – 8/2013 **Research and Teaching Assistant**, *University of Illinois at Urbana-Champaign*, Electrical and Computer Engineering, Urbana, IL.

Summer 2011 **Visiting Graduate Researcher**, *Air Force Summer Faculty Fellowship Program, Space Vehicles Directorate, Air Force Research Laboratory*, Albuquerque, NM.
- Research with R. Scott Erwin and Prof. Sayan Mitra to develop and apply hybrid systems abstraction and verification techniques to Air Force space systems problems, particularly verification of conjunction (collision) avoidance for satellite rendezvous maneuvers, resulting in paper [C5].

INDUSTRY AND STARTUP POSITIONS

December 2017 – Present **Founder and Chief Technology Officer (CTO)**, *Verivital, LLC*, Nashville, TN.
- Research, development, commercialization, and consulting activities on verification and validation results arising from our research group, particularly formal verification for autonomous cyber-physical systems.
- Founded as a Tennessee limited liability company (LLC).

May 2017 – Present **Founder and President**, *CelerFama, Inc.*, Nashville, TN.
- Technology and business development for automating data entry for electronic health records (EHRs) and electronic medical records (EMRs) using natural language processing (NLP), based on technology transfer of patent application [P2].
- Founded as a Tennessee class-C corporation.

Summer 2010 **Intern in Electrical Engineering**, *Schlumberger Technology Corporation*, Sugar Land, TX.
- Designed, implemented, and analyzed a real-time state estimator for maximum available power produced by a turbo-alternator, used for stalling protection of a turbine in a power control loop outside already cascaded velocity and torque control loops for permanent magnet synchronous motor (PMSM) control of a pump. This work resulted in a conference publication [LC1]—that won a best paper award—and patent [P1].

Summer 2008 **Intern in Electrical Engineering**, *Etudes et Productions Schlumberger*, Clamart, France.
- Analyzed and modeled analog and mixed-signal electronics designs for correctness by hand and using computer tools like PSpice with Monte Carlo simulation.

Summer 2007 **Intern in Computer Engineering**, *Schlumberger Technology Corporation*, Sugar Land, TX.
- Implemented new features on FPGAs in VHDL used in Space Vector Pulse Width Modulation (SV-PWM) control of permanent magnet synchronous motors (PMSMs).

Summer 2006 **Intern in Computer Engineering**, *Schlumberger Technology Corporation*, Sugar Land, TX.
- Designed, implemented, tested, and documented a networked boot loader and application framework in 8051 assembly and C for a microcontroller, utilizing CAN for networking via an SPI interface to a CAN transceiver.

Summer 2005 **Intern in Computer Science**, *Schlumberger Technology Corporation*, Sugar Land, TX.
- Designed and implemented an intranet web application in PHP and Javascript (AJAX) with a SQL database backend system to gather, store, and report static analysis metrics on embedded systems source code.

AWARDS AND HONORS

5/2025 **Best Artifact Award**, 16th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS 2025).
Award corresponding to artifact and repeatability evaluation for paper [C53].

11/2024 **Best Paper Award**, 6th International Workshop on Formal Methods for Autonomous Systems (FMAS 2024).
Award corresponding to paper [W31].

10/2023 **Outstanding Reviewer Award**, ACM SIGBED International Conference on Embedded Software (EMSOFT 2023).
Award for outstanding service in the EMSOFT reviewing process.

7/2023 **Distinguished Paper Award**, 9th IEEE International Conference on Space Mission Challenges for Information Technology (SMC-IT 2023).
Award corresponding to paper [C39].

9/2022 **Best Artifact Award**, 20th International Conference on Formal Modeling and Analysis of Timed Systems (FORMATS 2022).
Award corresponding to artifact and repeatability evaluation for paper [C34].

12/2021 **Trusted AI at Scale Challenge Series Awardee**, Air Force Research Laboratory (AFRL)/Air Force Office of Scientific Research (AFOSR)/Griffiss Institute Innovare Advancement Center.
Received grant award [CG25].

8/2018 **Junior Faculty Teaching Fellow for 2018-2019**.
Vanderbilt University Center for Teaching (CFT)

10/2017 **2018 Young Investigator Research Program (YIP) Award**, Air Force Office of Scientific Research (AFOSR).
Received grant award [CG17].

8/2017 **Southeastern Conference (SEC) Faculty Travel Program Award for 2017-2018**.
Travel support to visit Dr. Dylan Shell at Texas A&M University to collaborate on distributed and swarm robotics.

4/2016 **Best Software Repeatability Evaluation Award for [C14]**, 19th ACM International Conference on Hybrid Systems: Computation and Control (HSCC), Cyber-Physical Systems Week (CPSWeek) 2016, Austria, Vienna.

2/2016 **2016 Young Investigator Research Program (YIP) Award**, Air Force Office of Scientific Research (AFOSR).
Received grant award [CG9].

6/2015 **Computer and Information Science and Engineering (CISE) Research Initiation Initiative (CRII) Award**, National Science Foundation (NSF), Computer and Information Science and Engineering (CISE).
Received grant award [CG11].

Summer 2015 **Fellow**, *Air Force Research Laboratory, Information Directorate*, Air Force Office of Scientific Research (AFOSR), Summer Faculty Fellowship Program (SFFP), Rome, NY.
Received grant award [CG3].

3/2013 **Yi-Min Wang and Pi-Yu Chung Endowed Research Award**, *Electrical and Computer Engineering, University of Illinois at Urbana-Champaign*, Urbana, IL.

3/2013 **ECE Rambus Fellowship in Electrical and Computer Engineering**, *Electrical and Computer Engineering, University of Illinois at Urbana-Champaign*, Urbana, IL.

6/2012 **Best Overall Paper Award of Three Collocated Conferences for [C4]**, *IFIP International Conference on Formal Techniques for Distributed Systems: Joint International Conference of 14th Formal Methods for Open Object-Based Distributed Systems and 32nd Formal Techniques for Networked and Distributed Systems (FORTE/FMOODS 2012), of the 7th International Federated Conference on Distributed Computing Techniques (DisCoTec 2012)*, KTH, Stockholm, Sweden.

2012 – 2013 **Computer Engineering Fellowship Sponsored by Intel Corporation**, *Electrical and Computer Engineering, University of Illinois at Urbana-Champaign*, Urbana, IL.

2/2011 **Best Paper Award for [LC1]**, *2nd IEEE Power and Energy Conference at Illinois (PECI)*, Urbana, IL.

12/2009 **Most Interesting Cyber-Physical Systems Research Problem Award for [E1]**, *30th IEEE Real-Time Systems Symposium (RTSS)*, Washington, DC.

2006 **First Place Team, AMD Digital Logic Design Competition**, *Rice University*, Houston, TX.
Teammates: Brent Stephens and Barron Stone

2004 – 2008 **Coca-Cola Scholars Scholarship**.

2004 – 2008 **Robert C. Byrd Honors Scholarship**.

2004 – 2008 **Bluebonnet Electric Cooperative Scholarship of Excellence**.

2004 – 2008 **Glaser Family Charitable Foundation Scholarship**.

2004 – 2008 **USA Funds Access to Education Scholarship**.

2004 **Texas Society of Professional Engineers Scholarship**, *Brazos County Chapter, TX*.

2004 **Second Place in Computer Science**, *Texas State Science and Engineering Fair*, Arlington, TX.

2003 **Finalist in Computer Science**, *Intel International Science and Engineering Fair*, Cleveland, OH.

STUDENT AWARDS AND HONORS

1/2025 **SIU Prize, Computer Science Season 1 Gold Prize for "Verification of Learning-Enabled Cyber-Physical Systems," Saigon International University**, *Hoang-Dung Tran (DA4), January 2025*.

5/2024 **DOE CSGF Fellowship Award for Anne Tumlin[†], Department of Energy (DOE) Computational Science Graduate Fellowship (CSGF) Program**, *Anne Tumlin (DS5), May 2024*.

5/2022 **C. F. Chen Best Paper Award Honorable Mention for Tianshu Bao[†] for Paper [C32], Vanderbilt Computer Science**, *May 2022*.

5/2021 **IEEE Outstanding Ph.D. Dissertation Award for "Verification of Learning-Enabled Cyber-Physical Systems," IEEE Technical Committee on Cyber-Physical Systems (TCCPS)**, *Hoang-Dung Tran (DA4), May 2021*.

4/2021 **NDSEG Fellowship Award for "Safe and Robust Reinforcement Learning to Quantify Risk in Intelligent Systems," National Defense Science and Engineering Graduate (NDSEG) Fellowship Program**, *Preston Robinette (DS2), April 2021*.

4/2019 **NDSEG Fellowship Award for "Safe and Robust Reinforcement Learning for Autonomous Distributed Cyber-Physical Systems," National Defense Science and Engineering Graduate (NDSEG) Fellowship Program**, *Nathaniel Hamilton (DA6), April 2019*.

12/2014 **3rd Place in US/India Chamber of Commerce Spirit of Innovation Competition**, *Amol Vengurlekar (MA1), Ruoshi Zhang (MA2), Luan Viet Nguyen (DA2), and Eric Nelson for project related to paper [W2], which came with a $1000 award*.

4/2014 **NSF Graduate Research Fellowship Program (GRFP) Honorable Mention**, *Shamina Shahrin Hossain (MP1), April 2014*.

TEACHING EXPERIENCE

Vanderbilt University

Spring 2025 **Automated Verification (CS6315)**, *Instructor*.
32 students

Fall 2024 **Introduction to Engineering, Computer Science Module (ES140x)**, *Instructor*.
75 students total: 25 first-year students each in 3 one credit hour modules taught over the semester

Spring 2024 **Automated Verification (CS6315)**, *Instructor*.
29 students

Fall 2023 **Introduction to Engineering, Computer Science Module (ES140x)**, *Instructor*.
75 students total: 25 first-year students each in 3 one credit hour modules taught over the semester

Spring 2023 **Automated Verification (CS6315)**, *Instructor*.
15 students

Spring 2023 **Automated Verification (CS6315)**, *Instructor*.
17 students, online-only course as part of online MSc/PhD programs

Fall 2022 **Introduction to Engineering, Computer Science Module (ES140x)**, *Instructor*.
75 students total: 25 first-year students each in 3 one credit hour modules taught over the semester

Spring 2022 **Automated Verification (CS6315)**, *Instructor*.
12 students

Spring 2022 **Automated Verification (CS6315)**, *Instructor*.
22 students, online-only course as part of online MSc/PhD programs

Fall 2021 **Introduction to Engineering, Computer Science Module (ES140x)**, *Instructor*.
75 students total: 25 first-year students each in 3 one credit hour modules taught over the semester

Fall 2021 **Computer Networks (CS5283)**, *Instructor*.
26 students, online-only course as part of online MSc program

Spring 2021 **Automated Verification (CS6315)**, *Instructor*.
10 students

Fall 2020 **Introduction to Engineering, Computer Science Module (ES140x)**, *Instructor*.
80 students total: 25-30 first-year students each in 3 one credit hour modules taught over the semester

Summer 2020 **Computer Networks (CS5283)**, *Instructor*, Developed asynchronous content for this graduate-level course on computer networks as a part of Vanderbilt's new online MSc in computer science.
7 students, online-only course

Spring 2020 **Machine Learning Verification (CS8395)**, *Instructor*, Developed research seminar course on formal methods, verification, and software engineering for machine learning systems, building on our group's and others' recent results in this growing area.
10 students

Fall 2019 **Digital Systems (EECE2123)**, *Instructor*, Developed curriculum, assignments, lab assignments, and taught the first iteration of this new core undergraduate EECS course that replaced existing Computer Organization (CS2231) and Digital Logic (EECE2116) courses and labs.
33 students in EECE2123-02 section, and 115 students in 9 laboratory sections of EECE2123L

Fall 2019 **Introduction to Engineering, Computer Science Module (ES140x)**, *Instructor*.
80 students total: 25-30 first-year students each in 3 one credit hour modules taught over the semester

Spring 2019 **Automated Verification (CS6315)**, *Instructor*.
30 students, 25 graduate, 5 undergraduate

Fall 2018 **Introduction to Engineering, Computer Science Module (ES140x)**, *Instructor*, Redesigned curriculum to utilize Python programs to control mobile aerial robots (DJI Tello quadcopter drones), emphasizing cyber-physical and computational thinking.
80 students total: 25-30 first-year students each in 3 one credit hour modules taught over the semester

Spring 2018 **Computer Networks (CS4283/CS5283)**, *Instructor*.
35 students (25 undergraduate, 10 graduate)

Fall 2017 **Discrete Event Systems (CS6375)**, *Instructor*.
9 students

Fall 2017 **Introduction to Engineering, Computer Science Module (ES140x)**, *Instructor*.
75 students total: 25 first-year students each in 3 one credit hour modules taught over the semester

Spring 2017 **Automated Verification (CS6315)**, *Instructor*.
9 students

Fall 2016 **Computer Organization (CS2231)**, *Instructor*, This course's student results were used in the 2017 Accreditation Board for Engineering and Technology (ABET) Accreditation for the Computer Science (CS) and Computer Engineering (CmpE) program evaluations.
35 students

Courses for Professional Organizations

Fall 2020 **SAE C1876: Formal Methods for Functional Safety and Security in Cyber-Physical Systems**, *Instructor*, SAE International, 3-day course on formal methods, verification, and validation (V&V) in the automotive domain, arranged with feedback from DARPA (Raymond Richards), NSF (Jeremy Epstein), SAE, and the National Motor Freight Traffic Association (NMFTA) as a foundational background course for helping transition the seL4 microkernel into usage in automotive systems.
`https://www.sae.org/learn/content/c1876/`

University of Connecticut

Spring 2016 **Capstone Projects for Embedded Systems (SE5309), United Technologies Corporation (UTC), Institute for Advanced Systems Engineering (IASE)**, *Adjunct Faculty; Capstone Project Mentor*, Supervised two student teams for capstone embedded system design projects using formal methods concepts and tools as a part of their Embedded Systems Graduate Certificates.
6 students, online-only course

Summer 2015 **Formal Methods (SE5302), United Technologies Corporation (UTC), Institute for Advanced Systems Engineering (IASE)**, *Adjunct Faculty; Instructor of Record (Main Instructor)*, Developed and taught this all online course on formal methods to graduate-level engineers across three continents (North America, Europe, Asia) in industry from UTC through the UTC IASE. Formal methods tools used include nuXmv, NuSMV, Simulink Design Verifier, Simulink Verification and Validation, Frama-C, Daikon, and PVS. Guest lecturers provided by Prof. Sayan Mitra of Illinois, Dr. Eelco Scholte of UTC, and Jay Abraham of the MathWorks.
26 students, online-only course

University of Texas at Arlington

Fall 2015 **Automated Software Engineering (CSE6323)**, *Instructor*.
9 students; developed course

Summer 2015 **Introduction to Engineering and Engineering Mathematics (ENGR1.0x)**, *Guest Lecturer*, Created modules on computer science mathematics, particularly discrete math and graph theory.
Massive Open Online Course (MOOC) through edX via UTArlingtonX for high school students.

Spring 2015 **Mobile Systems Engineering (CSE4340 / CSE5349)**, *Instructor*.
32 students (18 undergraduates in 4340 and 14 graduates in 5349); redeveloped course

Fall 2014 **Computer Organization and Assembly Language Programming (CSE2312)**, *Instructor*.
49 students; also provided all course materials for another fall 2014 section, which has been reused in five subsequent sections in spring 2015, summer 2015, and fall 2015.

Spring 2014 **Special Topics in Advanced Systems and Architecture: Cyber-Physical Systems (CSE6359)**, *Instructor*.
9 students; developed course

Fall 2013 **Computer Organization and Assembly Language Programming (CSE2312)**, *Instructor*, Redeveloped course and also provided course materials for spring 2014 and summer 2014 sections.
47 students

University of Illinois at Urbana-Champaign

Spring 2010 **Introduction to Computing Systems (ECE190)**, *Graduate Teaching Assistant*.

Spring 2009 **Introduction to Computing Systems (ECE190)**, *Graduate Teaching Assistant*.

Fall 2008 **Introduction to Electrical and Computer Engineering (ECE110)**, *Graduate Teaching Assistant*.

Rice University

Spring 2008 **Applied Algorithms and Data Structures (COMP314)**, *Undergraduate Teaching Assistant*.

Spring 2008 **Intermediate Programming (COMP212)**, *Undergraduate Teaching Assistant*.

Fall 2007 **Digital Logic Design (ELEC326)**, *Undergraduate Lab Assistant*.

Spring 2007 **Intermediate Programming (COMP212)**, *Undergraduate Teaching Assistant*.

Spring 2007 **Microcontroller and Embedded Systems Laboratory (ELEC226)**, *Undergraduate Lab Assistant*.

Spring 2006 **Intermediate Programming (COMP212)**, *Undergraduate Teaching Assistant*.

PUBLICATIONS

Co-authors with a trailing † indicate thesis students formally advised or co-advised, with a trailing $^{\circ}$ are postdocs formally mentored, and co-authors with a trailing * indicate students informally mentored (all at the time of publication). Papers subject to double-blind reviews (both authors and reviewers are anonymous) are indicated by DBR. Papers that have corresponding software artifacts and have passed a repeatability/artifact evaluation are indicated by RAE.

Citation metrics are from Google Scholar, with a total of 6081 citations, h-index of 42, and $i10$-index of 99 as of October 21, 2025.

REFEREED JOURNAL ARTICLES

[J31] Joel Rosenfeld°, Ben Russo, Rushi Kamalapurkar, ***Taylor T. Johnson***, "The Occupation Kernel Method for Nonlinear System Identification," *SIAM Journal on Control and Optimization*, Vol: 62 (3), 2024. [pdf]
DOI: 10.1137/19M127029X
Impact Factor: 2.2.

[J30] Luan Viet Nguyen, Hoang-Dung Tran†, ***Taylor T. Johnson***, Vijay Gupta, "Decentralized Safe Control for Distributed Cyber-Physical Systems using Real-time Reachability Analysis," *IEEE Transactions on Control of Network Systems (TCNS)*, January 2023. [pdf]
DOI: 10.1109/TCNS.2023.3239562
Impact Factor: 4.0.

[J29] Christopher Brix, Mark Niklas Muller, Stanley Bak, ***Taylor T. Johnson***, Changliu Liu, "First Three Years of the International Verification of Neural Networks Competition (VNN-COMP)," *International Journal on Software Tools for Technology Transfer (STTT)*, January 2023. [pdf]
Impact Factor: 1.1.

[J28] Diego Manzanas Lopez†, ***Taylor T. Johnson***, Stanley Bak, Hoang-Dung Tran, Kerianne L Hobbs, "Evaluation of Neural Network Verification Methods for Air-to-Air Collision Avoidance," *AIAA Journal of Air Transportation (JAT)*, October 2023. [pdf]
DOI: 10.2514/1.D0255
Impact Factor: 1.2.

[J27] Hoang-Dung Tran, Luan Viet Nguyen, Patrick Musau†, Weiming Xiang, ***Taylor T. Johnson***, "Real-Time Verification for Distributed Cyber-Physical Systems," *Leibniz Transactions on Embedded Systems (LITES)*, February 2022. [pdf]
DOI: 10.4230/LITES.8.2.7. Extension of [C23] invited for special issue on Distributed Hybrid Systems.

[J26] Hoang-Dung Tran†, Weiming Xiang, ***Taylor T. Johnson***, "Verification Approaches for Learning-Enabled Autonomous Cyber-Physical Systems," *IEEE Design and Test (D&T)*, February 2022. [pdf]
DOI: 10.1109/MDAT.2020.3015712
Impact Factor: 2.409.

[J25] Joel A. Rosenfeld, Rushikesh Kamalapurkar, L. Forest Gruss, ***Taylor T. Johnson***, "Dynamic Mode Decomposition for Continuous Time Systems with the Liouville Operator," *Journal of Nonlinear Science*, October 2021. [pdf]
Impact Factor: 3.621.

[J24] Hoang-Dung Tran†, Diego Manzanas Lopez†, Patrick Musau†, Xiaodong Yang†, Luan Nguyen, Weiming Xiang, ***Taylor T. Johnson***, "Verification of piecewise deep neural networks: a star set approach with zonotope pre-filter," *Formal Aspects of Computing*, Vol: 33, p 519-545, August 2021. [pdf]
DOI: 10.1007/s00165-021-00553-4
Impact Factor: 1.4. *Special Issue of Formal Aspects of Computing on Formal Methods: Foundations and Practical Applications*, October 2020. Extension of [C25] invited for special issue.

[J23] Xiaodong Yang†, Omar Beg, Matthew Kenigsberg, ***Taylor T. Johnson***, "A Framework for Identification and Validation of Affine Hybrid Automata from Input-Output Traces," *ACM Transactions on Cyber-Physical Systems (TCPS)*, August 2021. [pdf]
Impact Factor: 2.6.

[J22] Omar Ali Beg, Luan Viet Nguyen, ***Taylor T. Johnson***, Ali Davoudi, "Cyber-Physical Anomaly Detection in Microgrids Using Time-Frequency Logic Formalism," *IEEE Access*, Vol: 9, p 20012-20021, January 2021. [pdf]
DOI: 10.1109/ACCESS.2021.3055229
Impact Factor: 3.745.

[J21] Weiming Xiang, Xiaodong Yang†, Hoang-Dung Tran†, ***Taylor T. Johnson***, "Reachable Set Estimation for Neural Network Control Systems: A Simulation-Guided Approach," *IEEE Transactions on Neural Networks and Learning Systems (TNNLS)*, May 2020. [pdf]
DOI: 10.1109/TNNLS.2020.2991090
Impact Factor: 8.793.

[J20] Hoang-Dung Tran†, Feiyang Cei, Diego Manzanas Lopez†, ***Taylor T. Johnson***, Xenofon Koutsoukos, "Safety Verification of Cyber-Physical Systems with Reinforcement Learning Control," *ACM Transactions on Embedded Computing Systems (TECS), Special Issue from EMSOFT'19*, Vol: 18, No: 5s, p 105:1-105:22, October 2019. [pdf]
DOI: 10.1145/3358230

Acceptance Rate: 25.0 percent (25 of 100)
Double-Blind Review (**DBR**)
Impact Factor: 2.609.

[J19] Ziaur Rahman, Stephen P. Mattingly, Rahul Kawadgave, Dian Nostikasari, Nicole Roeglin, Colleen Casey, ***Taylor T. Johnson***, "Using crowd sourcing to locate and characterize conflicts for vulnerable modes," *Accident Analysis and Prevention*, Vol: 128, p 23-39, July 2019. [pdf]
DOI: 10.1016/j.aap.2019.03.014
Impact Factor: 3.655.

[J18] Andrew Sogokon°, Paul B. Jackson, ***Taylor T. Johnson***, "Verifying Safety and Persistence in Hybrid Systems Using Flowpipes and Continuous Invariants," *Journal of Automated Reasoning (JAR), Springer*, Vol: 63, No: 4, p 1005-1029, December 2019. [pdf]
DOI: 10.1007/s10817-018-9497-x
Impact Factor: 1.445. Extension of [C19].

[J17] Stanley Bak, Omar Beg†, Sergiy Bogomolov, ***Taylor T. Johnson***, Luan Viet Nguyen†, Christian Schilling, "Hybrid automata: from verification to implementation," *International Journal on Software Tools for Technology Transfer (STTT), Springer*, Vol: 21 (1), p 87-104, February 2019. [pdf]
DOI: 10.1007/s10009-017-0458-1
Impact Factor: 1.079. Software tool: `http://swt.informatik.uni-freiburg.de/tool/spaceex/ha2slsf`

[J16] Omar Beg†, Luan Viet Nguyen†, ***Taylor T. Johnson***, Ali Davoudi, "Signal Temporal Logic-based Attack Detection in DC Microgrids," *IEEE Transactions on Smart Grid (TSG)*, Vol: 10, No: 4, p 3585-3595, July 2018. [pdf]
DOI: 10.1109/TSG.2018.2832544
Impact Factor: 8.267.

[J15] Weiming Xiang°, Hoang-Dung Tran†, ***Taylor T. Johnson***, "Nonconservative Lifted Convex Conditions for Stability of Discrete-Time Switched Systems under Minimum Dwell-Time Constraint," *IEEE Transactions on Automatic Control (TAC)*, Vol: 64, No: 8, p 3407-3414, August 2018. [pdf]
DOI: 10.1109/TAC.2018.2879585
Impact Factor: 5.625.

[J14] Weiming Xiang°, Hoang-Dung Tran†, ***Taylor T. Johnson***, "Robust exponential stability and disturbance attenuation for discrete-time switched systems under arbitrary switching," *IEEE Transactions on Automatic Control (TAC)*, Vol: 63, No: 5, p 1450-1456, May 2018. [pdf]
DOI: 10.1109/TAC.2017.2748918
Impact Factor: 5.625.

[J13] Weiming Xiang°, Hoang-Dung Tran†, ***Taylor T. Johnson***, "Output reachable set estimation and verification for multilayer neural networks," *IEEE Transactions on Neural Networks and Learning Systems (TNNLS)*, Vol: 29, No: 11, p 5777-5783, March 2018. [pdf]
DOI: 10.1109/TNNLS.2018.2808470
Impact Factor: 8.793.

[J12] Luan Viet Nguyen†, Khaza Anuaral Hoque°, ***Taylor T. Johnson***, Stanley Bak, Steven Drager, "Cyber-Physical Specification Mismatches," *ACM Transactions on Cyber-Physical Systems (TCPS)*, Vol: 2, No: 4, p 23:1-23:26, July 2018. [pdf]
DOI: 10.1145/3170500
Impact Factor: 2.6.

[J11] Andrew Sogokon°, Khalil Ghorbal, ***Taylor T. Johnson***, "Operational Models for Piecewise-Smooth Systems," *ACM Transactions on Embedded Computing Systems (TECS), Special Issue from EMSOFT'17*, Vol: 16, No: 5s, p 185:1-185:19, October 2017. [pdf]
DOI: 10.1145/3126506
Acceptance Rate: 25.6 percent (74 of 289)
Impact Factor: 2.609.

[J10] Omar Beg†, Houssam Abbas, ***Taylor T. Johnson***, Ali Davoudi, "Model Validation of PWM DC-DC Converters," *IEEE Transactions on Industrial Electronics (TIE)*, Vol: 64, No: 9, p 7049-7059, September 2017. [pdf]
DOI: 10.1109/TIE.2017.2688961
Impact Factor: 7.515.

[J9] Weiming Xiang°, Hoang-Dung Tran†, ***Taylor T. Johnson***, "Output Reachable Set Estimation for Switched Linear Systems and Its Application in Safety Verification," *IEEE Transactions on Automatic Control (TAC)*, Vol: 62, No: 10, p 5380-5387, October 2017. [pdf]

DOI: 10.1109/TAC.2017.2692100
Impact Factor: 5.625.

[J8] Weiming Xiang°, ***Taylor T. Johnson***, "Event-triggered control for continuous-time switched linear systems," *IET Control Theory and Applications (CTA)*, Vol: 11, No: 11, p 1694-1703, July 2017. [pdf]
DOI: 10.1049/iet-cta.2016.0672
Impact Factor: 3.526.

[J7] Hoang-Dung Tran†, Luan Viet Nguyen†, Weiming Xiang°, ***Taylor T. Johnson***, "Order-reduction abstractions for safety verification of high-dimensional linear systems," *Discrete Event Dynamic Systems (DEDS), Springer*, Vol: 27, No: 2, p 443-461, April 2017. [pdf]
DOI: 10.1007/s10626-017-0244-y
Impact Factor: 1.088.

[J6] Omar Beg†, ***Taylor T. Johnson***, Ali Davoudi, "Detection of false-data injection attacks in cyber-physical DC microgrids," *IEEE Transactions on Industrial Informatics (TII)*, Vol: 13, No: 5, p 2693-2703, October 2017. [pdf]
DOI: 10.1109/TII.2017.2656905
Impact Factor: 9.112.

[J5] Sergiy Bogomolov, Alexandre Donzé, Goran Frehse, Radu Grosu, ***Taylor T. Johnson***, Hamed Ladan, Andreas Podelski, Martin Wehrle, "Guided Search for Hybrid Systems Based on Coarse-Grained Space Abstractions," *International Journal on Software Tools for Technology Transfer (STTT), Springer*, Vol: 18, No: 4, p 449-467, August 2016. [pdf]
DOI: 10.1007/s10009-015-0393-y
Impact Factor: 1.079. Software tool: `http://www2.informatik.uni-freiburg.de/~bogom/sttt2015/`

[J4] ***Taylor T. Johnson***, Stanley Bak, Marco Caccamo, Lui Sha, "Real-time reachability for verified simplex design," *ACM Transactions on Embedded Computing Systems (TECS)*, Vol: 15, No: 2, p 26:1-26:27, February 2016. [pdf]
DOI: 10.1145/2723871
Impact Factor: 2.609. Extension of [C9]. Software Tool [S4]: `https://github.com/verivital/rtreach`

[J3] ***Taylor T. Johnson***, Sayan Mitra, "Safe and stabilizing distributed multi-path cellular flows," *Theoretical Computer Science (TCS), Elsevier*, Vol: 579, p 9-32, May 2015. [pdf]
DOI: 10.1016/j.tcs.2015.01.023
Impact Factor: 0.895. Extension of [C1]. Software Tool: `https://github.com/verivital/cell_flows`

[J2] Luan Viet Nguyen†, Hoang-Dung Tran†, ***Taylor T. Johnson***, "Virtual Prototyping for Distributed Control of a Fault-Tolerant Modular Multilevel Inverter for Photovoltaics," *IEEE Transactions on Energy Conversion (TEC)*, Vol: 29, No: 4, p 841-850, December 2014. [pdf]
DOI: 10.1109/TEC.2014.2362716
Impact Factor: 4.501.

[J1] ***Taylor T. Johnson***, Sayan Mitra, "Safe Flocking in Spite of Actuator Faults using Directional Failure Detectors," *Journal of Nonlinear Systems and Applications, Watam Press*, Vol: 2, No: 1-2, p 73-95, 2011. [pdf]. Extension of [C2]

REFEREED HIGHLY-SELECTIVE CONFERENCE PROCEEDINGS PAPERS

Acceptance based on peer review of full papers.

[C58] Preston Robinette†, Dung T. (Judy) Nguyen†, Samuel Sasaki†, ***Taylor T. Johnson***, "Trigger-Based Fragile Model Watermarking for Image Transformation Networks," *30th European Symposium on Research in Computer Security (ESORICS'25)*, September 2025. [pdf]
Acceptance Rate: 16.0 percent (86 of 535).

[C57] Dung T. (Judy) Nguyen†, ***Taylor T. Johnson***, Kevin Leach, "PARDON: Privacy-Aware and Robust Federated Domain Generalization," *45th IEEE International Conference on Distributed Computing Systems (ICDCS'25)*, July 2025. [pdf]
Acceptance Rate: 19.6 percent (104 of 529)
Double-Blind Review (**DBR**).

[C56] Nicholas Potteiger, Diego Manzanas Lopez°, ***Taylor T. Johnson***, Xenofon Koutsoukos, "Real-Time Reachability for Neurosymbolic Reinforcement Learning based Safe Autonomous Navigation," *2nd International Conference on Neuro-symbolic Systems (NeuS'25)*, May 2025. [pdf]
Acceptance Rate: 43.4 percent (40 of 92).

[C55] Samuel Sasaki†, Diego Manzanas Lopez°, ***Taylor T. Johnson***, "Neurosymbolic Finite and Pushdown Automata: Improved Multimodal Reasoning versus Vision Language Models (VLMs)," *2nd International Conference on Neuro-symbolic Systems (NeuS'25)*, May 2025. [pdf]
Acceptance Rate: 43.4 percent (40 of 92).

[C54] Serena Serbinowska†, Diego Manzanas Lopez°, Dung T. (Judy) Nguyen†, ***Taylor T. Johnson***, "Neuro-Symbolic Behavior Trees and Their Verification," *2nd International Conference on Neuro-symbolic Systems (NeuS'25)*, May 2025. [pdf]
Acceptance Rate: 43.4 percent (40 of 92).

[C53] Tianshu Bao°, Xiaoou Liu, Meiyi Ma, ***Taylor T. Johnson***, Hua Wei, "Uncertainty Quantification for Physics-Informed Traffic Graph Networks," *16th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS'25)*, May 2025. [pdf]
DOI: 10.1145/3716550.3722023
Acceptance Rate: 28.4 percent (29 of 102)
Double-Blind Review (**DBR**). **Best Artifact/Repeatability Evaluation Award**

[C52] Samuel Sasaki†, Preston Robinette†, Diego Manzanas Lopez°, ***Taylor T. Johnson***, "Robustness Verification of Video Classification Neural Networks," *13th International Conference on Formal Methods in Software Engineering (FormaliSE'25)*, May 2025. [pdf]
DOI: 10.1109/FormaliSE66629.2025.00009
Acceptance Rate: 31.2 percent (15 of 48)
Double-Blind Review (**DBR**).

[C51] Lucas Cordeiro, Matthew Daggitt, Julien Girard-Satabin, Omri Isac, ***Taylor T. Johnson***, Guy Katz, Ekaterina Komendantskaya, Augustin Lemesle, Edoardo Manino, Artjoms Sinkarovs, Haoze Wu, "Neural Network Verification is a Programming Language Challenge (Fresh Perspectives)," *34th European Symposium on Programming (ESOP'25)*, May 2025. [pdf]
DOI: 10.1007/978-3-031-91118-7_9
Acceptance Rate: 32.2 percent (30 of 93)
Double-Blind Review (**DBR**).

[C50] Dung T. (Judy) Nguyen†, Ngoc N. Tran, ***Taylor T. Johnson***, Kevin Leach, "PBP: Post-training Backdoor Purification for Malware Classifiers," *32nd Network and Distributed System Security Symposium (NDSS'25)*, February 2025. [pdf]
DOI: 10.14722/ndss.2025.240603
Acceptance Rate: 16.0 percent (211 of 1311)
Double-Blind Review (**DBR**).

[C49] Anne Tumlin†, Diego Manzanas Lopez°, Preston Robinette†, Yuying Zhao, Tyler Derr, ***Taylor T. Johnson***, "FairNNV: The Neural Network Verification Tool For Certifying Fairness," *5th ACM International Conference on AI in Finance (ICAIF'24)*, November 2024. [pdf]
DOI: 10.1145/3677052.3698677
Acceptance Rate: 39.2 percent (99 of 252)
Double-Blind Review (**DBR**). Selected for oral presentation (about half of all accepted papers).

[C48] Preston Robinette†, Daniel Moyer, ***Taylor T. Johnson***, "Sanitizing Hidden Information with Diffusion Models ," *27th European Conference on Artificial Intelligence (ECAI'24)*, October 2024. [pdf]
DOI: 10.3233/FAIA240562
Acceptance Rate: 23.3 percent (547 of 2344)
Double-Blind Review (**DBR**).

[C47] Tianshu Bao†, Hua Wei, Junyi Ji, Daniel Work, ***Taylor T. Johnson***, "Spatial-Temporal PDE Networks for Traffic Flow Forecasting," *European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD'24), Applied Data Science Track*, September 2024. [pdf]
DOI: 10.1007/978-3-031-70381-2_11
Acceptance Rate: 25.0 percent (56 of 224)
Double-Blind Review (**DBR**).

[C46] Tianshu Bao†, ***Taylor T. Johnson***, Xiaowei Jia, "Transfer Learning Using Inaccurate Physics Rule for Streamflow Prediction," *33rd International Joint Conference on Artificial Intelligence (IJCAI'24), AI for Good Track*, August 2024. [pdf]
DOI: 10.24963/ijcai.2024/793
Acceptance Rate: 14.0 percent (643 of 4566)
Double-Blind Review (**DBR**).

[C45] Preston Robinette†, Diego Manzanas Lopez†, Serena Serbinowska†, Kevin Leach, ***Taylor T. Johnson***, "Case Study: Neural Network Malware Detection Verification for Feature and Image Datasets," *12th International Conference on Formal Methods in Software Engineering (FormaliSE'24)*, April 2024. [pdf]
DOI: 10.1145/3644033.3644372
Acceptance Rate: 34.1 percent (14 of 41)
Double-Blind Review (**DBR**)
Repeatability/Artifact Evaluation Passed (**RAE**).

[C44] Ziyan An, ***Taylor T. Johnson***, Meiyi Ma, "Formal Logic Enabled Personalized Federated Learning Through Property Inference," *38th AAAI Conference on Artificial Intelligence (AAAI'24)*, February 2024. [pdf]
DOI: 10.1609/aaai.v38i10.28962
Acceptance Rate: 23.7 percent (2342 of 9862)
Double-Blind Review (**DBR**).

[C43] Ziyan An, Xia Wang, ***Taylor T. Johnson***, Jonathan Sprinkle, Meiyi Ma, "Runtime Monitoring of Accidents in Driving Recordings with Multi-Type Logic in Empirical Models," *23rd International Conference on Runtime Verification (RV'23)*, October 2023. [pdf]
DOI: 10.1007/978-3-031-44267-4_21
Acceptance Rate: 51.2 percent (20 of 39).

[C42] Preston Robinette†, ***Taylor T. Johnson***, David Wang, Nishan Shehadeh, Daniel C Moyer, "SUDS: Sanitizing Universal and Dependent Steganography," *26th European Conference on Artificial Intelligence (ECAI'23)*, October 2023. [pdf]
DOI: 10.3233/FAIA230489
Acceptance Rate: 20.5 percent (390 of 1896)
Double-Blind Review (**DBR**).

[C41] Neelanjana Pal†, Diego Manzanas Lopez†, ***Taylor T. Johnson***, "Robustness verification of deep neural networks using star-based reachability analysis with variable-length time series input," *ERCIM Working Group 28th International Conference on Formal Methods for Industrial Critical Systems (FMICS'23)*, September 2023. [pdf]
DOI: 10.1007/978-3-031-43681-9_10
Acceptance Rate: 58.3 percent (14 of 24).

[C40] Diego Manzanas Lopez†, Sung Woo Choi, Hoang-Dung Tran, ***Taylor T. Johnson***, "NNV 2.0: The Neural Network Verification Tool," *35th International Conference on Computer Aided Verification (CAV'23)*, July 2023. [pdf]
Acceptance Rate: 25.6 percent (67 of 261)
Repeatability/Artifact Evaluation Passed (**RAE**).

[C39] Nathaniel Hamilton†, Kyle Dunlap, ***Taylor T. Johnson***, Kerianne L. Hobbs, "Ablation Study of How Run Time Assurance Impacts the Training and Performance of Reinforcement Learning Agents," *IEEE 9th International Conference on Space Mission Challenges for Information Technology (SMC-IT'23)*, July 2023. [pdf]
Acceptance Rate: 60.0 percent (15 of 25). **Distinguished Paper Award.**

[C38] Preston K. Robinette†, Nathaniel Hamilton, ***Taylor T. Johnson***, "Self-Preserving Genetic Algorithms for Safe Learning in Discrete Action Spaces," *14th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS'23)*, May 2023. [pdf]
Acceptance Rate: 25.6 percent (21 of 82)
Double-Blind Review (**DBR**)
Repeatability/Artifact Evaluation Passed (**RAE**).

[C37] Nathaniel Hamilton†, Preston Robinette†, ***Taylor T. Johnson***, "Training Agents to Satisfy Timed and Untimed Signal Temporal Logic Specifications with Reinforcement Learning," *20th International Conference on Software Engineering and Formal Methods (SEFM'22)*, September 2022. [pdf]
DOI: 10.1007/978-3-031-17108-6_12
Acceptance Rate: 32.3 percent (22 of 68).

[C36] Serena Serbinowska†, ***Taylor T. Johnson***, "BehaVerify: Verifying Temporal Logic Specifications for Behavior Trees," *20th International Conference on Software Engineering and Formal Methods (SEFM'22)*, September 2022. [pdf]
DOI: 10.1007/978-3-031-17108-6_19
Acceptance Rate: 32.3 percent (22 of 68).

[C35] Diego Manzanas Lopez†, Patrick Musau, Nathaniel Hamilton, ***Taylor T. Johnson***, "Reachability Analysis of a General Class of Neural Ordinary Differential Equations," *20th International Conference*

on Formal Modeling and Analysis of Timed Systems (FORMATS'22), September 2022. [pdf]
DOI: 10.1007/978-3-031-15839-1_15
Acceptance Rate: 43.7 percent (14 of 32)
Repeatability/Artifact Evaluation Passed (**RAE**).

[C34] Xiaodong Yang†, Tom Yamaguchi, Hoang-Dung Tran, ***Taylor T. Johnson***, Danil Prokhorov, "Neural Network Repair with Reachability Analysis," *20th International Conference on Formal Modeling and Analysis of Timed Systems (FORMATS'22)*, September 2022. [pdf]
DOI: 10.1007/978-3-031-15839-1_13
Acceptance Rate: 43.7 percent (14 of 32)
Repeatability/Artifact Evaluation Passed (**RAE**). **Best Artifact/Repeatability Evaluation Award**

[C33] Tianshu Bao†, Shengyu Chen, ***Taylor T. Johnson***, Peyman Givi, Shervin Sammak, Xiaowei Jia, "Physics Guided Neural Networks for Spatio-temporal Super-resolution of Turbulent Flows," *38th Conference on Uncertainty in Artificial Intelligence (UAI'22)*, Vol: 180, p 118-128, August 2022. [pdf]
Acceptance Rate: 32.3 percent (230 of 712)
Double-Blind Review (**DBR**).

[C32] Tianshu Bao†, Xiaowei Jia, Jacob Zwart, Jeffrey Sadler, Alison Appling, Samantha Oliver, ***Taylor T. Johnson***, "Partial Differential Equation Driven Dynamic Graph Networks for Predicting Stream Water Temperature," *21st IEEE International Conference on Data Mining (ICDM'21)*, December 2021. [pdf]
DOI: 10.1109/ICDM51629.2021.00011
Acceptance Rate: 20.0 percent (198 of 990).

[C31] Hoang-Dung Tran†, Neelanjana Pal†, Patrick Musau†, Xiaodong Yang†, Nathaniel Hamilton†, Diego Manzanas Lopez†, Stanley Bak, ***Taylor T. Johnson***, "Robustness Verification of Semantic Segmentation Neural Networks Using Relaxed Reachability," *33rd International Conference on Computer-Aided Verification (CAV'21)*, Vol: 12759, p 263-283, July 2021. [pdf]
DOI: 10.1007/978-3-030-81685-8_12
Acceptance Rate: 27.2 percent (79 of 290)
Double-Blind Review (**DBR**)
Repeatability/Artifact Evaluation Passed (**RAE**). Reproducible artifact (functional, available, reusable badges): `https://zenodo.org/record/4726346`)

[C30] Xiaodong Yang†, Tomoya Yamaguchi, Hoang-Dung Tran, Bardh Hoxha, ***Taylor T. Johnson***, Danil Prokhorov, "Reachability Analysis of Deep ReLU Neural Networks using Facet-Vertex Incidence ," *24th ACM International Conference on Hybrid Systems (HSCC'21)*, p 18:1-7, May 2021. [pdf]
DOI: 10.1145/3447928.3456650
Acceptance Rate: 35.0 percent (27 of 77)
Double-Blind Review (**DBR**).

[C29] Hoang-Dung Tran†, Stanley Bak, Weiming Xiang, ***Taylor T. Johnson***, "Verification of Deep Convolutional Neural Networks Using ImageStars," *32nd International Conference on Computer-Aided Verification (CAV'20)*, Vol: 12224, p 18-42, July 2020. [pdf]
DOI: 10.1007/978-3-030-53288-8_2
Acceptance Rate: 27.3 percent (66 of 241)
Double-Blind Review (**DBR**). Reproducible CodeOcean capsule: `https://doi.org/10.24433/CO.3351375.v1`)

[C28] Stanley Bak, Hoang-Dung Tran†, Kerianne Hobbs, ***Taylor T. Johnson***, "Improved Geometric Path Enumeration for Verifying ReLU Neural Networks," *32nd International Conference on Computer-Aided Verification (CAV'20)*, Vol: 12224, p 66-96, July 2020. [pdf]
DOI: 10.1007/978-3-030-53288-8_4
Acceptance Rate: 27.3 percent (66 of 241)
Double-Blind Review (**DBR**)
Repeatability/Artifact Evaluation Passed (**RAE**).

[C27] Hoang-Dung Tran†, Xiaodong Yang†, Diego Manzanas Lopez†, Patrick Musau†, Luan Viet Nguyen, Weiming Xiang, Stanley Bak, ***Taylor T. Johnson***, "NNV: The Neural Network Verification Tool for Deep Neural Networks and Learning-Enabled Cyber-Physical Systems," *32nd International Conference on Computer-Aided Verification (CAV'20)*, Vol: 12224, p 3-17, July 2020. [pdf]
DOI: 10.1007/978-3-030-53288-8_1
Acceptance Rate: 27.3 percent (66 of 241)
Repeatability/Artifact Evaluation Passed (**RAE**). Reproducible CodeOcean capsule: `https://doi.org/10.24433/CO.0221760.v1`

[C26] Shafiul Azam Chowdhury, Sohil Lal Shrestha, ***Taylor T. Johnson***, Christoph Csallner, "SLEMI: Equivalence Modulo Input (EMI) Based Mutation of CPS Models for Finding Compiler Bugs in Simulink," *42nd International Conference on Software Engineering (ICSE'20)*, p 335-346, June 2020. [pdf]
DOI: 10.1145/3377811.3380381
Acceptance Rate: 20.9 percent (129 of 617)
Double-Blind Review (**DBR**)
Repeatability/Artifact Evaluation Passed (**RAE**).

[C25] Hoang-Dung Tran†, Patrick Musau†, Diego Manzanas Lopez†, Xiaodong Yang†, Luan Viet Nguyen, Weiming Xiang°, ***Taylor T. Johnson***, "Star-Based Reachability Analysis of Deep Neural Networks," *23rd International Symposium on Formal Methods (FM'19)*, Vol: 11800, p 670-686, September 2019. [pdf]
DOI: 10.1007/978-3-030-30942-8_39
Acceptance Rate: 34.1 percent (44 of 129).

[C24] Hoang-Dung Tran†, Luan Viet Nguyen, Nathaniel Hamilton†, Weiming Xiang°, ***Taylor T. Johnson***, "Reachability Analysis for High-Index Linear Differential Algebraic Equations," *17th International Conference on Formal Modeling and Analysis of Timed Systems (FORMATS'19)*, Vol: 11750, p 160-177, August 2019. [pdf]
DOI: 10.1007/978-3-030-29662-9_10
Acceptance Rate: 40.4 percent (17 of 42).

[C23] Hoang-Dung Tran†, Luan Viet Nguyen, Patrick Musau†, Weiming Xiang°, ***Taylor T. Johnson***, "Decentralized Real-Time Safety Verification for Distributed Cyber-Physical Systems," *39th International Conference on Formal Techniques for Distributed Objects (FORTE'19)*, Vol: 11535, p 261-277, June 2019. [pdf]
DOI: 10.1007/978-3-030-21759-4_15
Acceptance Rate: 42.8 percent (18 of 42).

[C22] Stanley Bak, Hoang-Dung Tran†, ***Taylor T. Johnson***, "Numerical verification of affine systems with up to a billion dimensions," *22nd ACM International Conference on Hybrid Systems (HSCC'19)*, p 23-32, April 2019. [pdf]
DOI: 10.1145/3302504.3311792
Acceptance Rate: 23.5 percent (21 of 89)
Double-Blind Review (**DBR**)
Repeatability/Artifact Evaluation Passed (**RAE**).

[C21] Shafiul Chowdhury†, Soumik Mohian, Sidharth Mehra, Siddhant Gawsane, ***Taylor T. Johnson***, Christoph Csallner, "Automatically Finding Bugs in a Commercial Cyber-Physical System Development Tool Chain With SLforge," *40th International Conference on Software Engineering (ICSE'18)*, p 981-992, May 2018. [pdf]
DOI: 10.1145/3180155.3180231
Acceptance Rate: 20.9 percent (105 of 502)
Double-Blind Review (**DBR**)
Repeatability/Artifact Evaluation Passed (**RAE**). Related software tools SLForge and CyFuzz [S6]

[C20] Luan Viet Nguyen†, James Kapinski, Xiaoqing Jin, Jyotirmoy Deshmukh, ***Taylor T. Johnson***, "Hyperproperties of real-valued signals," *15th ACM-IEEE International Conference on Formal Methods (MEMOCODE'17)*, p 104-113, September 2017. [pdf]
DOI: 10.1145/3127041.3127058
Acceptance Rate: 31.2 percent (15 of 48).

[C19] Andrew Sogokon°, Paul Jackson, ***Taylor T. Johnson***, "Verifying safety and persistence properties of hybrid systems using flowpipes and continuous invariants," *9th NASA Formal Methods Symposium (NFM'17)*, Vol: 10227, p 194-211, May 2017. [pdf]
DOI: 10.1007/978-3-319-57288-8_14
Acceptance Rate: 38.3 percent (23 of 60).

[C18] Luan Viet Nguyen†, James Kapinski, Xiaoqing Jin, Jyotirmoy Deshmukh, Ken Butts, ***Taylor T. Johnson***, "Abnormal data classification using time-frequency temporal logic," *20th International Conference on Hybrid Systems: Computation and Control (HSCC'17)*, p 237-242, April 2017. [pdf]
DOI: 10.1145/3049797.3049809
Acceptance Rate: 38.1 percent (29 of 76)
Double-Blind Review (**DBR**)
Repeatability/Artifact Evaluation Passed (**RAE**).

[C17] Umair Siddique, Khaza Anuaral Hoque°, ***Taylor T. Johnson***, "Formal Specification and Dependability Analysis of Optical Communication Networks," *Design, Automation, and Test in Europe (DATE'17)*, p 1564-1569, March 2017. [pdf]
DOI: 10.23919/DATE.2017.7927239
Acceptance Rate: 24.3 percent (193 of 794).

[C16] Andrew Sogokon°, Khalil Ghorbal, ***Taylor T. Johnson***, "Decoupling Abstractions of Non-linear Ordinary Differential Equations," *International Symposium on Formal Methods (FM'16)*, Vol: 9995, p 628-644, November 2016. [pdf]
DOI: 10.1007/978-3-319-48989-6_38
Acceptance Rate: 28.4 percent (43 of 151).

[C15] Muhammad Usama Sardar, Nida Afaq, Khaza Anuaral Hoque°, ***Taylor T. Johnson***, Osman Hasan, "Probabilistic formal verification of the SATS concept of operation," *8th NASA Formal Methods Symposium (NFM'16)*, Vol: 9690, p 191-205, June 2016. [pdf]
DOI: 10.1007/978-3-319-40648-0_15
Acceptance Rate: 37.2 percent (19 of 51).

[C14] Stanley Bak, Sergiy Bogomolov, Thomas A. Henzinger, ***Taylor T. Johnson***, Pradyot Prakash, "Scalable Static Hybridization Methods for Analysis of Nonlinear Systems," *19th ACM International Conference on Hybrid Systems: Computation and Control (HSCC'16)*, p 155-164, April 2016. [pdf]
DOI: 10.1145/2883817.2883837
Acceptance Rate: 43.0 percent (28 of 65)
Repeatability/Artifact Evaluation Passed (**RAE**). **Best Software Repeatability Evaluation Award**

[C13] Stanley Bak, ***Taylor T. Johnson***, "Periodically-Scheduled Controller Analysis using Hybrid Systems Reachability and Continuization," *36th IEEE Real-Time Systems Symposium (RTSS'15)*, p 195-205, December 2015. [pdf]
DOI: 10.1109/RTSS.2015.26
Acceptance Rate: 22.5 percent (34 of 151).

[C12] Luan Viet Nguyen†, Christian Schilling, Sergiy Bogomolov, ***Taylor T. Johnson***, "Runtime Verification for Hybrid Analysis Tools," *15th International Conference on Runtime Verification (RV'15)*, Vol: 9333, p 281-286, November 2015. [pdf]
DOI: 10.1007/978-3-319-23820-3_19
Acceptance Rate: 46.6 percent (21 of 45).

[C11] ***Taylor T. Johnson***, Stanley Bak, Steven Drager, "Cyber-Physical Specification Mismatch Identification with Dynamic Analysis," *ACM/IEEE 6th International Conference on Cyber-Physical Systems (ICCPS'15)*, p 208-217, April 2015. [pdf]
DOI: 10.1145/2735960.2735979
Acceptance Rate: 27.4 percent (25 of 91). Software Tool [S3]: `http://verivital.com/hynger/`

[C10] Stanley Bak, Sergiy Bogomolov, ***Taylor T. Johnson***, "HyST: A Source Transformation and Translation Tool for Hybrid Automaton Models," *18th International Conference on Hybrid Systems: Computation and Control (HSCC'15)*, p 128-133, April 2015. [pdf]
DOI: 10.1145/2728606.2728630
Acceptance Rate: 39.4 percent (30 of 76)
Repeatability/Artifact Evaluation Passed (**RAE**). Software Tool [S5]: `http://verivital.com/hyst/`

[C9] Stanley Bak, ***Taylor T. Johnson***, Marco Caccamo, Lui Sha, "Real-Time Reachability for Verified Simplex Design," *35th IEEE Real-Time Systems Symposium (RTSS'14)*, p 138-148, December 2014. [pdf]
DOI: 10.1109/RTSS.2014.21
Acceptance Rate: 21.4 percent (33 of 154). Software Tool [S4]: `https://github.com/verivital/rtreach`

[C8] ***Taylor T. Johnson***, Sayan Mitra, "Anonymized Reachability of Hybrid Automata Networks," *12th International Conference on Formal Modeling and Analysis of Timed Systems (FORMATS'14)*, Vol: 8711, p 130-145, September 2014. [pdf]
DOI: 10.1007/978-3-319-10512-3_10
Acceptance Rate: 47.2 percent (17 of 36).

[C7] Sergiy Bogomolov, Alexandre Donzé, Goran Frehse, Radu Grosu, ***Taylor T. Johnson***, Hamed Ladan, Andreas Podelski, Martin Wehrle, "Abstraction-based guided search for hybrid systems," *20th International SPIN Symposium on Model Checking of Software (SPIN'13)*, p 117-134, 2013. [pdf]
Acceptance Rate: 50.0 percent (20 of 40).

[C6] Parasara Sridhar Duggirala, ***Taylor T. Johnson***, Adam Zimmerman, Sayan Mitra, "Static and dynamic analysis of timed distributed traces," *33rd IEEE Real-Time Systems Symposium (RTSS'12)*, p 173-182, December 2012. [pdf]
DOI: 10.1109/RTSS.2012.69
Acceptance Rate: 22.2 percent (35 of 157).

[C5] ***Taylor T. Johnson***, Jeremy Green, Sayan Mitra, Rachel Dudley, R. Scott Erwin, "Satellite rendezvous and conjunction avoidance: Case studies in verification of nonlinear hybrid systems," *International Symposium on Formal Methods (FM'12)*, Vol: 7436, p 252-266, August 2012. [pdf]
DOI: 10.1007/978-3-642-32759-9_22
Acceptance Rate: 21.2 percent (28 of 132).

[C4] ***Taylor T. Johnson***, Sayan Mitra, "A small model theorem for rectangular hybrid automata networks," *IFIP International Conference on Formal Techniques for Distributed Systems: Joint International Conference of 14th Formal Methods for Open Object-Based Distributed Systems and 32nd Formal Techniques for Networked and Distributed Systems (FORTE/FMOODS'12)*, Vol: 7273, p 18-34, June 2012. [pdf]
DOI: 10.1007/978-3-642-30793-5_2
Acceptance Rate: 38.0 percent (16 of 42). **Best Paper Award**. Top 1 of 155 Submissions Across Three Conferences

[C3] ***Taylor T. Johnson***, Sayan Mitra, "Parameterized verification of distributed cyber-physical systems: An aircraft landing protocol case study," *3rd ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS'12)*, p 161-170, April 2012. [pdf]
DOI: 10.1109/ICCPS.2012.24
Acceptance Rate: 34.1 percent (14 of 41).

[C2] ***Taylor T. Johnson***, Sayan Mitra, "Safe flocking in spite of actuator faults," *Stabilization, Safety, and Security of Distributed Systems (SSS'10)*, Vol: 6366, p 588-602, September 2010. [pdf]
DOI: 10.1007/978-3-642-16023-3_45
Acceptance Rate: 43.3 percent (39 of 90).

[C1] ***Taylor T. Johnson***, Sayan Mitra, Karthik Manamcheri, "Safe and stabilizing distributed cellular flows," *30th IEEE International Distributed Computing Systems (ICDCS'10)*, p 577-586, June 2010. [pdf]
DOI: 10.1109/ICDCS.2010.49
Acceptance Rate: 14.3 percent (84 of 585).

BOOK CHAPTERS

Acceptance based on peer review of full papers.

[BC2] Xiaodong Yang, Tomoya Yamaguchi, Bardh Hoxha, Danil Prokhorov, ***Taylor T. Johnson***, "Metacognition with Neural Network Verification and Repair using Veritex," *Metacognitive Artificial Intelligence*, February 2025. [pdf].

[BC1] Weiming Xiang°, Diego Manzanas Lopez†, Patrick Musau†, ***Taylor T. Johnson***, "Reachable Set Estimation and Verification for Neural Network Models of Nonlinear Dynamic Systems," *Safe, Autonomous and Intelligent Vehicles, Series on Unmanned Systems Technologies, Springer*, p 123-144, 2019. [pdf]
DOI: 10.1007/978-3-319-97301-2_7. Editors: Huafeng Yu, Xin Li, Richard Murray, Claire J. Tomlin, Ramesh S

OTHER FULLY REFEREED CONFERENCE PROCEEDINGS PAPERS

Acceptance based on peer review of full papers.

[OC18] Alessandro Abate, Matthias Althoff, Lei Bu, Gidon Ernst, Goran Frehse, Luca Geretti, ***Taylor T. Johnson***, Claudio Menghi, Stefan Mitsch, Stefan Schupp, Sadegh Soudjani , "The ARCH-COMP Friendly Verification Competition for Continuous and Hybrid Systems," *TOOLympics Challenge 2023 and TOOLympics 2024*, Vol: 14550, p 1-37, October 2024. [pdf]
DOI: 10.1007/978-3-031-67695-6_1.

[OC17] Neelanjana Pal, Seojin Lee, Taylor T Johnson, "Benchmark: formal verification of semantic segmentation neural networks," *1st International Conference on Bridging the Gap between AI and Reality (AISoLA'23)*, October 2023. [pdf]
DOI: 10.1007/978-3-031-46002-9_20.

[OC16] Preston K Robinette, Diego Manzanas Lopez, Taylor T Johnson, "Benchmark: neural network malware classification," *1st International Conference on Bridging the Gap between AI and Reality (AISoLA'23)*,

October 2023. [pdf]
DOI: 10.1007/978-3-031-46002-9_17.

[OC15] Diego Manzanas Lopez, Taylor T Johnson, "Empirical analysis of benchmark generation for the verification of neural network image classifiers," *1st International Conference on Bridging the Gap between AI and Reality (AISoLA'23)*, October 2023. [pdf]
DOI: 10.1007/978-3-031-46002-9_21.

[OC14] Preston Robinette†, Benjamin Heiner, Umberto Ravaioli, Nathaniel Hamilton†, ***Taylor T. Johnson***, Kerianne Hobbs, "Reinforcement Learning Heuristics for Aerospace Control Systems," *IEEE Aerospace Conference*, March 2022. [pdf]
DOI: 10.1109/AERO53065.2022.9843224.

[OC13] Patrick Musau†, Nathaniel Hamilton†, Diego Manzanas Lopez†, ***Taylor T. Johnson***, "Zero-Shot Policy Transfer in Autonomous Racing: Reinforcement Learning versus Imitation Learning," *IEEE International Conference on Assured Autonomy (ICAA'22)*, March 2022. [pdf]
DOI: 10.1109/ICAA52185.2022.00011
Acceptance Rate: 57.1 percent (16 of 28).

[OC12] Patrick Musau†, Nathaniel Hamilton†, Diego Manzanas Lopez†, Preston Robinette†, ***Taylor T. Johnson***, "On Using Real-Time Reachability for the Safety Assurance of Machine Learning Controllers," *IEEE International Conference on Assured Autonomy (ICAA'22)*, March 2022. [pdf]
DOI: 10.1109/ICAA52185.2022.00010
Acceptance Rate: 57.1 percent (16 of 28).

[OC11] Joel A. Rosenfeld, Rushikesh Kamalapurkar, L. Forest Gruss, ***Taylor T. Johnson***, "On Occupation Kernels, Liouville Operators, and Dynamic Mode Decomposition," *2021 American Control Conference (ACC)*, May 2021. [pdf]
DOI: 10.23919/ACC50511.2021.9483121.

[OC10] Omar Ali Beg, Ajay P. Yadav, ***Taylor T. Johnson***, Ali Davoudi, "Formal Online Resiliency Monitoring in Microgrids," *IEEE 2020 Resilience Week (RWS)*, p 99-105, October 2020. [pdf]
DOI: 10.1109/RWS50334.2020.9241272.

[OC9] Joel Rosenfeld°, Rushi Kamalapurkar, Ben Russo, ***Taylor T. Johnson***, "Occupation Kernels and Densely Defined Liouville Operators for System Identification," *IEEE 58th Conference on Decision and Control (CDC'19)*, p 6455-6460, December 2019. [pdf]
DOI: 10.1109/CDC40024.2019.9029337
Acceptance Rate: 59.5 percent (1155 of 1938).

[OC8] Weiming Xiang°, Hoang-Dung Tran†, Joel Rosenfeld°, ***Taylor T. Johnson***, "Reachable Set Estimation and Safety Verification for Piecewise Linear Systems with Neural Network Controllers," *American Control Conference (ACC'18)*, p 1574-1579, June 2018. [pdf]
DOI: 10.23919/ACC.2018.8431048
Acceptance Rate: 66.9 percent (1087 of 1623).

[OC7] Luan Viet Nguyen†, Bardh Hoxha, ***Taylor T. Johnson***, Georgios Fainekos, "Mission Planning for Multiple Vehicles with Temporal Specifications using UxAS," *6th IFAC Analysis and Design of Hybrid Systems (ADHS'18)*, Vol: 51, No: 16, p 67-72, July 2018. [pdf]
DOI: 10.1016/j.ifacol.2018.08.012
Acceptance Rate: 69.4 percent (50 of 72).

[OC6] Hoang-Dung Tran†, Stanley Bak, ***Taylor T. Johnson***, "Reachability Analysis for One Dimensional Linear Parabolic Equations," *6th IFAC Analysis and Design of Hybrid Systems (ADHS'18)*, Vol: 51, No: 16, p 133-138, July 2018. [pdf]
DOI: 10.1016/j.ifacol.2018.08.023
Acceptance Rate: 69.4 percent (50 of 72).

[OC5] Omar Beg†, Luan Viet Nguyen†, Ali Davoudi, ***Taylor T. Johnson***, "Computer-Aided Formal Verification of Power Electronics Circuits," *VDE Frontiers in Analog Computer Aided Design (FAC'17)*, p 21-26, July 2017. [pdf].

[OC4] Weiming Xiang°, ***Taylor T. Johnson***, Hoang-Dung Tran†, "On reachable set estimation for discrete-time switched linear systems under arbitrary switching," *American Control Conference (ACC'17)*, p 4534-4539, May 2017. [pdf]
DOI: 10.23919/ACC.2017.7963654
Acceptance Rate: 64.2 percent (944 of 1469).

[OC3] Weiming Xiang°, Hoang-Dung Tran†, ***Taylor T. Johnson***, "Reachable set estimation and control for switched linear systems with dwell-time restriction," *55th IEEE Conference on Decision and Control*

(CDC'16), p 7246-7251, December 2016. [pdf]
DOI: 10.1109/CDC.2016.7799387
Acceptance Rate: 59.5 percent (1242 of 2086).

[OC2] Parasara Sridhar Duggirala, Chuchu Fan, Matthew Potok, Bolun Qi, Sayan Mitra, Mahesh Viswanathan, Stanley Bak, Sergiy Bogomolov, ***Taylor T. Johnson***, Luan Viet Nguyen†, Christian Schilling, Andrew Sogokon°, Hoang-Dung Tran†, Weiming Xiang°, "Tutorial: software tools for hybrid systems verification, transformation, and synthesis: C2E2, HyST, and TuLiP," *IEEE Conference on Control Applications (CCA'16)*, p 1024-1029, September 2016. [pdf]
DOI: 10.1109/CCA.2016.7587948.

[OC1] ***Taylor T. Johnson***, Sayan Mitra, Cédric Langbort, "Stability of Digitally Interconnected Linear Systems," *50th IEEE Conference on Decision and Control (CDC'11)*, p 2687-2692, December 2011. [pdf]
DOI: 10.1109/CDC.2011.6161264.

LIGHTLY REFEREED CONFERENCE PROCEEDINGS PAPERS

Acceptance based on peer review of abstracts or short papers.

[LC9] Krishna Muvva, Justin M. Bradley, Marilyn Wolf, ***Taylor T. Johnson***, "Assuring Learning-Enabled Components in Small Unmanned Aircraft Systems," *AIAA Scitech 2021 Forum*, January 2021. [pdf]
DOI: 10.2514/6.2021-0994.

[LC8] Diego Manzanas Lopez†, ***Taylor T. Johnson***, Hoang-Dung Tran, Stanley Bak, Xin Chen, Kerianne L. Hobbs, "Verification of Neural Network Compression of ACAS Xu Lookup Tables with Star Set Reachability," *AIAA Scitech 2021 Forum*, January 2021. [pdf]
DOI: 10.2514/6.2021-0995.

[LC7] Nathaniel Hamilton†, Lena Schlemmer, Christopher Menart, Chad Waddington, Todd Jenkins, ***Taylor T. Johnson***, "Sonic to knuckles: evaluations on transfer reinforcement learning," *SPIE Defense + Commercial Sensing - Unmanned Systems Technology XXII*, Vol: 11425, April 2020. [pdf]
DOI: 10.1117/12.2559546.

[LC6] ***Taylor T. Johnson***, Raghunath Gannamaraju, and Sebastian Fischmeister, "A survey of electrical and electronic (e/e) notifications for motor vehicles," *24th International Technical Conference on the Enhanced Safety of Vehicles (ESV'15)*, p 1-15, 2015. [pdf].

[LC5] Leonardo Bobadilla, ***Taylor T. Johnson***, Amy LaViers, Umer Huzaifa, "Verified Planar Formation Control Algorithms by Composition of Primitives," *AIAA Science and Technology Forum and Exposition (SciTech'15)*, January 2015. [pdf]
DOI: 10.2514/6.2015-1541.

[LC4] ***Taylor T. Johnson***, Sayan Mitra, "Invariant Synthesis for Verification of Parameterized Cyber-Physical Systems with Applications to Aerospace Systems," *AIAA Infotech at Aerospace*, p 1-16, August 2013. [pdf]
DOI: 10.2514/6.2013-4811.

[LC3] Shamina Shahrin Hossain⋆, Sairaj Dhople, ***Taylor T. Johnson***, "Reachability Analysis of Closed Loop Switching Power Converters," *IEEE Power and Energy Conference at Illinois (PECI'13)*, p 130-134, February 2013. [pdf]
DOI: 10.1109/PECI.2013.6506047.

[LC2] ***Taylor T. Johnson***, Zhihao Hong⋆, Akash Kapoor⋆, "Design Verification Methods for Switching Power Converters," *IEEE Power and Energy Conference at Illinois (PECI'12)*, p 1-6, February 2012. [pdf]
DOI: 10.1109/PECI.2012.6184587.

[LC1] ***Taylor T. Johnson***, Albert E. Hoefel, "Turbo-alternator stalling protection using available-power estimate," *IEEE Power and Energy Conference at Illinois (PECI'11)*, p 1-6, February 2011. [pdf]
DOI: 10.1109/PECI.2011.5740501. **Best Paper Award**

REFEREED WORKSHOP PROCEEDINGS PAPERS

Acceptance based on peer review of full papers.

[W31] Serena Serbinowska†, Preston Robinette†, Gabor Karsai, ***Taylor T. Johnson***, "Formalizing Stateful Behavior Trees," *6th International Workshop on Formal Methods for Autonomous Systems (FMAS'24)*, November 2024. [pdf]
DOI: 10.4204/EPTCS.411.14
Acceptance Rate: 73.6 percent (14 of 19). Best paper award.

[W30] Serena Serbinowska†, Nicholas Potteiger, Anne Tumlin†, ***Taylor T. Johnson***, "Verification of Behavior Trees with Contingency Monitors," *6th International Workshop on Formal Methods for Autonomous Systems (FMAS'24)*, November 2024. [pdf]
DOI: 10.4204/EPTCS.411.4
Acceptance Rate: 73.6 percent (14 of 19).

[W29] Neelanjana Pal†, ***Taylor T. Johnson***, "Formal Verification of Long Short-Term Memory based Audio Classifiers: A Star based Approach," *5th International Workshop on Formal Methods for Autonomous Systems (FMAS'23)*, November 2023. [pdf]
DOI: 10.4204/EPTCS.395.12
Acceptance Rate: 60.0 percent (15 of 25).

[W28] Sergiy Bogomolov, ***Taylor T. Johnson***, Diego Manzanas Lopez, Patrick Musau, Paulius Stankaitis, "Online Reachability Analysis and Space Convexification for Autonomous Racing," *5th International Workshop on Formal Methods for Autonomous Systems (FMAS'23)*, November 2023. [pdf]
DOI: 10.4204/EPTCS.395.7
Acceptance Rate: 60.0 percent (15 of 25).

[W27] Diego Manzanas Lopez†, Patrick Musau†, Nathaniel Hamilton†, Hoang-Dung Tran†, ***Taylor T. Johnson***, "Case Study: Safety Verification of an Unmanned Underwater Vehicle," *IEEE Workshop on Assured Autonomous Systems (WAAS'20), Co-located with the 41st IEEE Symposium on Security and Privacy (Oakland)*, 2020. [pdf].

[W26] Charles Hartsell, Nagabhushan Mahadevan, Shreyas Ramakrishna, Abhishek Dubey, Theodore Bapty, ***Taylor T. Johnson***, Xenofon Koutsoukos, Janos Sztipanovits, and Gabor Karsai, "CPS Design with Learning-Enabled Components: A Case Study," *30th International Workshop on Rapid System Prototyping (RSP'19)*, p 57-63, October 2019. [pdf]
DOI: 10.1145/3339985.3358491.

[W25] Hoang-Dung Tran†, Luan V. Nguyen, Patrick Musau†, Weiming Xiang°, ***Taylor T. Johnson***, "Decentralized real-time safety verification for distributed cyber-physical systems," *3rd International Workshop on Methods and Tools for Distributed Hybrid Systems (DHS'19)*, 2019. [pdf].

[W24] Hoang-Dung Tran†, Feiyang Cai, Diego Manzanas Lopez†, Patrick Musau†, ***Taylor T. Johnson***, Xenofon Koutsoukos, "Safety Verification in Reinforcement Learning Control," *2nd Workshop on Formal Methods for ML-Enabled Autonomous Systems (FoMLAS'19)*, 2019. [pdf].

[W23] Hoang-Dung Tran†, Patrick Musau†, Diego Manzanas Lopez†, Xiaodong Yang†, Luan Viet Nguyen, Weiming Xiang, ***Taylor T. Johnson***, "Parallelizable reachability analysis algorithms for feed-forward neural networks," *7th IEEE/ACM International Conference on Formal Methods in Software Engineering (FormalISE'19)*, p 31-40, May 2019. [pdf]
DOI: 10.1109/FormaliSE.2019.00012
Acceptance Rate: 32.5 percent (13 of 40).

[W22] Diego Manzanas Lopez†, Patrick Musau†, Hoang-Dung Tran†, ***Taylor T. Johnson***, "Verification of closed-loop systems with neural network controllers," *EPiC Series in Computing 61, 6th Applied Verification for Continuous and Hybrid Systems (ARCH'19)*, Vol: 61, p 201-210, May 2019. [pdf]
DOI: 10.29007/btv1.

[W21] Tamas Kecskes, Patrik Meijer, ***Taylor T. Johnson***, Marcus Lucas, "Demo: A Design Studio for Verification Tools," *1st Workshop on Design Automation for CPS and IoT (DESTION'19)*, p 60-61, April 2019. [pdf]
DOI: 10.1145/3313151.3314057.

[W20] Charles Hartsell, Nagabhushan Mahadevan, Shreyas Ramakrishna, Abhishek Dubey, Theodore Bapty, ***Taylor T. Johnson***, Xenofon Koutsoukos, Janos Sztipanovits, Gabor Karsai, "Model-based design for CPS with learning-enabled components," *1st Workshop on Design Automation for CPS and IoT (DESTION'19)*, p 1-9, April 2019. [pdf]
DOI: 10.1145/3313151.3313166.

[W19] Weiming Xiang°, Hoang-Dung Tran†, ***Taylor T. Johnson***, "Specification-Guided Safety Verification for Feedforward Neural Networks," *2nd Verification of Neural Networks (VNN'19), AAAI 2019 Spring Symposium*, 2019. [pdf].

[W18] Weiming Xiang°, Xiaodong Yang†, Hoang-Dung Tran†, ***Taylor T. Johnson***, "Reachability Analysis and Safety Verification for Neural Network Control Systems," *2nd Verification of Neural Networks (VNN'19), AAAI 2019 Spring Symposium*, 2019. [pdf].

[W17] Patrick Musau†, Diego Manzanas Lopez†, Hoang-Dung Tran†, ***Taylor T. Johnson***, "Differential Algebraic Equations (DAEs) with Varying Index (Benchmark Proposal)," *5th International Workshop*

on Applied Verification for Continuous and Hybrid Systems (ARCH'18), Vol: 54, p 174-184, September 2018. [pdf]
DOI: 10.29007/4gj7.

[W16] Patrick Musau†, ***Taylor T. Johnson***, "Continuous-Time Recurrent Neural Networks (CTRNNs) (Benchmark Proposal)," *5th International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH'18)*, Vol: 54, p 196-207, September 2018. [pdf]
DOI: 10.29007/6czp.

[W15] Hoang-Dung Tran†, Tianshu Bao†, ***Taylor T. Johnson***, "Discrete-Space Analysis of Partial Differential Equations (PDEs) (Benchmark Proposal)," *5th International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH'18)*, Vol: 54, p 185-195, September 2018. [pdf]
DOI: 10.29007/fvpp.

[W14] Shafiul Chowdhury†, Lina Sera Varghese, Soumik Mohian, ***Taylor T. Johnson***, Christoph Csallner, "A Curated Corpus of Simulink Models for Model-based Empirical Studies," *4th International Workshop on Software Engineering for Smart Cyber-Physical Systems (SEsCPS '18)*, p 45-48, May 2018. [pdf]
DOI: 10.1145/3196478.3196484.

[W13] ***Taylor T. Johnson***, "Reusable and Understandable Formal Verification for Cyber-Physical Systems," *1st International Workshop on Formal Approaches to Explainable VERification (FEVER'17)*, 2017. [pdf].

[W12] Hoang-Dung Tran†, Luan Viet Nguyen†, Weiming Xiang°, ***Taylor T. Johnson***, "Distributed Autonomous Systems (Benchmark Proposal)," *4th International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH'17)*, Vol: 48, p 33-43, June 2017. [pdf]
DOI: 10.29007/slz2.

[W11] Omar Beg†, Ali Davoudi, ***Taylor T. Johnson***, "Reachability Analysis of Transformer-Isolated DC-DC Converters (Benchmark Proposal)," *4th International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH'17)*, Vol: 48, p 52-64, June 2017. [pdf]
DOI: 10.29007/8xk7.

[W10] Shafiul Chowdhury†, ***Taylor T. Johnson***, Christoph Csallner, "CyFuzz: A Differential Testing Framework for Cyber-Physical Systems Development Environments," *6th Workshop on Design, Modeling and Evaluation of Cyber Physical Systems (CyPhy'16)*, Vol: 10107, p 46-60, October 2016. [pdf]
DOI: 10.1007/978-3-319-51738-4_4
Acceptance Rate: 60.0 percent (9 of 15).

[W9] Hoang-Dung Tran†, Luan Viet Nguyen†, ***Taylor T. Johnson***, "Large-Scale Linear Systems from Order-Reduction (Benchmark Proposal)," *3rd International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH'16)*, Vol: 43, p 60-67, 2016. [pdf]
DOI: 10.29007/xk7x.

[W8] Andrew Sogokon°, Khalil Ghorbal, ***Taylor T. Johnson***, "Non-linear Continuous Systems for Safety Verification (Benchmark Proposal)," *3rd International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH'16)*, Vol: 43, p 42-51, 2016. [pdf]
DOI: 10.29007/w94n.

[W7] Omar Beg†, Ali Davoudi, ***Taylor T. Johnson***, "Charge Pump Phase-Locked Loops and Full Wave Rectifiers for Reachability Analysis (Benchmark Proposal)," *3rd International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH'16)*, Vol: 43, p 27-35, 2016. [pdf]
DOI: 10.29007/x211.

[W6] Luan Viet Nguyen†, Djordje Maksimovic, ***Taylor T. Johnson***, Andreas Veneris, "Quantified Bounded Model Checking for Rectangular Hybrid Automata," *9th International Workshop on Constraints in Formal Verification (CFV'15)*, 2015. [pdf].

[W5] Stanley Bak, Sergiy Bogomolov, ***Taylor T. Johnson***, "HyST: A Source Transformation and Translation Tool for Hybrid Automaton Models," *1st International Workshop on Symbolic and Numerical Methods for Reachability Analysis (SNR'15)*, 2015. [pdf].

[W4] Hoang-Dung Tran†, Luan Viet Nguyen†, ***Taylor T. Johnson***, "Benchmark: A Nonlinear Reachability Analysis Test Set from Numerical Analysis," *2nd International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH'15)*, Vol: 34, p 89-97, 2015. [pdf]
DOI: 10.29007/6dcf.

[W3] Stanley Bak, Sergiy Bogomolov, Marius Greitschus, ***Taylor T. Johnson***, "Benchmark: Stratified Controllers of Tank Networks," *2nd International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH'15)*, Vol: 34, p 73-79, 2015. [pdf]
DOI: 10.29007/2ljt.

[W2] Luan Viet Nguyen†, Eric Nelson⋆, Amol Vengurlekar†, Ruoshi Zhang†, Kristopher I. White, Victor Salinas, ***Taylor T. Johnson***, "Model-based design and analysis of a reconfigurable continuous-culture bioreactor," *4th ACM SIGBED International Workshop on Design, Modeling (CyPhy'14)*, p 48-51, April 2014. [pdf]
DOI: 10.1145/2593458.2593469
Acceptance Rate: 50.0 percent (14 of 28).

[W1] Luan Viet Nguyen†, ***Taylor T. Johnson***, "Benchmark: DC-to-DC Switched-Mode Power Converters (Buck Converters, Boost Converters, and Buck-Boost Converters).," *1st International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH'14)*, p 19-24, 2014. [pdf]
DOI: 10.29007/23pm.

OTHER WORKSHOP PROCEEDINGS PAPERS

Other workshop proceedings papers, not fully refereed, such as competition reports.

[OW13] Diego Manzanas Lopez, Matthias Althoff, Luis Benet, Clemens Blab, Marcelo Forets, Yuhao Jia, ***Taylor T. Johnson***, Manuel Kranzl, Tobias Ladner, Lukas Linauer, Philipp Neubauer, Sophie Neubauer, Christian Schilling, Huan Zhang, Xiangru Zhong, "ARCH-COMP24 Category Report: Artificial Intelligence and Neural Network Control Systems (AINNCS) for Continuous and Hybrid Systems Plants," *EPiC Series in Computing 103, 11th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH'24)*, Vol: 103, p 64-121, October 2024. [pdf]
DOI: 10.29007/mxld.

[OW12] Diego Manzanas Lopez, Matthias Althoff, Marcelo Forets, ***Taylor T. Johnson***, Tobias Ladner, Christian Schilling, "ARCH-COMP23 Category Report: Artificial Intelligence and Neural Network Control Systems (AINNCS) for Continuous and Hybrid Systems Plants," *EPiC Series in Computing 96, 10th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH'23)*, October 2023. [pdf]
DOI: 10.29007/x38n.

[OW11] ***Taylor T. Johnson***, "ARCH-COMP23 Repeatability Evaluation Report," *EPiC Series in Computing 96, 10th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH'23)*, October 2023. [pdf]
DOI: 10.29007/q313.

[OW10] Diego Manzanas Lopez, Matthias Althoff, Luis Benet, Xin Chen, Jiameng Fan, Marcelo Forets, Chao Huang, Taylor T Johnson, Tobias Ladner, Wenchao Li, Christian Schilling, Qi Zhu, "ARCH-COMP22 Category Report: Artificial Intelligence and Neural Network Control Systems (AINNCS) for Continuous and Hybrid Systems Plants," *EPiC Series in Computing 90, 9th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH22)*, September 2022. [pdf]
DOI: 10.29007/wfgr.

[OW9] ***Taylor T. Johnson***, "ARCH-COMP22 Repeatability Evaluation Report," *EPiC Series in Computing 90, 9th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH22)*, September 2022. [pdf]
DOI: 10.29007/djqx.

[OW8] ***Taylor T. Johnson***, Diego Manzanas Lopez†, Luis Benet, Marcelo Forets, Sebastián Guadalupe, Christian Schilling, Radoslav Ivanov, Taylor J. Carpenter, James Weimer, Insup Lee, "ARCH-COMP21 Category Report: Artificial Intelligence and Neural Network Control Systems (AINNCS) for Continuous and Hybrid Systems Plants," *EPiC Series in Computing 80, 8th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH21)*, Vol: 80, p 90-119, December 2021. [pdf]
DOI: 10.29007/kfk9.

[OW7] ***Taylor T. Johnson***, "ARCH-COMP21 Repeatability Evaluation Report," *EPiC Series in Computing 80, 8th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH21)*, Vol: 80, p 153-160, December 2021. [pdf]
DOI: 10.29007/zqdx.

[OW6] ***Taylor T. Johnson***, Diego Manzanas Lopez†, Patrick Musau†, Hoang-Dung Tran†, Elena Botoeva, Francesco Leofante, Amir Maleki, Chelsea Sidrane, Jiameng Fan and Chao Huang, "ARCH-COMP20 Category Report: Artificial Intelligence and Neural Network Control Systems (AINNCS) for Continuous and Hybrid Systems Plants," *EPiC Series in Computing 74, 7th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH'20)*, Vol: 74, p 107-139, September 2020. [pdf]
DOI: 10.29007/9xgv.

[OW5] ***Taylor T. Johnson***, "ARCH-COMP20 Repeatability Evaluation Report," *EPiC Series in Computing 74, 7th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH'20)*,

Vol: 74, p 175-183, September 2020. [pdf]
DOI: 10.29007/8dp4.

[OW4] Diego Manzanas Lopez†, Patrick Musau†, Hoang-Dung Tran†, Souradeep Dutta, Taylor J. Carpenter, Radoslav Ivanov, ***Taylor T. Johnson***, "ARCH-COMP19 Category Report: Artificial Intelligence/Neural Network Control Systems (AINNCS) for Continuous and Hybrid Systems Plants," *EPiC Series in Computing 61, 6th Applied Verification for Continuous and Hybrid Systems (ARCH'19)*, Vol: 61, p 103-119, May 2019. [pdf]
DOI: 10.29007/rgv8.

[OW3] ***Taylor T. Johnson***, "ARCH-COMP19 Repeatability Evaluation Report," *EPiC Series in Computing 61, 6th Applied Verification for Continuous and Hybrid Systems (ARCH'19)*, Vol: 61, p 162-169, May 2019. [pdf]
DOI: 10.29007/wbl3.

[OW2] ***Taylor T. Johnson***, "ARCH-COMP18 Repeatability Evaluation Report," *5th International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH'18)*, Vol: 54, p 128-134, September 2018. [pdf]
DOI: 10.29007/n9t3.

[OW1] ***Taylor T. Johnson***, "ARCH-COMP17 Repeatability Evaluation Report," *4th International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH'17)*, Vol: 48, p 175-180, June 2017. [pdf]
DOI: 10.29007/7hvk.

POSITION/EDITORIAL/OPINION PAPERS

Acceptance based on peer review of abstracts or short papers.

[E2] Daniel Neider, ***Taylor T. Johnson***, "Track C1: Safety Verification of Deep Neural Networks (DNNs)," *1st International Conference on Bridging the Gap between AI and Reality (AISoLA'23)*, October 2023. [pdf]
DOI: 10.1007/978-3-031-46002-9_12.

[E1] ***Taylor T. Johnson***, Sayan Mitra, "Handling Failures in Cyber-Physical Systems: Potential Directions," *Real-Time Systems Symposium (RTSS'09)*, 2009. [pdf]. **Award for *Most Interesting Cyber-Physical Systems Research Problem***

PATENTS AND PATENT APPLICATIONS

[P2] "Systems and Methods for Providing Speech-to-Text Recognition and Autosummarization," ***Taylor T. Johnson***. VU 17131, MCC Docket Number 10644-043PV1, Patent Application, February 1, 2018.

[P1] "Control of a Component of a Downhole Tool", Albert Hoefel, Francois Bernard, Kent D. Harms, Sylvain Ramshaw, Shayan Darayan, and ***Taylor T. Johnson***. Patent No. US 9222352, Patent Issued December 29, 2015. Based in part on paper [LC1]. [pdf]

PRESENTATIONS

KEYNOTE/PLENARY PRESENTATIONS

[KT12] Invited keynote presentation, "From Neural Network Verification to Formally Verifying Neuro-Symbolic Artificial Intelligence (AI) ," at the 25th High Confidence Software and Systems Conference (HCSS'25), Annapolis, MD, May 12, 2025.

[KT11] Invited plenary tutorial presentation, "Neural Network Verification for Medical Imaging Analysis," at the SPIE Medical Imaging 2025, San Diego, CA, February 18, 2025.

[KT10] Invited keynote presentation, "From Neural Network Verification to Formal Verification for Neuro-Symbolic Artificial Intelligence (AI)," at the 22nd ACM-IEEE International Symposium on Formal Methods and Models for System Design (MEMOCODE 2024), Raleigh, NC, October 4, 2024.

[KT9] Invited keynote presentation, "From Neural Network Verification to Formal Verification for Neuro-Symbolic Artificial Intelligence (AI)," at the 7th International Workshop on Dependable and Secure Machine Learning (DSML 2024), Brisbane, Australia, June 24, 2024.

[KT8] Invited plenary presentation, "From Neural Network Verification to Verification for Neuro-Symbolic Systems: Verifying Safety and Liveness in Neuro-Symbolic Behavior Trees (NSBTs)," at the Lorentz Center Workshop Engineering Reliable Autonomous Systems (ERAS 2024), Leiden, the Netherlands, June 12, 2024.

[KT7] Invited plenary presentation, "Formal Verification of Neural Networks in Autonomous Systems," Los Alamos National Laboratory (LANL) AI Forum, Los Alamos, New Mexico, April 22, 2024.

[KT6] Invited keynote presentation, "Formal Verification of Neural Networks in Autonomous Cyber-Physical Systems," at the International Workshop on Perception for Safety-Critical Cyber-Physical Systems (PerCPS 2023), San Antonio, TX, May 9, 2023.

[KT5] Invited keynote presentation, "Formal Verification for Neural Networks in Autonomous Cyber-Physical Systems," at the 4th Workshop on Formal Methods for Autonomous Systems (FMAS 2022), Berlin, Germany, September 26, 2022.

[KT4] Invited plenary presentation, "Repeatability, CPS-VO Design Studios, ARCH Benchmarks, and ARCH-COMP Repository," at the 7th International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH 2020), at IFAC World Congress, Berlin, Germany, July 12, 2020.

[KT3] Invited keynote presentation, "Verification for Autonomous Cyber-Physical Systems with Machine Learning Components," at the 6th International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH 2019), at Cyber-Physical Systems and Internet of Things (CPS-IoT) Week 2019, Montreal, Canada, April 15, 2019.

[KT2] Plenary presentation, "Verification of Neural Networks," at the AAAI Spring Symposium, Stanford University, Stanford, CA, March 26, 2019.

[KT1] Keynote presentation, based on paper [C9], "Real-Time Reachability for Verified Simplex Design," at the *8th International Workshop on Numerical Software Verification 2015* (NSV 2015) at Cyber-Physical Systems Week (CPS Week 2015), Seattle, WA, April 13, 2015.

INVITED PRESENTATIONS

[IT52] Presented "Formal Verification for Neuro-Symbolic Systems: Verifying Safety and Liveness in Neuro-Symbolic Behavior Trees (NSBTs)," 1st International Conference on Neuro-symbolic Systems (NeuS), University of California, Berkeley, California, May 22, 2024.

[IT51] Presented "Formal Verification of Neural Networks: From Autonomous Systems to Security and Beyond," Electrical and Computer Engineering Department Seminar, University of New Mexico, Albuquerque, New Mexico, April 23, 2024.

[IT50] Presented " Metacognition in Autonomous Cyber-Physical Systems with Neural Network Verification, Repair, and Monitoring," ARO Workshop on Metacognitive Prediction of AI Behavior, Arizona State University, Tempe, AZ, November 15, 2023.

[IT49] Presented "Formal Verification for Neural Networks in Autonomous Cyber-Physical Systems," Lero SFI Research Centre for Software and University of Limerick, Limerick, Ireland, June 7, 2023.

[IT48] Presented "Formal Verification for Neural Networks in Autonomous Cyber-Physical Systems," Oxford University Computer Science Department, Oxford, UK, January 25, 2023.

[IT47] Presented "Formal Verification for Neural Networks in Autonomous Cyber-Physical Systems," IMDEA Software Institute, Madrid, Spain, December 15, 2022.

[IT46] Presented "Formal Verification for Neural Networks in Autonomous Cyber-Physical Systems," Formal Methods meet Machine Learning Track, 11th International Symposium On Leveraging Applications of Formal Methods, Verification and Validation (ISoLA 2022), Rhodes, Greece, October 25, 2022.

[IT45] Presented (virtually, alongside Stanley Bak and Changliu Liu) "How Good are Current Neural Network Formal Verification Methods," AI in Aviation Standard Committee (SAE G-34/EUROCAE WG-114), Technical Talks: Regular Sessions, December 2, 2021.

[IT44] Presented (virtually) "Semantic Segmentation Neural Network Verification," Stony Brook University, CSE-643: Cyber-Physical Systems & Verification Seminar, September 23, 2021.

[IT43] Presented (virtually) "Verification and assurance tools for Cyber-physical Systems with Learning-Enabled Components," IEEE Real Time Systems Symposium (RTSS), Application of DARPA Assured Autonomy Program Technologies to Autonomous Learning-Enabled Real-Time Systems Hot Topics Day Workshop, December 1, 2020.

[IT42] Presented (virtually) "Verifying Deep Neural Networks in Autonomous Cyber-Physical Systems," University of Southern California, Center for Cyber-Physical Systems and the Internet of Things (CCI) and Ming Hsieh Institute for Electrical Engineering (MHI) Seminar, November 18, 2020.

[IT41] Presented "Verifying Deep Neural Networks in Autonomous Cyber-Physical Systems," University of Memphis, Computer Science Colloquium, March 16, 2020.

[IT40] Presented "Challenges for Perception Verification in Autonomy," at the CPS Verification & Validation: Industrial Challenges & Foundations: Safe Learning and Optimization, Carnegie Mellon University, Pittsburgh, PA, December 11, 2019.

[IT39] Presented "Verifying Deep Neural Networks in Autonomous Cyber-Physical Systems," Georgetown University, Computer Science Colloquium, November 14, 2019.

[IT38] Presented "Formal Verification: An Introduction," DARPA seL4 Summit, September 23, 2019.

[IT37] Presented "Verifying Neural Networks in Autonomous Cyber-Physical Systems," Stony Brook University, Computer Science Seminar, July 12, 2019.

[IT36] Presented "Verifying Neural Networks in Autonomous Cyber-Physical Systems," Waterloo University, Electrical and Computer Engineering Seminar, June 3, 2019.

[IT35] Presented "Verifying Neural Networks in Autonomous Cyber-Physical Systems," McGill University, Computer Science Seminar, May 28, 2019.

[IT34] Presented "Safety Assurance in Autonomous Cyber-Physical Systems," University of Nebraska Lincoln, Computer Science and Engineering Colloquium, April 2, 2019.

[IT33] Presented "Safety and Security Assurance in Autonomous Cyber-Physical Systems," University of Illinois at Urbana-Champaign, Information Trust Institute (ITI) Seminar, March 11, 2019.

[IT32] Presented "Safety Assurance in Cyber-Physical Systems built with Learning-Enabled Components," at the CPS Verification & Validation: Industrial Challenges & Foundations: Safe Implementation of CPS, Carnegie Mellon University, Pittsburgh, PA, December 12, 2018.

[IT31] Presented "Safety and Security Assurance in Autonomous Cyber-Physical Systems with Hyperproperties & Hybrid Automata," SimCenter Center of Excellence in Applied Computational Science and Engineering, University of Tennessee at Chattanooga, SimCenter Research Seminar, October 19, 2018.

[IT30] Presented three invited lectures on "Design-Time and Runtime Verification for Safe Autonomous Cyber-Physical Systems," at the Summer School on Cyber-Physical Systems, Halmstad University, Halmstad, Sweden, June 11-15, 2018.

[IT29] Presented "SEC Faculty Travel Program Award Presentation: Formal Specification, Verification, & Falsification for Autonomous Cyber-Physical Systems with Hyperproperties & Hybrid Automata," at the Computer Science and Engineering Graduate Seminar (CSCE 681), Texas A&M University, College Station, TX, March 5, 2018.

[IT28] Presented "Software Defects in Medical Devices," in conjunction with Prof. Pampee Young's presentation "Software Error in Blood Bank Systems," Vanderbilt University Medical Center (VUMC), Department of Medicine, Division of Hematology and Oncology, Laboratory Medicine Rounds, November 10, 2017.

[IT27] Presented "Real-Time Reachability for Safety Verification of Autonomous Cyber-Physical Systems," at the CPS Verification & Validation: Industrial Challenges & Foundations: Safe Implementation of CPS, Carnegie Mellon University, Pittsburgh, PA, May 12, 2017.

[IT26] Presented "Real-Time Reachability for Safety of Autonomous Systems," at the Computer Science and Engineering Graduate Seminar (CSCE 681), Texas A&M University, College Station, TX, March 6, 2017.

[IT25] Presented "Real-Time Reachability for Verification of Autonomous Cyber-Physical Systems," at the Electrical and Computer Engineering Seminar Series (ECE698/699), Rice University, Houston, TX, March 3, 2017.

[IT24] Presented "Real-Time Reachability for Verification of Autonomous Systems," at the Computer Science Seminar, University of Houston, Houston, TX, February 20, 2017.

[IT23] Invited Presentation, "Cyber-Physical Specification Mismatches," at the Air Force Research Laboratory, Air Vehicles Directorate, Wright-Patterson Air Force Base, Dayton, OH, June 28, 2016.

[IT22] Invited Presentation, "Hybrid automata: from verification to implementation," at the MathWorks Faculty Research Summit, Natick, MA, June 4, 2016.

[IT21] Invited Presentation, "Automated Formal Verification for Cyber-Physical Systems," at the Federal Laboratory Day, Laboratory for Telecommunication Sciences, University of Maryland, College Park, MD, March 29, 2016.

[IT20] Invited Presentation, "Automated Formal Verification for Cyber-Physical Systems," at the Electrical Engineering and Computer Science Department, Vanderbilt University, Nashville, TN, March 14, 2016.

[IT19] Invited Presentation, "Automated Formal Verification for Aerospace Cyber-Physical Systems," at the Aerospace Engineering Department Seminar, University of Michigan, Ann Arbor, MI, March 8, 2016.

[IT18] Presented "Temporal and Functional Correctness in Support of Systems Biology Research," at the Green Center for Systems Biology, University of Texas Southwestern Medical Center at Dallas (UT Southwestern), Dallas, TX, January 13, 2016.

[IT17] Presented "Automating Verification of Cyber-Physical Systems with HyST," at the Formal Methods Seminar, Department of Computer Science, University of Illinois at Urbana-Champaign, Urbana, IL, December 11, 2015.

[IT16] Presented "Real-Time Reachability of Hybrid Systems for Formally Verified Supervisory Control," at the Electrical Engineering Colloquium, University of North Texas, Denton, TX, September 18, 2015.

[IT15] Invited presentation, "Automated Formal Verification of Distributed Cyber-Physical Systems," at Systems and Information Engineering Department Colloquium, University of Virginia, Charlottesville, VA, December 19, 2014.

[IT14] Invited presentation, "Cyber-Physical Specification Mismatch Identification with Dynamic Analysis," at the CPS Verification and Validation: Industrial Challenges and Foundations (CPS V&V I&F), Carnegie Mellon University, Pittsburgh, PA, December 12, 2014.

[IT13] Invited presentation, "Software Verification and Validation Methods: Automated Formal Verification of Distributed Cyber-Physical Systems," at the IEEE Metrocon, Arlington, TX, October 2, 2014.

[IT12] Presented, "Automated Formal Verification of Distributed Cyber-Physical Systems," at School of Computer Science Colloquium, McGill University, Montreal, Quebec, Canada, August 12, 2014.

[IT11] Presented, "Automated Formal Verification of Distributed Cyber-Physical Systems," at Electrical and Computer Engineering Colloquium, University of Waterloo, Waterloo, Ontario, Canada, July 25, 2014.

[IT10] Presented, "Automated Formal Verification of Distributed Cyber-Physical Systems," at the Air Force Research Laboratory's Safe & Secure Systems and Software Symposium (S5), Dayton, OH, June 10, 2014.

[IT9] Invited presentation, "Automated Formal Verification of Distributed Cyber-Physical Systems," at the Trust and Security Seminar, Information Trust Institute, University of Illinois at Urbana-Champaign, Urbana, IL, May 16, 2014.

[IT8] Presented "Automated Formal Verification for Reliable Cyber-Physical Systems," Computer Science and Engineering Colloquium, Southern Methodist University, Dallas, TX, April 2, 2014.

[IT7] Invited presentation, "Verification Techniques and Tools for Reliable Cyber-Physical Systems," University of Pennsylvania, Philadelphia, TX, April 3, 2013.

[IT6] Invited presentation, "Verification Techniques and Tools for Reliable Cyber-Physical Systems," Sandia National Laboratory, Livermore, CA, March 20, 2013.

[IT5] Invited presentation, "Verification Techniques and Tools for Reliable Cyber-Physical Systems," University of Texas at San Antonio, San Antonio, TX, March 17, 2013.

[IT4] Invited presentation, "Verification Techniques and Tools for Reliable Cyber-Physical Systems," Texas State University, San Marcos, TX, March 5, 2013.

[IT3] Invited presentation, "Verification Techniques and Tools for Reliable Cyber-Physical Systems," University of Texas at Arlington, Arlington, TX, March 4, 2013.

[IT2] Invited presentation, "Verification Techniques and Tools for Reliable Cyber-Physical Systems," Old Dominion University, Norfolk, VA, March 1, 2013.

[IT1] Invited presentation, "Safety Verification for Parameterized Hybrid Automata Networks," at Formal Methods in Systems Engineering (FORSYTE), Austrian Society for Rigorous Systems Engineering (ARiSE), Technische Universität Wien and Institute of Science and Technology Austria, Vienna, Austria, January 24, 2013.

CONFERENCE/WORKSHOP PAPER PRESENTATIONS

[CT26] Presented paper [C25], "Star-Based Reachability Analysis for Deep Neural Networks", 23rd International Symposium on Formal Methods (FM'19), Porto, Portugal, October 2019.

[CT25] Presented paper [C24], "Reachability Analysis for High-Index Linear Differential Algebraic Equations (DAEs)", 17th International Conference on Formal Modeling and Analysis of Timed Systems (FORMATS'19), Amsterdam, the Netherlands, August 2019.

[CT24] Presented paper [C23], "Decentralized Real-Time Safety Verification for Distributed Cyber-Physical Systems", Formal Techniques for Distributed Objects, Components, and Systems (FORTE'19), Copenhagen, Denmark, June 2019.

[CT23] Presented paper [W25], Decentralized real-time safety verification for distributed cyber-physical systems, 3rd International Workshop on Methods and Tools for Distributed Hybrid Systems (DHS 2019), Associated with CONCUR 2019, Amsterdam, The Netherlands, 26 August 2019.

[CT22] Presented paper [W23], "Parallelizable Reachability Analysis Algorithms for Feed-forward Neural Networks", In Proceedings of the 7th International Workshop on Formal Methods in Software Engineering (FormaliSE'19), 2019, May.

[CT21] Presented paper [OW4], "ARCH-COMP19 Category Report: Artificial Intelligence and Neural Network Control Systems (AINNCS) for Continuous and Hybrid Systems Plants", In ARCH19. 6th International Workshop on Applied Verification of Continuous and Hybrid Systems, April 2019.

[CT20] Presented paper [OW3], "ARCH-COMP19 Repeatability Evaluation Report", In ARCH19. 6th International Workshop on Applied Verification of Continuous and Hybrid Systems, 2019, April.

[CT19] Presented paper [W18], Reachability Analysis and Safety Verification for Neural Network Control Systems, Verification of Neural Networks (VNN19), AAAI 2019 Spring Symposium, March 2019.

[CT18] Presented paper [OC6], "Reachability Analysis for One Dimensional Linear Parabolic Equation," at the IFAC Conference on Analysis and Design of Hybrid Systems (ADHS 2018), Oxford, United Kingdom, July 12, 2018.

[CT17] Presented paper [W16], "Benchmark: Continuous-Time Recurrent Neural Networks," at the 5th Applied Verification for Continuous and Hybrid Systems (ARCH 2018), Oxford, United Kingdom, July 13, 2018.

[CT16] Presented paper [W17], "Benchmark: Differential Algebraic Equations (DAEs) with Varying Index," at the 5th Applied Verification for Continuous and Hybrid Systems (ARCH 2018), Oxford, United Kingdom, July 13, 2018.

[CT15] Presented paper [W15], "Benchmark: Discrete-Space Analysis of Partial Differential Equations," at the 5th Applied Verification for Continuous and Hybrid Systems (ARCH 2018), Oxford, United Kingdom, July 13, 2018.

[CT14] Presented paper [C15], "Probabilistic Formal Verification of the SATS Concept of Operation," at the 8th NASA International Symposium on Formal Methods (NFM 2016), Minneapolis, MN, June 8, 2016.

[CT13] Presented paper [W7], "Charge Pump Phase-Locked Loops and Full Wave Rectifiers for Reachability Analysis (Benchmark Proposal),"at Applied Verification for Continuous and Hybrid Systems (ARCH), Workshop Co-located with CPSWeek 2016, Vienna, Austria, April 11, 2016.

[CT12] Presented paper [W9], "Large-Scale Linear Systems from Order-Reduction (Benchmark Proposal),"at Applied Verification for Continuous and Hybrid Systems (ARCH), Workshop Co-located with CPSWeek 2016, Vienna, Austria, April 11, 2016.

[CT11] Presented paper [W6], "Quantified Bounded Model Checking for Rectangular Hybrid Automata," at the 9th International Workshop on Constraints in Formal Verification (CFV 2015), Austin, TX, November 5, 2015.

[CT10] Presented paper [LC6], "A Survey of Electrical and Electronic (E/E) Notifications for Motor Vehicles," 24th NHTSA International Technical Conference on the Enhanced Safety of Vehicles (ESV 2015), Paper Number 15-0063, Gothenburg, Sweden, June 9, 2015.

[CT9] Presented paper [C11], "Cyber-Physical Specification Mismatch Identification with Dynamic Analysis," at *International Conference on Cyber-Physical Systems* (ICCPS 2015) at Cyber-Physical Systems Week (CPS Week 2015), Seattle, WA, April 16, 2015.

[CT8] Presented paper [LC5], "Verified Planar Formation Control Algorithms by Composition of Primitives," at *AIAA SciTech*, Kissimmee, FL, January 8, 2015.

[CT7] Presented paper [C8], "Anonymized Reachability of Hybrid Automata Networks," at *12th International Conference on Formal Modeling and Analysis of Timed Systems (FORMATS)*, Florence, Italy, September 9, 2014.

[CT6] Presented paper [W2], "Model-Based Design and Analysis of a Reconfigurable Continuous-Culture Bioreactor," at 4th ACM SIGBED International Workshop on Design, Modeling, and Evaluation of Cyber-Physical Systems, Workshop Co-located with CPSWeek 2014, Berlin, Germany, April 14, 2014.

[CT5] Presented paper [W1], "Benchmark: DC-to-DC Switched-Mode Power Converters (Buck Converters, Boost Converters, and Buck-Boost Converters)," at Applied Verification for Continuous and Hybrid Systems (ARCH), Workshop Co-located with CPSWeek 2014, Berlin, Germany, April 14, 2014.

[CT4] Presented paper [C4], "A Small Model Theorem for Rectangular Hybrid Automata Networks," at the *IFIP International Conference on Formal Techniques for Distributed Systems: Joint International Conference of 14th Formal Methods for Open Object-Based Distributed Systems and 32nd Formal Techniques for Networked and Distributed Systems (FORTE/FMOODS)*, KTH, Stockholm, Sweden, June 15, 2012. (**Best Paper Award**).

[CT3] Presented paper [LC2], "Design Verification Methods for Switching Power Converters," at the *3rd IEEE Power and Energy Conference at Illinois (PECI)*, University of Illinois at Urbana-Champaign, Champaign, IL, February 24, 2012.

[CT2] Presented paper [LC1], "Turbo-Alternator Stalling Protection using Available Power Estimate," at the *2nd IEEE Power and Energy Conference at Illinois (PECI)*, University of Illinois at Urbana-Champaign, Urbana, IL, February 25, 2011. (**Best Paper Award**).

[CT1] Presented paper [C2], "Safe Flocking in Spite of Actuator Faults," at *12th International Symposium on Stabilization, Safety, and Security of Distributed Systems (SSS)*, New York, NY, September 22, 2010.

OTHER PRESENTATIONS

[OT14] Panel presentation with Matthias Hein (University of Tubingen), Cho-Jui Hsieh (UCLA), ***Taylor T. Johnson*** (Vanderbilt University), Wan-Yi Lin (Bosch Center for AI), Aditi Raghunathan (Stanford

University), Florian Tramer (Stanford University), Workshop on Security and Reliability of Machine Learning (SRML'21), Affiliated with the 19th International Symposium on Automated Technology for Verification and Analysis (ATVA'21), October 18, 2021.

[OT13] Panel presentation, "Panel discussion: Formal Methods and Machine Learning: Progress and Future directions," with Clark Barrett, ***Taylor T. Johnson***, Alessio Lomuscio, and Luca Pulina, 2nd Workshop on Formal Methods for ML-Enabled Autonomous Systems (FoMLAS'19), Affiliated with CAV'19, July 2019.

[OT12] Presented "Automated Formal Verification for Cyber-Physical Systems," at the College of Engineering Advisory Board Meeting, University of Texas at Arlington, Arlington, TX, January 29, 2016.

[OT11] Omar Beg[†] presented, "Formal Verification for Software-Controlled Power Electronics," at the Air Force Research Laboratory's Safe & Secure Systems and Software Symposium (S5), Dayton, OH, June 11, 2015.

[OT10] Presented, "Automated Formal Verification of Distributed Cyber-Physical Systems," at the Air Force Research Laboratory's Information Directorate, Rome, NY, August 5, 2014.

[OT9] Presented, "Safe Flocking in Spite of Actuator Faults and Planar Distributed Formation Control with One-Dimensional Primitives," at the Air Force Research Laboratory's Information Directorate, Rome, NY, July 23, 2014.

[OT8] Presented "Automatic Safety Verification of Distributed Cyber-Physical Systems," Texas Systems Day, Texas A&M University, College Station, TX, March 28, 2014.

[OT7] Presented "Verification and Validation for Reliable Cyber-Physical Systems," at the Computer Science Colloquium, University of Texas at Arlington, Arlington, TX, November 11, 2013.

[OT6] Presented "Safety Verification of Distributed Cyber-Physical Systems," at the Formal Methods Seminar, Department of Computer Science, University of Illinois at Urbana-Champaign, Urbana, IL, September 27, 2012.

[OT5] Presented paper [OC1], "Stability of Digitally Interconnected Linear Systems" at the 7th CSL Student Conference, January 27, 2012, Urbana, IL.

[OT4] Presented "Fault-Tolerant Distributed Cyber-Physical Systems" to the Control Systems Group, University of New Mexico, Albuquerque, NM, June 16, 2011.

[OT3] Presented "Automatic Parameterized Verification of Distributed Algorithms" at 6th CSL Student Conference, Urbana, IL, January 28, 2011.

[OT2] Presented paper [C1], "Safe and Stabilizing Distributed Cellular Flows" to the Multi-Robot Systems Lab, Rice University, Houston, TX, July 15, 2010.

[OT1] Presented paper [C1], "Safe and Stabilizing Distributed Cellular Flows" at the 5th CSL Student Conference, Urbana, IL, January 29, 2010.

DEMONSTRATION AND TUTORIAL PRESENTATIONS

Acceptance based on peer review of abstracts or short papers.

[D9] ***Taylor T. Johnson***, Hoang-Dung Tran, Diego Manzanas Lopez, "Tutorial: Safe, Secure, and Trustworthy Artificial Intelligence (AI) via Formal Verification of Neural Networks and Autonomous Cyber-Physical Systems (CPS) with NNV," *54th Annual IEEE/IFIP International Conference on Dependable Systems and Networks (DSN'24)*, June 2024. [pdf]
DOI: 10.1109/DSN-S60304.2024.00027.

[D8] Hoang-Dung Tran, Diego Manzanas Lopez, ***Taylor T. Johnson***, "Tutorial: Verification and Validation of Neural Networks in Automated Vehicles using the Neural Network Verification (NNV) Tool," *IEEE International Automated Vehicle Validation Conference (IAVVC'23)*, October 2023. [pdf].

[D7] Hoang-Dung Tran, Diego Manzanas Lopez, ***Taylor T. Johnson***, "Tutorial: Neural Network and Autonomous Cyber-Physical Systems Formal Verification for Trustworthy AI and Safe Autonomy," *International Conference on Embedded Software (EMSOFT'23)*, September 2023. [pdf]
DOI: 10.1145/3607890.3608454.

[D6] Shafiul Azam Chowdhury, Sohil Lal Shrestha, ***Taylor T. Johnson***, Christoph Csallner, "Demo: SLEMI: Finding Simulink Compiler Bugs through Equivalence Modulo Input (EMI)," *42nd International Conference on Software Engineering (ICSE'20)*, p 1-4, June 2020. [pdf]
DOI: 10.1145/3377812.3382147
Acceptance Rate: 33.3 percent (25 of 75)
Double-Blind Review (**DBR**).

[D5] Stephen A. Rees, Tamas Kecskes, Patrik Meijer, ***Taylor T. Johnson***, Katie Dey, Paulo Tabuada, Marcus Lucas, "Cyber-physical Systems Virtual Organization: Active Resources: Enabling Reproducibility,

Improving Accessibility, and Lowering the Barrier to Entry", In Proceedings of the 10th ACM/IEEE International Conference on Cyber-Physical Systems, ACM, New York, NY, USA, pp. 340–341, 2019, April.

[D4] Shafiul Chowdhury†, ***Taylor T. Johnson***, and Christoph Csallner, "Fuzzing Cyber-Physical System Development Environments With CyFuzz," Demo Session, 20th International Conference on Hybrid Systems: Computation and Control (HSCC 2017), CPSWeek 2017, Pittsburgh, PA, April 2017.

[D3] Presented demo, "Hybrid Systems Model Transformations with HyST," at the 8th NASA International Symposium on Formal Methods (NFM 2016), Minneapolis, MN, June 7, 2016.

[D2] Stanley Bak, Sergiy Bogomolov, and ***Taylor T. Johnson***, "HyST: A Source Transformation and Translation Tool for Hybrid Automaton Models," Demonstration Session, 18th International Conference on Hybrid Systems: Computation and Control (HSCC 2015), CPSWeek 2015, Seattle, Washington, April 2015.

[D1] ***Taylor T. Johnson*** and Sayan Mitra, "The Passel Verification Tool for Hybrid Automata Networks," Demonstration Session, 16th ACM International Conference on Hybrid Systems: Computation and Control (HSCC), CPSWeek 2013, Philadelphia, PA, April 9, 2013.

POSTER PRESENTATIONS

Acceptance based on peer review of abstracts, short papers, or posters.

[Po13] Jonathan Andreasen, Diego Manzanas Lopez, ***Taylor T. Johnson***, Yatis Dodia, "Parallel Verification of Neural Networks Applied to Medical Imaging (Research Poster)," *36th International Conference for High Performance Computing, Networking, Storage, and Analysis / Supercomputing Conference (SC'24)*, November 2024. [pdf].

[Po12] Nathaniel Hamilton† and ***Taylor T. Johnson***, "Architecture for an Indoor Distributed Cyber-Physical System Composed of Mobile Robots and Fog Computing Nodes," Poster Session, Safe and Secure Systems and Software Symposium (S5 2017), Dayton, Ohio, August 2017.

[Po11] Christina Wang† and ***Taylor T. Johnson***, "Moving Target Tracking with Formation Control by Groups of UAVs," Poster Session, Safe and Secure Systems and Software Symposium (S5 2017), Dayton, Ohio, August 2017.

[Po10] Luan Viet Nguyen†, James Kapinski, Xiaoqing Jin, Jyotirmoy V. Deskmukh, and ***Taylor T. Johnson***, "Hyperproperties of Real-Valued Signals," Poster Session, 20th International Conference on Hybrid Systems: Computation and Control (HSCC 2017), CPSWeek 2017, Pittsburgh, PA, April 2017.

[Po9] Luan Viet Nguyen† and ***Taylor T. Johnson***, "Towards Bounded Model Checking for Timed and Hybrid Automata with a Quantified Encoding," PhD Student Forum, Oral and Poster Sessions, 15th International Conference on Formal Methods in Computer-Aided Design (FMCAD), Austin, TX, September 27-30, 2015.

[Po8] Omar Beg† and ***Taylor T. Johnson***, "Computer-Aided Formal Verification for Power Electronics Cyber-Physical systems," PhD Student Forum, Poster Session, 15th International Conference on Formal Methods in Computer-Aided Design (FMCAD), Austin, TX, September 27-30, 2015.

[Po7] Luan Viet Nguyen†, Christian Schilling, Sergiy Bogomolov, and ***Taylor T. Johnson***, "HyRG: A Random Generation Tool for Affine Hybrid Automata," Poster Session, 18th International Conference on Hybrid Systems: Computation and Control (HSCC 2015), CPSWeek 2015, Seattle, Washington, April 2015. Software Tool: `http://verivital.com/hyrg/`

[Po6] Hoang-Dung Tran†, Luan Viet Nguyen†, and ***Taylor T. Johnson***, "Transforming Differential Algebraic Equations (DAEs) to Hybrid Automaton Models for Formal Verification," Poster Session, Texas Systems Day 2015, University of Texas at Dallas, Plano, Texas, March 28, 2015.

[Po5] Leonardo Bobadilla, ***Taylor T. Johnson***, and Amy LaViers, "Towards Verified Planar Formation Control Algorithms by Composition of Primitives," 5th Workshop on Formal Methods for Robotics and Automation Poster Session, Workshop Co-located with Robotics: Science and Systems Conference (RSS), Berkeley, CA, July 12, 2014. [poster pdf] [abstract pdf]

[Po4] Luan Viet Nguyen† and ***Taylor T. Johnson***, "Model-Based Design and Analysis of a Continuous-Culture Bioreactor for Systems Biology Experiments," Texas Systems Day Poster Session, Texas A&M University, College Station, TX, March 28, 2014. [poster pdf]

[Po3] ***Taylor T. Johnson*** and Sayan Mitra, "Verification of Distributed Cyber-Physical Systems: Stability of Digitally Interconnected Linear Systems," Poster Session, Coordinated Science Laboratory 60th Anniversary Symposium, University of Illinois at Urbana-Champaign, Urbana, IL, October 28, 2011. [poster pdf]

[Po2] ***Taylor T. Johnson*** and Sayan Mitra, "Verification of Distributed Cyber-Physical Systems: Stability of Digitally Interconnected Linear Systems," Poster Session, Coordinated Science Laboratory Symposium on Emerging Topics in Control and Modeling: Cyber-Physical Systems, Urbana, IL, October 20, 2011. [poster pdf]

[Po1] ***Taylor T. Johnson*** and Sayan Mitra, "Power Usage of Time and Event-Triggered Paradigms: A Case Study," Poster Session, 15th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), CPSWeek 2009, San Francisco, CA, April 13, 2009. [poster pdf]

SOFTWARE TOOLS AND ARTIFACTS

We develop a large amount of research software, particularly verification software tool prototypes, some of which is peer-reviewed through activities such as software repeatability evaluations. Source code for each major artifact is indicated below, and is maintained on the following accounts (Git/Mercurial): `https://github.com/verivital`, `https://bitbucket.org/verivital/`, `https://bitbucket.org/ttj/`, `https://github.com/ttj`.

[S11] Behavior Tree Verification Tool (BehaVerify): This software tool implements methods to formally verify behavior trees. Development timeframe: 2020-present. Related papers include [C36,W31,W30]. https://github.com/verivital/behaverify

[S10] NNV and nnmt: Neural network verification and neural network model transformation tools. These software tools implement methods for formally verifying properties of systems incorporating neural networks, as well as for interchange with other neural network verification tools and related software, such as ONNX, PyTorch, Keras, Tensorflow, etc. Development timeframe: 2018-present. Related papers include [C52,C49,C40,C35,C31,C27,C29,J21,W27,C25,J20,W23,W22,OW4,J13]. Available online: https://github.com/verivital/nnv/ and https://github.com/verivital/nnmt. Reproducible CodeOcean capsules are also available (CAV'20 Tool [C27]: `https://doi.org/10.24433/CO.0221760.v1`, CAV'20 ImageStar Paper [C29]: `https://doi.org/10.24433/CO.3351375.v1`).

[S9] Hybrid Automata Learning Toolkit (HAutLearn): This software tool implements methods to infer hybrid automaton models from time-series data. Development timeframe: 2018-present. Related papers include [J23].
https://github.com/verivital/hautlearn

[S8] daev: Differential algebraic equation (DAE) verification tool. This software tool implements methods to formally verify safety properties of systems incorporating DAEs, specifically targeted for DAEs with index greater than one, for which it is impossible to represent as classical hybrid automata without model transformations. Development timeframe: 2017-present. Related papers include [C24]. https://github.com/verivital/daev

[S7] pdev: Partial differential equation (PDE) verification tool. This software tool implements numerical reachability analysis methods for systems incorporating PDEs. Development timeframe: 2017-present. Related papers include [OC6]. https://github.com/verivital/pdev

[S6] SLForge and CyFuzz: Random differential testing for CPS Development Toolchains. This software tool randomly generates CPS model artifacts, currently targeting the MathWorks' Simulink/Stateflow (SLSF). Development timeframe: 2015-present. Related papers include [C26,D6,C21,D4,W10].
https://github.com/verivital/slsf_randgen

[S5] HyST: Hybrid Source Transformer. This software tool takes hybrid automaton models in the SpaceEx XML or Compositional Interchange Format (CIF) formats and translates them to other popular hybrid systems verification and reachability analysis tools, including Flow*, dReach, HyComp, HyCreate, and development tools including MathWorks' Simulink/Stateflow (SLSF). Development timeframe: 2014-present. Related papers include [C27,J17,C14,C13,C12,C10,D2]. *Best repeatability evaluation award [C14]*. Available online: http://www.verivital.com/hyst/

[S4] rtreach: Real-time reachability algorithms for hybrid systems with linear and nonlinear dynamics: This software implements reachability analysis algorithms based on face-lifting that have worst-case execution time (WCET) guarantees. Related papers include [C23,J4,C9]. Development timeframe: 2014-present. Available online: https://github.com/verivital/rtreach/

[S3] Hynger: Hybrid iNvariant GEneratoR: This software tool takes MathWorks' Simulink/Stateflow (SLSF) models, instruments them, and produces traces for dynamic analysis in tools like Daikon. Related papers include [J16,J6,J12,C11]. Development timeframe: 2014-present. Available online: http://www.verivital.com/hynger/

[S2] HyRG: Hybrid Random Generator. This software tool randomly generates hybrid automaton models, and is integrated within HyST [S5] to generate models in output formats compatible with several

different formal verification tools for hybrid systems. Development timeframe: 2014-2016. Related papers include [C12,Po7]. Available online: http://www.verivital.com/hyrg/

[S1] Passel: This software tool is used for parameterized verification (sometimes known as uniform verification) of parameterized networks of hybrid automata, and has been used to verify safety specifications in several distributed cyber-physical systems such as proving safe separation in air traffic control protocols. Development timeframe: 2011-2014. Related papers include [C8,LC4,C4,C3]. Available online: https://publish.illinois.edu/passel-tool/

RESEARCH MENTORING (CURRENT)

POSTDOCTORAL RESEARCH SCHOLAR AND RESEARCH SCIENTIST ADVISER

[PD3] Navid Hashemi, Spring 2025 – Present.

[PD2] Tianshu Bao, Fall 2023 – Present.

[PD1] Diego Manzanas Lopez, Fall 2022 – Present.

DOCTORAL DISSERTATION ADVISER

[DS5] Fall 2023 – Present: Anne Tumlin, Computer Science, Vanderbilt University, Dissertation Topic: Fairness verification in graph neural networks. Co-advised with Prof. Tyler Derr. Major awards: 2024 DOE CSGF ($\$500k$).

[DS4] Fall 2023 – Present: Samuel Sasaki, Computer Science, Vanderbilt University, Dissertation Topic: Runtime verification in machine learning.

[DS3] Fall 2023 – Present: Thuy Dung (Judy) Nguyen, Computer Science, Vanderbilt University, Dissertation Topic: Robust federated and adversarial machine learning. Co-advised with Prof. Kevin Leach.

[DS2] Fall 2020 – Present: Preston Robinette, Electrical Eng. and Computer Science, Vanderbilt University, Dissertation Topic: Robustness verification in steganography and watermarking neural networks. Major awards: 2021 NDSEG Fellowship ($\$500k$).

[DS1] Summer 2019 – Present: Serena Serbinowska, Electrical Eng. and Computer Science, Vanderbilt University, Dissertation Topic: Hyperproperties in adversarial machine learning and cyber-physical systems.

MASTER'S THESIS ADVISER

[MS1] None currently.

UNDERGRADUATE RESEARCHERS

Spring 2025 **Grant Petrosky**, *Vanderbilt BSc ECE, Project: "Autonomous systems development," Vanderbilt University School of Engineering (VUSE) Summer Research Program*.

RESEARCH MENTORING (PAST / GRADUATED ALUMNI)

POSTDOCTORAL RESEARCH SCHOLAR ALUMNI

[PDA4] 8/2017 – 8/2019: Joel Rosenfeld, Electrical Eng. and Computer Science, Research Topic: Optimization-Based Verification for Cyber-Physical Systems. Next/current position: Assistant Professor, Mathematics and Statistics, University of South Florida. Website: `http://joel.rosenfeldresearch.com/`

[PDA3] 11/2015 – 8/2019: Weiming Xiang, Electrical Eng. and Computer Science, Research Topic: Unbounded-Time Reachability Analysis for Switched Systems. Research results: [J21,OC6,J15,OC8,J13,BC1,J14,J9,J7,OC4,W12,OC3,OC2]. Next/current position: Assistant Professor, School of Computer and Cyber Sciences, Augusta University. Website: `https://xiangweiming.github.io/`

[PDA2] 1/2016 – 5/2017: Andrew Sogokon, Electrical Eng. and Computer Science, Vanderbilt University, Research Topic: Liveness Verification for Hybrid Automata. Research results: [J11,C19,C16,OC2,W8]. Next position: Postdoc at Carnegie Mellon University. Current position: Lecturer at the University of Southampton, UK. Website: `https://sites.google.com/site/andrewsogokon/`

[PDA1] 3/2016 – 8/2016: Khaza Anuarul Hoque, Department of Computer Science and Eng., University of Texas at Arlington, Research Topic: Formal Verification for Aerospace CPS. Research results: [J12,C17,C15]. Next position: Research Fellow at Oxford University. Current position: Assistant Professor, Electrical Engineering and Computer Science (EECS) at University of Missouri Columbia. Website: `https://www.kahoque.com/`

DOCTORAL DISSERTATION ALUMNI

[DA10] Summer 2019 – Fall 2023: Neelanjana Pal, Electrical Eng. and Computer Science, Vanderbilt University, Dissertation Topic: Robustness verification in time-series neural networks.

[DA9] Fall 2017 – Summer 2023: Tianshu Bao, Electrical Eng. and Computer Science, Vanderbilt University, Dissertation Topic: Partial differential equation for physics-informed machine learning.

[DA8] Fall 2017 – Summer 2022: Diego Manzanas Lopez, Electrical Eng. and Computer Science, Vanderbilt University, Dissertation Title: Learning and Verification of Dynamical Systems with Neural Network Components. Research results: [BC1].

[DA7] Fall 2017 – Summer 2022: Xiaodong Yang, Electrical Eng. and Computer Science, Vanderbilt University, Dissertation Title: Reachability Analysis and Repair of Deep Neural Networks in Autonomous Systems. Next position: Research Scientist at Visa Research.

[DA6] Summer 2017 – Summer 2022: Nathaniel (Nate) Hamilton, Electrical Eng. and Computer Science, Vanderbilt University, Dissertation Title: Safe and Robust Reinforcement Learning for Autonomous Cyber-Physical Systems. Major awards: 2019 NDSEG Fellowship.

[DA5] Fall 2017 – Spring 2022: Patrick Musau, Electrical Eng. and Computer Science, Vanderbilt University, Dissertation Title: Safety Assurance of Autonomous Learning-Enabled Cyber Physical Systems. Research results: [BC1].

[DA4] Spring 2015 – Summer 2020: Hoang-Dung Tran, Electrical Eng. and Computer Science, Vanderbilt University, Dissertation Topic: Formal Verification of Distributed Cyber-Physical Systems. Research results: [C25,C23,C24,W23,OC6,J14,J15,J9,J7,W12,OC3,OC2,W9,W4,J2]. Next position: Assistant Professor, Computer Science and Engineering, University of Nebraska Lincoln. Website: `https://sites.google.com/site/trhoangdung/`

[DA3] Fall 2015 – Fall 2019: Shafiul Chowdhury, Department of Computer Science and Eng., University of Texas at Arlington, Dissertation Topic: Randomized Differential Testing for CPS Development Environments. Co-advised with Prof. Christoph Csallner. Research results: [C21,W10]. Next position: Research Scientist, Facebook. Website: `https://shafiul.github.io/`

[DA2] Spring 2014 – Summer 2018: Luan Viet Nguyen, Department of Computer Science and Eng., University of Texas at Arlington, Dissertation Topic: Specifications for Cyber-Physical Systems. Research results: [J12,C20,J17,C18,W11,W12,J7,OC2,W9,W6,C12,W4,W1,W2,J2]. Next position: Postdoc at University of Pennsylvania, then Postdoc at University of Notre Dame; Current position: Assistant Professor at University of Dayton. Website: `https://luanvietnguyen.github.io/`

[DA1] Summer 2014 – Summer 2017: Omar Beg, Department of Electrical Engineering, University of Texas at Arlington, Dissertation Topic: Reachability Analysis of Power Electronics and Systems. Co-advised with Prof. Ali Davoudi. Research results: [J16,J17,J10,J6,OC5,W11,W7]. Next position: Assistant Professor at University of Texas at Permian Basin. Website: `https://sites.google.com/site/omaralibeg/`

OTHER FORMER GRADUATE STUDENTS

[FS2] Fall 2017 – Fall 2018: Yuanqi Xie, Electrical Eng. and Computer Science, Vanderbilt University, Research Topic: Auto-scribing electronic health records with natural language processing and autosummarization.

[FS1] Fall 2017 – Spring 2018: Ran Hao, Electrical Eng. and Computer Science, Vanderbilt University, Research Topic: Safe reinforcement learning for distributed autonomous robots.

MASTER'S THESIS ALUMNI

[MA8] Summer 2017 – Fall 2021: Ayana Wild, Electrical Eng. and Computer Science, Vanderbilt University, Thesis Topic: Examining the Impact of Curricular and Robotic Interventions.

[MA7] Fall 2019 – Summer 2020: Ulysses Yu, Electrical Eng. and Computer Science, Vanderbilt University, Thesis Topic: Combining Reachable Set Computation with Neuron Coverage.

[MA6] Fall 2015 – Summer 2016: Randy Long, Electrical Engineering, University of Texas at Arlington, Thesis Topic: Time-Triggered Controller Area Network Design for Formula SAE Racecars and Technique for Measuring CPU Usage on Systems with Nested and Non-Nested Interrupts. Next position: Engineer at Faraday Future.

[MA5] Fall 2015 – Summer 2016: Rahul Kawadgave, Electrical Engineering, University of Texas at Arlington, Thesis Topic: Automatic Conflict Classification for Vulnerable Road Users. Next position: Engineer at Qualcomm.

[MA4] Fall 2014 – Spring 2016: Nathan Hervey, Computer Science and Eng., University of Texas at Arlington, Thesis Topic: Distributed Robotics Localization and Control. Next position: Software Engineer at Lockheed Martin.

[MA3] Fall 2014 – Spring 2015: Shweta Hardas, Electrical Engineering, University of Texas at Arlington, Thesis: "Virtual and Hardware Prototyping of a Modular Multilevel Inverter for Photovoltaics". Next position: Engineer at Cummins.

[MA2] Fall 2013 – Spring 2015: Ruoshi Zhang, Electrical Engineering, University of Texas at Arlington, Thesis: "Model-Based Design and Analysis of Automotive Systems using Time-Triggered Controller Area Networks (TTCAN)". Next position: PhD student in Electrical Engineering at University of Texas at Arlington.

[MA1] Fall 2013 – May 2015: Amol Vengurlekar, Electrical Engineering, University of Texas at Arlington, Thesis: "Design of a Real-Time Reconfigurable Bioreactor". Next position: Engineer at EchoStar.

MASTER'S PROJECT ALUMNI

[MP4] Fall 2018 – Summer 2019: Ronald Picard, Vanderbilt University, Master of Engineering: Cyber-Physical Systems, Project: "Action Schema Neural Networks: Generalized Policies for Stochastic Planning Problems in the Wargaming Domain". Next position: Computer Engineer at Air Force Research Laboratory, Aerospace Systems Directorate, Autonomous Controls Branch.

[MP3] Summer 2018 – Fall 2018: Ruohan Wang, Vanderbilt University, Computer Science, Project: "Auto-Scribing Electronic Health Records (EHRs) with Natural Language Processing (NLP) and Autosummarization". Next position: Software Engineer at Google.

[MP2] Spring 2014 – Spring 2015: Zankar Bapat, University of Texas at Arlington, Electrical Engineering, Project: "Robot Localization with Circle Detection". Next position: Engineer at Ferro Technologies.

[MP1] Fall 2012–Spring 2013, University of Illinois at Urbana-Champaign, Electrical and Computer Engineering: Shamina Shahrin Hossain (first-year graduate student), Project: Verification of Closed-Loop Switching Power Converters (resulted in paper [LC3]).

UNDERGRADUATE RESEARCH PROJECT ALUMNI

Summer 2024 **Lana Cartailler** , *Vanderbilt BSc CS, Project: "Malware Detection Graph Neural Network Verification," Vanderbilt University School of Engineering (VUSE) Summer Research Program*.

Summer 2023 **Seojin Lee**, *Johns Hopkins University BSc CS, Project: "Semantic Segmentation Neural Network Verification," Vanderbilt University School of Engineering (VUSE) Summer Research Program*.

Summer 2023 **Jingyu (Gloria) Zhang**, *Vanderbilt BSc CS, Project: "Semantic Segmentation Neural Network Verification," Vanderbilt University School of Engineering (VUSE) Summer Research Program*.

Summer 2022 **Amanda Zhou**, *Vanderbilt BSc CS, Project: "Trustworthy Artificial Intelligence (AI)," Vanderbilt University School of Engineering (VUSE) Summer Research Program*.

Summer 2020 **Yi Li**, *Vanderbilt BSc CS, Project: "Neural Network and Machine Learning Verification," Vanderbilt University School of Engineering (VUSE) Summer Research Program*.

Summer 2020 **Siqi (Christine) Zhao**, *Vanderbilt BSc CS, Project: "Neural Network and Machine Learning Verification," Vanderbilt University School of Engineering (VUSE) Summer Research Program*.

Summer 2019–Spring 2020 **Diandry A Rutayisire**, *Vanderbilt BSc CS, Project: "Autonomous F1/10 Race Car," Vanderbilt University School of Engineering (VUSE) Summer Research Program and Independent Research*.

Summer 2019 **Luke Bhan**, *Vanderbilt BSc CS, Project: "Autonomous F1/10 Race Car," Vanderbilt University School of Engineering (VUSE) Research Volunteer*.

Summer 2019 **Jiuke Huang**, *Vanderbilt BSc CS, Project: "Auto-Scribing Electronic Health Records (EHRs) with Natural Language Processing (NLP) and Autosummarization," Vanderbilt University School of Engineering (VUSE) Summer Research Program*.

Summer 2019 **Rong Wang**, *Vanderbilt BSc CS, Project: "Auto-Scribing Electronic Health Records (EHRs) with Natural Language Processing (NLP) and Autosummarization," Vanderbilt University School of Engineering (VUSE) Summer Research Program*.

Summer 2019 **Julie Truong**, *Vanderbilt BSc CS, Project: "Controlling Groups of Swarm Robots," Vanderbilt University School of Engineering (VUSE) Summer Research Program*.

Summer 2019 **Angela R Maliakal**, *Tufts University BSc CS, Project: "Controlling Groups of Swarm Robots," Vanderbilt University School of Engineering (VUSE) Summer Research Program*.

Spring 2019, Fall 2018 **Arda Turkmen**, *Vanderbilt BSc CS, Project: "Auto-Scribing Electronic Health Records (EHRs) with Natural Language Processing (NLP) and Autosummarization," Vanderbilt University School of Engineering (VUSE), Individual Study*.

Spring 2019, Fall 2018 **Harsha Vankayalapati**, *Vanderbilt BSc CS, Project: "Auto-Scribing Electronic Health Records (EHRs) with Natural Language Processing (NLP) and Autosummarization," Vanderbilt University School of Engineering (VUSE), Individual Study.*

Spring 2019 **Matthew Kenigsberg**, *Vanderbilt BSc CS, Project: "Learning Hybrid Automata from Data," Vanderbilt University School of Engineering (VUSE), Individual Study.*

Fall 2018 **Teo Lee**, *Vanderbilt BSc CS, Project: "Auto-Scribing Electronic Health Records (EHRs) with Natural Language Processing (NLP) and Autosummarization," Vanderbilt University School of Engineering (VUSE) Individual Study.*

Fall 2018 **Joshua Wilson**, *Vanderbilt BSc CS, Project: "Controlling Groups of Swarm Robots," Vanderbilt University School of Engineering (VUSE) Individual Study.*

Summer 2018 **Daniel Hong**, *Johns Hopkins BSc ME, Project: "Controlling Groups of Swarm Robots," Vanderbilt University School of Engineering (VUSE) Summer Research Program.*

Summer 2018 **Joshua Wilson**, *Vanderbilt BSc CS, Project: "Controlling Groups of Swarm Robots," Vanderbilt University School of Engineering (VUSE) Summer Research Program.*

Summer 2018 **Jackson Brewer**, *Vanderbilt BSc ME, Project: "Controlling Groups of Swarm Robots," Vanderbilt University School of Engineering (VUSE) Summer Research Program.*

Summer 2018 **Yufei Yan**, *Vanderbilt BSc CS, Project: "Auto-Scribing Electronic Health Records (EHRs) with Natural Language Processing (NLP) and Autosummarization," Vanderbilt University School of Engineering (VUSE) Summer Research Program.*

Summer 2018 **Arda Turkmen**, *Vanderbilt BSc CS, Project: "Auto-Scribing Electronic Health Records (EHRs) with Natural Language Processing (NLP) and Autosummarization," Vanderbilt University School of Engineering (VUSE) Summer Research Program.*

Summer 2018 **Xueqing Zhao**, *Vanderbilt BSc CS, Project: "Auto-Scribing Electronic Health Records (EHRs) with Natural Language Processing (NLP) and Autosummarization," Vanderbilt University School of Engineering (VUSE) Summer Research Program.*

Summer 2018 **Teo Lee**, *Vanderbilt BSc CS, Project: "Auto-Scribing Electronic Health Records (EHRs) with Natural Language Processing (NLP) and Autosummarization," Vanderbilt University School of Engineering (VUSE) Summer Research Program.*

Summer 2018 **Sally Kwok**, *Vanderbilt BSc CS, Project: "Auto-Scribing Electronic Health Records (EHRs) with Natural Language Processing (NLP) and Autosummarization," Vanderbilt University School of Engineering (VUSE) Summer Research Program.*

Summer 2018 **Xue Zou**, *Vanderbilt BSc CS, Project: "Auto-Scribing Electronic Health Records (EHRs) with Natural Language Processing (NLP) and Autosummarization," Vanderbilt University School of Engineering (VUSE) Summer Research Program.*

Summer 2017 **Daniel Hong**, *Johns Hopkins BSc ME, Project: "Controlling Groups of Swarm Robots with Android Studio and Microsoft Kinect," Vanderbilt University School of Engineering (VUSE) Summer Research Program.*

Summer 2017 **Christina Wang**, *Vanderbilt BSc CS, Project: "Controlling Groups of Swarm Robots with Android Studio and Microsoft Kinect," Vanderbilt University School of Engineering (VUSE) Summer Research Program.*

Summer 2017 **Timothy Liang**, *Vanderbilt BSc CS, Project: "Controlling Groups of Swarm Robots with Android Studio and Microsoft Kinect," Vanderbilt University School of Engineering (VUSE) Summer Research Program.*

Summer 2017 **Anissa Alexander**, *Vanderbilt BSc CS, Project: "Controlling Groups of Swarm Robots with Android Studio and Microsoft Kinect," Vanderbilt University School of Engineering (VUSE) Summer Research Program.*

Summer 2017 **Austin Wilms**, *Vanderbilt BSc CS, Project: "Controlling Groups of Swarm Robots with Android Studio and Microsoft Kinect," Vanderbilt University School of Engineering (VUSE) Summer Research Program.*

Summer 2017 **Stirling Carter**, *Vanderbilt BSc CS, Project: "Controlling Groups of Swarm Robots with Android Studio and Microsoft Kinect," Vanderbilt University School of Engineering (VUSE) Summer Research Program.*

Summer 2017 **Yinghui Yang**, *Vanderbilt BSc CS, Project: "Controlling Groups of Swarm Robots with Android Studio and Microsoft Kinect," Vanderbilt University School of Engineering (VUSE) Summer Research Program*.

Summer 2015 **Ewin Tang**, *Major: Mathematics, University of Texas at Austin, Topic: Using the Isabelle Theorem Prover to Prove Some of the Top 100 Formalized Theorems*.

Fall 2013–Spring 2014 **Eric Nelson**, *Computer Science, University of Texas at Arlington, Project: Xenomai Real-Time Operating System (RTOS) Design for Continuous-Culture Bioreactor*.

Fall 2011 **Zhongdong Zhu**, *University of Illinois at Urbana-Champaign, Project: Simulating Safe and Stabilizing Distributed Cellular Flows*.

NSF RESEARCH EXPERIENCES FOR UNDERGRADUATES (REU) PROJECT ALUMNI

[REU2] Summer 2012: Lucas Buccafusca, University of Colorado at Boulder, Project: Safe Distributed Flocking Implemented on the StarL Distributed Robotics Framework. Information Trust Institute, NSF Research Experiences for Undergraduates (REU) Summer Program, University of Illinois at Urbana-Champaign.

[REU1] Summer 2009: Shashank Gupta, Indian Institute of Technology, Kharagpur, Project: Distributed Algorithms for Sensor Networks Implemented on Net-X. Information Trust Institute, NSF Research Experiences for Undergraduates (REU) Summer Program, University of Illinois at Urbana-Champaign.

PROMOTING UNDERGRADUATE RESEARCH IN ENGINEERING (PURE) ALUMNI, University of Illinois at Urbana-Champaign

[PURE10] Spring 2012 (co-advised with Adam Zimmerman): Jordan Kravitz, Project: Distributed Robotics in StarL.

[PURE9] Fall 2011: Akash Kapoor, Project: Reachability Analysis of Power Converters (resulted in paper [LC2]).

[PURE8] Spring 2011: Hershed Tilak, Project: Implementation of a Boundary Detection Algorithm.

[PURE7] Spring 2011: Jeffrey Lale, Project: A Randomized Algorithm for Deadlock-Free Robot Routing.

[PURE6] Spring 2011: Zhihao (Ted) Hong: Modeling Parameterized Power Converters using Timed Automata (resulted in paper [LC2]).

[PURE5] Fall 2010: Hershed Tilak, Project: Simulating Coupled Inverted Pendulums in Matlab.

[PURE4] Fall 2009: Jerry Sun and Dongeek Shin, Joint Project: Simulating a Planar Conveyor System in Matlab.

[PURE3] Spring 2009: Rohan Bali, Project: Simulating Coupled Inverted Pendulums in Matlab.

[PURE2] Spring 2009: Patrick Gu, Project: Extending Giotto to xGiotto on nxtOSEK for Lego Mindstorms.

[PURE1] Fall 2008: Haeran Lee, Soonwoo (Daniel) Chang, Youngho (Ryan) Park, and Yosub Shin, Joint Project: Reachability Analysis of Switched-Mode Power Converters.

SPONSORED RESEARCH SUPPORT

2013 – present **Funded Research Grants, Contracts, and Fellowships**.

Total Research Funding (PI + Co-PI, active and completed projects): $\sim \$34.45$M

Research Funding as PI: $\sim \$4.5$M (Sole PI Share: $\sim \$2.5$M). Research Funding as Co-PI: $\sim \$29.95$M.

Our research is currently supported by AFOSR, DARPA, NSA/DoD, and NSF, and past research has been supported by AFOSR, AFRL, ARO, NSF, ONR, USDOT, the MathWorks, NVIDIA, and Toyota.

ACTIVE RESEARCH SUPPORT

[AG4] Taylor T. Johnson (Co-PI), with Kevin Leach (PI), "Improving Malware Classifiers with Plausible Novel Samples," Science of Security (SoS), National Security Agency (NSA), Award Amount: $750,000, 2023-10-01 to 2026-09-30, Duration: 3.0 years.

[AG3] Taylor T. Johnson (Co-PI), with Gabor Karsai (PI), Xenofon Koutsoukos (Co-PI), Abhishek Dubey (Co-PI), Janos Sztipanovits, "Assured Neuro Symbolic Components and Systems (ANSCS)," Assured Neuro Symbolic Learning and Reasoning (ANSR), Defense Advanced Research Projects Agency (DARPA), Award Amount: $5,673,000, 2023-03-01 to 2027-02-28, Duration: 4.0 years.

[AG2] Taylor T. Johnson (PI), with Ipek Oguz (Co-PI), Meiyi Ma (Co-PI), "FMitF: Track I: Generative Neural Network Verification in Medical Imaging Analysis," Formal Methods in the Field (FMitF), Directorate for Computer and Information Science and Engineering (FMitF), National Science Foundation (NSF), Award Amount: $750,000, 2022-10-01 to 2025-09-30, Award Number: 2220401, Duration: 3.0 years.

[AG1] Taylor T. Johnson (PI), with Hoang-Dung Tran (PI, UNL), "Collaborative Research: FMitF: Track II: Enhancing the Neural Network Verification (NNV) Tool for Industrial Applications," Formal Methods in the Field (FMitF), Directorate for Computer and Information Science and Engineering (FMitF), National Science Foundation (NSF), Award Amount: $100,000, 2022-10-01 to 2025-03-30, Award Number: 2220426, Duration: 2.5 years.

COMPLETED RESEARCH SUPPORT

[CG26] Taylor T. Johnson (PI), "High-Performance Computing for Neural Network Verification," Georgia Tech Research Institute (GTRI), National Security Agency (NSA), Award Amount: $25,000, 2023-09-01 to 2024-08-31, Duration: 1.0 years.

[CG25] Taylor T. Johnson (PI (Sole)), "Verification of Autonomous Systems: Hyperproperties in Machine Learning," Trusted AI Challenge (TAI), Air Force Office of Scientific Research (AFOSR), Award Amount: $200,000, 2021-12-15 to 2023-12-14, Duration: 2.0 years.

[CG24] Taylor T. Johnson (PI), with Joel Rosenfeld (PI), Rushikesh Kamalapurkar (PI), "Collaborative Research: Operator Theoretic Methods for Identification and Verification of Dynamical Systems," Energy, Power, Control, and Networks Program, Division of Electrical, Communications and Cyber Systems, Directorate for Engineering (ENG:ECCS:EPCN), National Science Foundation (NSF), Award Amount: $229,935, 2020-10-01 to 2024-09-30, Duration: 4.0 years.

[CG23] Taylor T. Johnson (PI), with Jerry Zhu, Kate Saenko, "NSF Workshop on Safety and Trust in Artificial Intelligence Enabled Systems," Software and Hardware Foundations, Division of Computing and Communication Foundations, Directorate for Computer and Information Science and Engineering (SHF), National Science Foundation (NSF), Award Amount: $50,000, 2022-08-01 to 2023-01-31, Award Number: 2231543, Duration: 0.5 years.

[CG22] Taylor T. Johnson (PI), with Christoph Csallner (PI), "SHF: Small: Collaborative Research: Fuzzing Cyber-Physical System Development Tool Chains with Deep Learning (DeepFuzz-CPS)," Software and Hardware Foundations, Division of Computing and Communication Foundations, Directorate for Computer and Information Science and Engineering (CISE:CCF:SHF), National Science Foundation (NSF), Award Amount: $248,473, 2019-10-01 to 2022-09-30, Duration: 3.0 years.

[CG21] Taylor T. Johnson (Co-PI), with Gabor Karsai, Xenofon Koutsoukos (Co-PI), Ted Bapty (Co-PI), Janos Sztipanovits (Oversight), "Assurance-Based Learning-Enabled Cyber-Physical Systems (ALC)," Assured Autonomy (AA), Defense Advanced Research Projects Agency (DARPA), Award Amount: $7,200,000, 4/2/2018 to 2023-01-31, Duration: 4.8 years.

[CG20] Taylor T. Johnson (Co-PI), with Xenofon Koutsoukos (PI), Janos Sztipanovits (Vanderbilt/EECS), Gabor Karsai (Vanderbilt/EECS), Aniruddha Gokhale (Vanderbilt/EECS), Yevgeniy Vorobeychik (Vanderbilt/EECS), Abhishek Dubey (Vanderbilt/EECS), Maithilee Kunda (Vanderbilt/EECS), Peter Volgyesi (Vanderbilt/EECS), Jennifer Trueblood (Vanderbilt/Psychology), S. Shankar Sastry (Berkeley/EECS), Claire Tomlin (Berkeley/EECS), Anthony Joseph (Berkeley/EECS), Saurabh Amin (MIT/CEE), Nazli Choucri (MIT/Political Science), Alvaro Cardenas (UT Dallas/CS), Bhavani Thuraisingham (UT Dallas/CS), "Science of Security for Cyber-Physical Systems Lablet," Science of Security Lablet (SoSL), Department of Defense (DoD), Award Amount: $14,750,000, 9/1/2017 to 8/31/2022, Duration: 5.0 years.

[CG19] Taylor T. Johnson (PI), with Joel Rosenfeld (Co-PI), "FMitF: Track II: Hybrid and Dynamical Systems Verification on the CPS-VO," Formal Methods in the Field (FMitF), Directorate for Computer and Information Science and Engineering (CISE:FMitF), National Science Foundation (NSF), Award Amount: $98,311, 2019-10-01 to 2021-03-30, Duration: 1.5 years.

[CG18] Taylor T. Johnson (Co-PI), with Ali Davoudi (PI, UT-Arlington), "Scalable Formal Verification of Resilient Converter-dominated MVDC Networks," Sea and Warfare Weapons (Code 33), Office of Naval Research (ONR), Award Amount: $640,000, 2018-03-01 to 2021-02-28, Award Number: N00014-18-1-2184, Duration: 3.0 years.

[CG17] Taylor T. Johnson (PI (Sole)), "Understandable and Reusable Formal Verification for Cyber-Physical Systems," Young Investigator Research Program (YIP), Air Force Office of Scientific Research (AFOSR), Award Amount: $437,469, 2018-02-01 to 2021-01-31, Award Number: FA9550-18-1-0122, Duration: 3.0 years. Due to contractual issues, I had to re-apply and compete for the AFOSR YIP again, which previously was awarded at UT-Arlington [CG9].

[CG16] Taylor T. Johnson (PI (Sole)), "Hyperproperties for Generative AI Models," Artificial Intelligence Hardware (AIHW), Semiconductor Research Corporation (SRC), Award Amount: $240,000, 2021-01-01 to 2023-12-31, Duration: 3.0 years. Recommended for award, but declined by Vanderbilt due to intellectual property (IP) contractual concerns.

[CG15] Taylor T. Johnson (PI), with Christoph Csallner (Co-PI), "SHF: Small: Automating Improvement of Development Environments for Cyber-Physical Systems (AIDE-CPS)," Software and Hardware Foundations, Division of Computing and Communication Foundations, Directorate for Computer and Information Science and Engineering (CISE:CCF:SHF), National Science Foundation (NSF), Award

Amount: $498,437, 2015-09-01 to 2019-08-31, Award Number: 1736323, 1527398, Duration: 4.0 years.

[CG14] Taylor T. Johnson (Co-PI), with Ali Davoudi (PI), David Levine (Senior Personnel), "Real-time Ab Initio Modeling of Electric Machines," Energy, Power, Control, and Networks Program, Division of Electrical, Communications and Cyber Systems, Directorate for Engineering (ENG:ECCS:EPCN), National Science Foundation (NSF), Award Amount: $285,000, 2015-08-01 to 2018-07-31, Award Number: 1509804, Duration: 3.0 years.

[CG13] Taylor T. Johnson (Co-PI), with Christoph Csallner (PI), "Equivalence Modulo Input (EMI)-Based Validation of CPS Tool Chains," Development Collaboration Research Grant (DCRG), The MathWorks (MathWorks), Award Amount: $32,000, 2018-09-01 to 2019-08-31, Duration: 1.0 years.

[CG12] Taylor T. Johnson (PI (Sole)), "Cyber-Physical Systems Specification Mismatch and Safe Upgrades," Systems and Software Program (SS), Air Force Office of Scientific Research (AFOSR), Award Amount: $397,806, 2015-08-15 to 2018-08-14, Award Number: FA9550-15-1-0258, Duration: 3.0 years.

[CG11] Taylor T. Johnson (PI (Sole)), "CRII: CPS: Safe Cyber-Physical Systems Upgrades," CISE Research Initiation Initiative, Cyber-Physical Systems Program, Division of Computer and Network Systems, Directorate for Computer and Information Science and Engineering (CISE:CNS:CRII:CPS), National Science Foundation (NSF), Award Amount: $174,634, 2015-06-15 to 2017-06-14, Award Number: 1713253, 1464311, Duration: 2.0 years.

[CG10] Taylor T. Johnson (PI), with Gautam Biswas (Co-PI), Clare McCabe (Co-PI), Julie Johnson (Co-PI), "Improving Participation of Female Computer Science Majors and Professionals through Digital Learning with Groups of Mobile Robots Controlled by Android Apps," MacroGrant, Vanderbilt Institute for Digital Learning (VIDL), Award Amount: $10,000, 2017-07-01 to 2018-06-30, Duration: 1.0 years.

[CG9] Taylor T. Johnson (PI (Sole)), "Reusable Formal Verification for Cyber-Physical Systems," Young Investigator Research Program (YIP), Air Force Office of Scientific Research (AFOSR), Award Amount: $357,564, 2016-08-01 to 2019-07-31, Award Number: FA9550-16-1-0246, Duration: 3.0 years.

[CG8] Taylor T. Johnson (Co-PI), with Ali Davoudi (PI, UT-Arlington), Frank Lewis (Co-PI, UT-Arlington), Hamidreza Modares (Co-PI, UT-Arlington), "Testbed Acquisition for Resilient Self-Organizing Microgrids," Defense University Research Instrumentation Program (DURIP), Office of Naval Research (ONR), Award Amount: $220,000, 2016-09-15 to 2017-09-14, Award Number: N0014-16-1-3180, Duration: 1.0 years.

[CG7] Taylor T. Johnson (Co-PI), with Ali Davoudi (PI, UT-Arlington), Frank Lewis (Co-PI, UT-Arlington), Hamidreza Modares (Co-PI, UT-Arlington), "Realizing Resilient Self-Organizing Microgrids," Department of Defense (DoD) Research and Education Program for Historically Black Colleges and Universities and Minority-Serving Institutions (HBCU/MI) (REP:HBCU/MSI), Army Research Office (ARO), Award Amount: $300,000, 2016-09-15 to 2017-09-14, Award Number: W911NF-16-1-0534, Duration: 1.0 years.

[CG6] Taylor T. Johnson (PI (Sole)), "Safely and Securely Controlling Large Swarms of Unmanned Aerial Vehicles (UAVs) with the STAbilizing Robot Language (StarL)," Summer of Innovation (SoI), Air Force Research Laboratory (AFRL), Award Amount: $90,000, 2017-05-01 to 2017-08-31, Award Number: FA8650-12-3-7255, Duration: 0.3 years.

[CG5] Taylor T. Johnson (PI (Sole)), "Formal Modeling of Emergence in Distributed Cyber-Physical Systems," Trusted Autonomy and Verification and Validation (VV), Integrated Command and Control (TAVV), Air Force Research Laboratory (AFRL), Award Amount: $499,546, 2015-04-16 to 2017-04-15, Award Number: FA8750-15-1-0105, Duration: 2.0 years.

[CG4] Taylor T. Johnson (Co-PI), with Stephen Mattingly (PI), Colleen Casey (Co-PI), "App-Based Crowd Sourcing of Bicycle and Pedestrian Conflict Data," University Transportation Center for Livable Communities (TRCLC), United States Department of Transportation (USDOT), Award Amount: $120,001, 2015-08-01 to 2016-07-31, Award Number: DTRT13-G-UTC60, Duration: 1.0 years.

[CG3] Taylor T. Johnson (PI (Sole)), "Detecting and Mitigating Cyber-Physical Attacks with Invariant Inference and Runtime Assurance," Summer Faculty Fellowship Program (SFFP), Air Force Office of Scientific Research (AFOSR), Award Amount: $43,575, 2015-05-18 to 2015-07-31, Duration: 0.2 years.

[CG2] Taylor T. Johnson (PI), with Ali Davoudi (Co-PI), David Levine (Senior Personnel), "Real-time Ab Initio Modeling of Electric Machines," Hardware Donation Program (HDP), NVIDIA (NVIDIA), Award Amount: $4,000, 2014-11-12 to 2014-11-12.

[CG1] Taylor T. Johnson (PI (Sole)), "Inferring Physical System Specifications from Embedded Software Tests," Visiting Faculty Research Program (VFRP), Air Force Research Laboratory (AFRL), Award Amount: $27,980, 2014-05-19 to 2014-08-08, Award Number: FA8750-13-2-0115, Duration: 0.2 years.

CONFERENCE AND OTHER TRAVEL GRANTS

August 2017 **Southeastern Conference (SEC) Faculty Travel Program Award**.

May 2017 **CPS Verification and Validation: Industrial Challenges and Foundations Workshop (CPS V&V I&F Workshop 2017), Carnegie Mellon University (NSF)**.

March 2015 **NSF CISE CAREER Workshop 2015 (NSF)**.

December 2014 **CPS Verification and Validation: Industrial Challenges and Foundations Workshop (CPS V&V I&F Workshop 2014), Carnegie Mellon University (NSF)**.

December 2012 **IEEE Real-Time Systems Symposium (RTSS), (University of Illinois at Urbana-Champaign Graduate College and NSF)**.

December 2011 **IEEE Conference on Decision and Control (CDC) (University of Illinois at Urbana-Champaign Graduate College and Rockwell Collins)**.

September 2010 **International Symposium on Stabilization, Safety, and Security of Distributed Systems (SSS) (NSF)**.

December 2009 **IEEE Real-Time Systems Symposium (RTSS) (NSF)**.

April 2009 **IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS) (NSF)**.

OUTREACH

2014 – Present **Rice Alumni Volunteers for Admission (RAVA)**.

- Interviewed prospective Rice University undergraduate students in-person and via teleconference (around 5 annually), and presented during high school college fairs.

2012 – Present **StackExchange and StackOverflow Contributor**.

- Answered over fifty questions related to computer science and programming.
- Contributed extensively to Microsoft Research's Z3 satisfiability modulo theories (SMT) solver questions, and ranked as the top user not employed by Microsoft.

2017 – 2018 **MNPS K-12 Computer Science Curriculum Development**.

- Developed a mobile phone for computer science curriculum and demonstrations using the Raspberry Pi in conjunction with Chaz Carothers, M.Ed., Encore K-4 Teacher in Metro Nashville Public Schools (MNPS), Advanced Academics Resource Teacher (AART), Henry C. Maxwell Elementary School.

2014 – 2016 **Judge**.

- January 2016: Congressional STEM Competition Mobile App Contest Judge, El Centro College, Dallas County Community College District, Dallas, TX, sponsored by US Congressman Marc Veasey (`http://www.house.gov/content/educate/app_challenge/`).
- May 2014: Congressional STEM Competition Mobile App Contest Judge, El Centro College West Campus, Dallas County Community College District, Dallas, TX, sponsored by US Congressman Marc Veasey (`http://www.house.gov/content/educate/app_challenge/`).
- 2014-2015: Computer Science Area Judge, Fort Worth Regional Science and Engineering Fair, University of Texas at Arlington, Arlington, TX.

2012 **Demonstrator, Engineering Open House**, *University of Illinois at Urbana-Champaign*, Urbana, IL.

- Spring 2012: Adam Zimmerman, Matt Johnson, ***Taylor T. Johnson***, and Sayan Mitra. Demonstration: Drawing Pictures with Mobile Robots. [video]

2007 – 2008 **Mentor for High School Students, DREAM Program**, *Rice University*, Houston, TX.

- Mentored several underrepresented high school students on science and engineering fair projects.

PROFESSIONAL ACTIVITIES AND SERVICE

PROFESSIONAL LICENSURE

2019 – Present **Professional Engineer (PE), License Number 122259**, *Tennessee Board of Architectural and Engineer Examiners*, Passed the National Council of Examiners for Engineering and Surveying (NCEES) PE exam (Software Engineering) in April 2019, fully licensed since June 2019.

2018 – 2019 **Engineer-in-Training (EiT) / Engineer Intern, License Number 33711**, *Tennessee Board of Architectural and Engineer Examiners*.

PROFESSIONAL ORGANIZATIONS

2019 – Present **Member**, *Association for the Advancement of Artificial Intelligence (AAAI)*.

2018 – Present **Member**, *National Society of Professional Engineers (NSPE)*.

2016 – Present **Member**, *American Association for the Advancement of Science (AAAS)*.

2015 – Present **Member**, *Society of Automotive Engineers (SAE International)*.

2014 – Present **Member**, *American Institute of Aeronautics and Astronautics (AIAA)*.

2005 – Present **Member**, *Institute of Electrical and Electronics Engineers (IEEE)*.

2003 – Present **Member**, *Association for Computing Machinery (ACM)*.

UNIVERSITY SERVICE

2021 – Present **Vanderbilt University, Graduate Faculty Council**.
Elected member advising the Graduate School from the School of Engineering. Participated as a panelist in Graduate Student Orientation

2017 – Present **Vanderbilt University, Ingram Commons, Vanderbilt Visions / VUcept, Faculty VUceptor for a cohort of $17-20$ first-year undergraduates.**, *Fall 2024, Fall 2023, Fall 2022, Fall 2021, Fall 2020, Fall 2019, Fall 2018, Fall 2017*.

2021 – 2024 **Vanderbilt University, Graduate Faculty Council, Executive Committee**.
Invited member of executive committee advising the Graduate School from the School of Engineering

2021 – 2022 **Vanderbilt University, Graduate School Search Committee**.
Search committee member for Associate Dean for Academic Affairs of the Graduate School

2020 **Vanderbilt University, Online Course Design Institute (OCDI), Center for Teaching**.
Participated in an online course design institute to better prepare for online and blended online-and-in-person teaching

2019 **Vanderbilt University, Ingram Commons, Vanderbilt Visions / VUcept, Student VUceptor Interviewer**.
Interviewed six prospective student VUceptor candidates for the 2019-2020 academic year

2018 – 2019 **Vanderbilt University, Ingram Commons, Vanderbilt Visions / VUcept, Commons Reading Selection Committee**.
Evaluated five potential Commons reading book prospects and made recommendations for the 2019 Commons reading

2017 – 2019 **Vanderbilt University, VU Women in Science and Engineering and VU Center for Integration of Research, Teaching, and Learning (VU-WiSE and VU-CIRTL) Tiered Mentorship Program (TMP)**, *Participated as a faculty mentor*, 2018-2019, 2017-2018.

COLLEGE/SCHOOL AND DEPARTMENTAL SERVICE

2024 – Present **Vanderbilt University, Computer Science Faculty Search Committee Member**.

2024 – Present **Vanderbilt University, College of Connected Computing (CCC), Faculty Advisory Committee**.
Provide feedback and guidance for formation of College of Connected Computing (CCC)

2024 – Present **Vanderbilt University, School of Engineering, Associate Chair for Computer Science**.
Provide strategic guidance for department, handle duties of chair when in absentia

2023 – Present **Vanderbilt University, School of Engineering, Director of Graduate Studies (DGS) for Computer Science PhD Program**.
Responsible for all aspects of the computer science PhD degree, covering recruitment, advising, program progression, staff/Graduate Program Coordinator (GPC) staff hiring and management, funding and budget management (teaching assistantship assignments, etc., totaling about $\$2.5$ million annually), etc. for over 150 PhD students

2021 – Present **Vanderbilt University, School of Engineering, Director for Master of Engineering (MEng) in Cyber-Physical Systems (CPS)**.
Responsible for all aspects of this professional graduate degree, covering recruitment, advising, program progression (serving as the Director of Graduate Studies [DGS] for the program), marketing, etc

2021 – Present **Vanderbilt University, Vanderbilt University School of Engineering, Digital Fabrication Minor, CS Faculty Delegate**.
Provided feedback on CS courses to be included in digital fabrication minor

2021 – 2023 **Vanderbilt University, Electrical Eng. and Computer Science, Destination CS / Destination Vanderbilt Faculty Search Committee Member**.

2017 – 2023 **Vanderbilt University, Electrical Eng. and Computer Science, Academic Advisor for a cohort of 35 undergraduates in Computer Science (CS) and Computer Engineering (CmpE) for the classes of 2021 and 2025**.

2017 – 2022 **Vanderbilt University, Electrical Eng. and Computer Science, WithIT Computer Science Seminar Organizer**.

2019 – 2022 **Vanderbilt University, Electrical Eng. and Computer Science, Adviser for Student Team in two F1/10 Autonomous Racecar Competitions held at events such as the Cyber-Physical Systems and Internet-of-Things Week (CPS-IoT Week) 2019 and Embedded Systems Week (ESWeek) 2019 and IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2021**.

2018 – 2021 **Vanderbilt University, Electrical Eng. and Computer Science, Director of Graduate Recruiting (DGR), Computer Science**.

Helped ACM-W/Women-in-Computing raise funds totaling around $12.5k for Vanderbilt to server as a platinum sponsor and for Vanderbilt CS students to attend the Grace Hopper Celebration of Women in Computing in 2019, and again for around a dozen and a half Vanderbilt CS students to attend the 2020 virtual edition. In total, around three dozen Vanderbilt CS students attended through our sponsorship efforts, and myself as CS DGR to help with CS graduate recruiting.

2018 – 2019 **Vanderbilt University, Electrical Eng. and Computer Science, Digital Systems (EECE2123) Revision Committee**.

Committee to determine future plans for digital systems introduction to computer systems and engineering across the CS and ECE departments, with recommendation to create a new required Computer Architecture course in CS and cross-list with ECE.

2018 – 2020 **Vanderbilt University, Electrical Eng. and Computer Science, Adviser for Student Team in 2018, 2019, and 2020 NSF Cyber-Physical Systems (CPS) Challenges**.

2019 **Vanderbilt University, School of Engineering, Profs in the House, Spoke with about 40 first year students about their transition to Vanderbilt**.

2019 **Vanderbilt University, Data Science Institute (DSI), Electrical Eng. and Computer Science, Postdoctoral Fellow Selection Committee**.

2018 **Vanderbilt University, VandyHacks, Electrical Eng. and Computer Science, Judge for Award Selection**.

2016 – Present **Vanderbilt University, Accreditation Board for Engineering and Technology (ABET) Accreditation, Computer Science (CS) and Computer Engineering (CmpE) evaluation development**.

2018 – 2019 **Vanderbilt University, Electrical Eng. and Computer Science, Digital Systems (EECE2123) Curriculum Creation Committee**.

Primary contributor to make a core undergraduate curriculum change for our Computer Science (CS), Computer Engineering (CmpE), and Electrical Engineering (EE) degrees, eliminating two required undergraduate courses (Computer Organization (CS2231) and Digital Logic (EECE2216)) and creating one new required undergraduate course (Digital Systems (EECE2123), then teaching the first iteration of EECE2123 in fall 2019.

2016 – 2018 **Vanderbilt University, Graduate Faculty Delegate Assembly (GFDA), Computer Science Representative**.

2015 – 2016 **College of Engineering, University of Texas at Arlington, Service and Committees**.

- 2015-2016: Engineering Freshman Interest Group (FIG) Mentor.

2013 – 2016 **Department of Computer Science and Eng., University of Texas at Arlington, Committees**.

- 2015 – 2016: Computer Science and Eng. Faculty Search for Three Tenure-Track Positions, Search Committee.
- 2015 – 2016: Computer Science and Eng. CSE2100: Practical Computer Hardware/Software Systems, Curriculum Committee.
- 2013 – 2016: Computer Science and Eng., Computer Engineering Curriculum Committee.
- 2013 – 2016: Computer Science and Eng. PhD Admissions Committee.
- 2013 – 2016: Computer Science and Eng. Graduate Studies Committee (GSC).
- 2013 – 2016: Computer Science and Eng. Colloquium: invited speakers for over eight invited talks.

2010–2013 **Electrical and Computer Engineering, University of Illinois at Urbana-Champaign**.

- 2010–2013: Incoming Graduate Student Orientation Program Volunteer and Panelist.

2013 – Present **Doctoral Dissertation Committee Membership**.

- 2024: Abdelrahman Waleed Elsayed Aly Hekal, "'Safety of Cyber-Physical Systems: Verification, Falsification, and Adversarial Attacks"', Computer Science, Newcastle University. Advisers: Sergiy Bogomolov and Sadegh Soudjani. Role: External examiner.
- 2023 – 2024: Nham Le, "'Verifying Neural Networks Explanation"', Electrical and Computer Engineering, University of Waterloo. Advisers: Arie Gurfinkel. Role: External examiner and committee member.
- 2022 – 2023: Florian Jaeckle, "'Towards Robust Machine Learning with Graph Neural Network"', Engineering Science, Oxford University. Advisers: Philip Torr and M. Pawan Kumar. Internal Examiner: Victor A. Prisacariu. Role: External examiner.
- 2021 – 2022: Dario Guidotti, "'Verification and Repair of Machine Learning Models"', Computer Science and Systems Engineering, University of Genova. Adviser: Armando Tacchella. Role: External examiner and committee member.
- 2020 – 2021: Niveditha Manjunath, "'Fault-Based Analysis of Cyber-Physical Systems"', Informatics, Technical University of Vienna (TU Wien). Adviser: Ezio Bartocci. Role: Reviewer and External Committee Member.
- 2017 – 2020: Ritwika Ghosh, "'Separation of distributed coordination and control for programming reliable robotics"', Computer Science, University of Illinois at Urbana-Champaign . Adviser: Sayan Mitra. Role: External Committee Member.
- 2016 – 2019: Fardin Abdi, "'Safety and security of cyber-physical systems"', Electrical and Computer Engineering, University of Illinois at Urbana-Champaign . Adviser: Marco Caccamo. Role: External Committee Member.
- 2015 – 2016: John Podolanko, Computer Science and Eng., University of Texas at Arlington. Adviser: Matthew Wright.
- 2014 – 2016: Brian Cook, Computer Science and Eng., University of Texas at Arlington. Adviser: Manfred Huber.
- 2014 – 2016: Nicholas Brent Burns, Computer Science and Eng., University of Texas at Arlington. Adviser: Gergely Zaruba.
- 2014 – 2015: Seyedali Moayedi, Electrical Engineering, University of Texas at Arlington. Adviser: Ali Davoudi.
- 2014 – 2015: Vahidreza Nasirian, Electrical Engineering, University of Texas at Arlington. Adviser: Ali Davoudi.
- 2013 – 2016: Minh Nguyen, Computer Science and Eng., University of Texas at Arlington. Adviser: Hao Che.

2013 – Present **Doctoral Preliminary Exam Committee Membership**.
Served on dozens of preliminary exam committees

REVIEWING AND SCHOLARLY COMMUNITY SERVICE

RESEARCH PROPOSAL REVIEWING

NSF **National Science Foundation (NSF), CISE Review Panels**, *2015, 2016, 2017, 2018, 2019, 2020, 2022, 2023 (3), 2024, 2025*.

ISF **Israel Science Foundation**, *2024*.

EU **European Union EUTOPIA Science and Innovation Fellowships (SIF) Programme**, *2024*.

ANR **Agence Nationale de la Recherche**, *2023, 2025*.

NDSEG **Department of Defense National Defense Science and Engineering Graduate Fellowship Program (NDSEG)**, *2021*.

SMART **Science, Mathematics And Research for Transformation (SMART) Scholarship for Service Program, Department of Defense (DoD), Reviewer**, *2016, 2018, 2019, 2020*.

NSF-EPSCoR **National Science Foundation (NSF), Ad Hoc Reviewer**, *2020*.

NSF-GRFP **National Science Foundation (NSF), Graduate Research Fellowship Program (GRFP) Panel**, *2020*.

Mitacs **Mitacs Canada Accelerate Program, External Reviewer**, *2017, 2019, 2024*.

Nebraska **University of Nebraska, Faculty Grants System Science Request for Applications**, *2018*.

NSERC **Natural Sciences and Engineering Research Council of Canada (NSERC), External Reviewer**, *2017, 2018*.

AFOSR **Air Force Office of Scientific Research (AFOSR), External Reviewer**, *2015, 2016*.

ORAU **Oak Ridge Associated Universities (ORAU), NASA Postdoctoral Program (NPP)**, *2014*.

RESEARCH REVIEWING AND ORGANIZATIONAL SERVICE

2009 – Present **Reviewing Service Overview and Verified Publons Record**.
My reviewing service for journals and conferences is verified through Publons, and a summary may be seen below with details at: `https://publons.com/author/522170/taylor-johnson` .

JOURNAL EDITORSHIP

NAHS **International Federation of Automatic Control (IFAC) Nonlinear Analysis: Hybrid Systems (NAHS)**, *2024-on*, Guest Associate Editor.

AMAI **Springer Annals of Mathematics and Artificial Intelligence (AMAI)**, *2024-on*, Associate Editor.

STTT **Springer International Journal on Software Tools for Technology Transfer (STTT)**, *2022-on*, Associate Editor.

IET-CTA **IET Control Theory & Applications, Guest Editor for Special Issue on Recent Advances in Control and Verification for Hybrid Systems**, *2018-2019*.

CONFERENCE/WORKSHOP STEERING COMMITTEE MEMBERSHIP

SAIV **Symposium on Artificial Intelligence (AI) Verification (SAIV), Steering Committee Member**, *2023-present*.

DHS **Methods and Tools for Distributed Hybrid Systems (DHS), Steering Committee Member**, *2019-present*.

SNR **International Workshop on Symbolic-Numeric Methods for Reasoning about CPS and IoT (SNR, Steering Committee Member)**, *2018-present*.

TECHNICAL PROGRAM COMMITTEE MEMBERSHIP

AAAI'26 **40th AAAI Conference on Artificial Intelligence (AAAI 2026), Senior Program Committee, Singapore, January 2026**.

NeurIPS'25 **39th Annual Conference on Neural Information Processing Systems (NeurIPS 2025), Technical Program Committee, San Diego, California, December 2025**.

ICCV'25 **IEEE International Conference on Computer Vision (ICCV 2025), Technical Program Committee, Honolulu, Hawaii, October 2025**.

EMSOFT'25 **25th ACM International Conference on Embedded Software (EMSOFT 2025), Technical Program Committee, Taipei, Taiwan, September 2025**.

IJCAI'25 **34th International Joint Conference on Artificial Intelligence (IJCAI 2025), Technical Program Committee, Montreal Canada, August 2025**.

QEST-FORMATS'25 **2nd Joint Conference of the 22nd International Conference on Quantitative Evaluation of SysTems (QEST) and 23rd International Conference on Formal Modeling and Analysis of Timed Systems (QEST-FORMATS 2025), Technical Program Committee, Aarhus, Denmark, August**, *2025*.

SAIV'25 **8th International Symposium on AI Verification (SAIV 2025), Technical Program Committee, Zagreb, Croatia, July**, *2025*.

FTfJP'25 **27th International Workshop on Formal Techniques for Judicious Programming (FTfJP'25), colocated with European Conference on Object-Oriented Programming (ECOOP), Technical Program Committee, Bergen, Norway, July 2025**.

SMC-IT/SCC'25 **IEEE International Conference on Space Mission Challenges for Information Technology (SMC-IT) and Space Computing Conference (SCC) (SMC-IT/SCC'25), Technical Program Committee, Los Angeles, CA, July 2025**.

HotSoS'25 **Hot Topics in the Science of Security 2025 (HotSoS 2025), Technical Program Committee, Virtual, April 2025**.

ICCPS'25 **16th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS 2025), Technical Program Committee, Cyber-Physical Systems and Internet of Things Week (CPS-IoTWeek), Irvine, California, May 2025**.

MLforSystems'24 **Workshop on Machine Learning (ML) for Systems, co-located with 38th Annual Conference on Neural Information Processing Systems (NeurIPS'24), Technical Program Committee, December 2024**.

FMAS'24 **Formal Methods for Autonomous Systems Workshop (FMAS'24), Technical Program Committee, Manchester, England, November 2024**.

EMSOFT'24 **24th ACM International Conference on Embedded Software (EMSOFT 2024), Technical Program Committee, Raleigh, North Carolina, USA, September 2024**.

QEST-FORMATS'24 **1st Joint Conference of the 21st International Conference on Quantitative Evaluation of SysTems (QEST) and 22nd International Conference on Formal Modeling and Analysis of Timed Systems (QEST-FORMATS 2024), Technical Program Committee, Calgary, Canada, September**, *2024*.

SMC-IT/SCC'24 **IEEE International Conference on Space Mission Challenges for Information Technology (SMC-IT) and Space Computing Conference (SCC) (SMC-IT/SCC'24), Technical Program Committee, Mountain View, CA, July 2024**.

ADHS'24 **8th IFAC Conference Analysis and Design of Hybrid Systems (ADHS 2024), Technical Program Committee, Boulder, Colorado, July 2024**.

HSCC'24 **27th ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2024), Technical Program Committee, Cyber-Physical Systems and Internet of Things Week (CPS-IoTWeek), Hong Kong, May 2023**.

ICCPS'24 **15th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS 2024), Technical Program Committee, Cyber-Physical Systems and Internet of Things Week (CPS-IoTWeek), Hong Kong, May 2024**.

NFM'24 **16th NASA Formal Methods Symposium (NFM 2024), Technical Program Committee, Moffett Field, California, May 2024**.

AAAI'24 **38th AAAI Conference on Artificial Intelligence (AAAI 2024), Senior Program Committee for Safe and Robust AI (SRAI) Track, February 2024**.

FMAS'23 **Formal Methods for Autonomous Systems Workshop (FMAS'23), Technical Program Committee, Leiden, Netherlands, November 2023**.

EMSOFT'23 **23rd ACM International Conference on Embedded Software (EMSOFT 2023), Technical Program Committee, Hamburg, Germany, September 2023**, *Outstanding Reviewer Award*.

FORMATS'23 **21st International Conference on Formal Modeling and Analysis of Timed Systems (FORMATS 2023), Technical Program Committee, September 2023**.

WFVML'23 **2nd Workshop on Formal Verification of Machine Learning (WFVML 2023), Technical Program Committee, Honolulu, Hawaii, July 2023**.

SMC-IT/SCC'23 **IEEE International Conference on Space Mission Challenges for Information Technology (SMC-IT) and Space Computing Conference (SCC) (SMC-IT/SCC'23), Technical Program Committee, Pasadena, CA, July 2023**.

SPIN'23 **29th International Symposium on Model Checking of Software (SPIN 2023), Technical Program Committee, April 2023**.

HSCC'23 **26th ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2023), Technical Program Committee, Cyber-Physical Systems and Internet of Things Week (CPS-IoTWeek), May 2023**.

ICCPS'23 **14th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS 2023), Technical Program Committee, Cyber-Physical Systems and Internet of Things Week (CPS-IoTWeek), May 2023**.

AAAI'23 **37th AAAI Conference on Artificial Intelligence (AAAI 2023), Senior Program Committee for Safe and Robust AI (SRAI) Track, February 2023**.

FMAS'22 **Formal Methods for Autonomous Systems Workshop (FMAS'22), Technical Program Committee, Berlin, Germany, October 2022**.

NSV'22 **15th International Workshop on Numerical Software Verification (NSV'22), Technical Program Committee, Haifa, Israel, August 2022**.

FORMATS'22 **20th International Conference on Formal Modeling and Analysis of Timed Systems (FORMATS 2022), Technical Program Committee, September 2022**.

CAV'22 **34th International Conference on Computer Aided Verification (CAV 2022), Technical Program Committee, August 2022**.

CVPR'22 **IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2022), Technical Program Committee, June 2022**.

AAAI'22 **36th AAAI Conference on Artificial Intelligence (AAAI 2022), Technical Program Committee, February 2022**.

HSCC'22 **25th ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2022), Technical Program Committee, Cyber-Physical Systems and Internet of Things Week (CPS-IoTWeek), May 2022**.

ICCPS'22 **13th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS 2022), Technical Program Committee, Cyber-Physical Systems and Internet of Things Week (CPS-IoTWeek), May 2022**.

ICCV'21 **IEEE International Conference on Computer Vision (ICCV 2021), Technical Program Committee, October 2021**.

CVPR'21 **IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2021), Technical Program Committee, June 2021**.

AAAI'21 **35th AAAI Conference on Artificial Intelligence (AAAI 2021), Technical Program Committee, February 2021**.

SNR'21 **7th International Workshop on Symbolic-Numeric Methods for Reasoning about CPS and IoT (SNR 2021), Technical Program Committee, August 2021**.

FMAS'21 **Formal Methods for Autonomous Systems Workshop (FMAS'21), Technical Program Committee, Virtual, October 2021**.

ADHS'21 **7th IFAC Conference Analysis and Design of Hybrid Systems (ADHS 2021), Technical Program Committee, July 2021**.

SNR'20 **6th International Workshop on Symbolic-Numeric Methods for Reasoning about CPS and IoT (SNR 2020), Technical Program Committee, August 2020**.

FMAS'20 **Formal Methods for Autonomous Systems Workshop (FMAS'20), Technical Program Committee, Virtual, October 2020**.

NFM'20 **12th NASA Formal Methods Symposium (NFM 2020), Technical Program Committee, May 2020**.

HSCC'20 **23rd ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2020), Technical Program Committee, Cyber-Physical Systems and Internet of Things Week (CPS-IoTWeek), April 2020**.

ICCPS'20 **11th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS 2020), Technical Program Committee, Cyber-Physical Systems and Internet of Things Week (CPS-IoTWeek), April 2020**.

FMAS'19 **Formal Methods for Autonomous Systems Workshop (FMAS'19), Technical Program Committee, Porto, Portugal, October 2019**.

F4TDAS'19 **1st International Workshop on Formal Techniques for Dependable Autonomous Systems (F4TDAS'19), Technical Program Committee, Turku, Finland, September 2019**.

FoMLAS'19 **2nd Workshop on Formal Methods for ML-Enabled Autonomous Systems (FoMLAS'19), Technical Program Committee, New York, NY, July 2019**.

GHC'19 **Anita Borg Institute Grace Hopper Celebration (GHC'19), Technical Program Committee, Orlando, FL, October 2019**.

ISORC'19 **22nd IEEE International Symposium on Real-Time Distributed Computing (ISORC'19), Technical Program Committee, Valencia, Spain, May 2019**.

ICCPS'19 **10th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS 2019), Technical Program Committee, Cyber-Physical Systems and Internet-of-Things Week (CPS-IoTWeek), April 2019**.

ICCPS-WiP'19 **10th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS 2019), Poster/Demo/Work-in-Progress Sessions, Technical Program Committee, Cyber-Physical Systems and Internet-of-Things Week (CPS-IoTWeek), April 2019**.

HSCC'19 **22nd ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2019), Technical Program Committee, Cyber-Physical Systems and Internet-of-Things Week (CPS-IoTWeek), April 2019**.

RTSS-AE'18 **39th IEEE Real-Time Systems Symposium (RTSS), Artifact Evaluation Committee, Nashville, TN, December 2018**.

TREC4CPS'18 **1st International Workshop on Trustworthy and Real-time Edge Computing for Cyber-Physical Systems (TREC4CPS), Technical Program Committee, Real-Time Systems Symposium (RTSS), Nashville, TN, December 2018**.

SNR'19 **5th International Workshop on Symbolic and Numerical Methods for Reachability Analysis (SNR 2019), Technical Program Committee, Cyber-Physical Systems Week (CPSWeek), Montreal, Canada 2019**.

CPS-SR'19 **2nd Workshop on Cyber-Physical Systems Security and Resilience (CPS-SR 2019), collocated with CPSWeek 2019, Technical Program Committee, Montreal, Canada, April 2019**.

EMSOFT'18 **18th ACM International Conference on Embedded Software (EMSOFT 2018), Technical Program Committee, Torino, Italy, September-October 2018**.

FAC'18 **9th International Workshop on Frontiers in Analog CAD (FAC 2018), Technical Program Committee, Vienna, Austria, May 2018**.

ICCPS'18 **9th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS 2018), Technical Program Committee, Cyber-Physical Systems Week (CPSWeek), April 2018**.

HSCC'18 **21st ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2018), Technical Program Committee, Cyber-Physical Systems Week (CPSWeek), April 2018**.

CPS-SR'18 **1st Workshop on Cyber-Physical Systems Security and Resilience (CPS-SR 2018), collocated with CPSWeek 2018, Technical Program Committee, Porto, Portugal, April 2018**.

RTSS-AE'17 **38th IEEE Real-Time Systems Symposium (RTSS), Artifact Evaluation Committee, Paris, France, December 2017**.

EMSOFT'17 **17th ACM International Conference on Embedded Software (EMSOFT 2017), Technical Program Committee, South Korea, 2017**.

V2CPS'17 **2nd International Workshop on Verification and Validation of Cyber-Physical Systems (V2CPS), co-located with the Integrated Formal Methods Conference (iFM 2017), 2017**.

HSCC'17 **20th ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2017), Technical Program Committee, Cyber-Physical Systems Week (CPSWeek), Pittsburgh, Pennsylvania, April 11-14, 2017**.

RTSS'16 **37th IEEE Real-Time Systems Symposium (RTSS), Technical Program Committee, Cyber-Physical Systems Track, Porto, Portugal, December 2016**.

EMSOFT'16 **16th ACM International Conference on Embedded Software (EMSOFT 2016), Technical Program Committee, Pittsburgh, PA, October 2-7, 2016**.

ICPP'16 **45th International Conference on Parallel Processing (ICPP 2016), Cyber-Physical Systems Track, Technical Program Committee, Philadelphia, PA, August 16-19, 2016**.

HSCC'16 **19th ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2016), Technical Program Committee, Cyber-Physical Systems Week (CPSWeek), Vienna, Austria, April 11-14, 2016**.

SNR'16 **2nd International Workshop on Symbolic and Numerical Methods for Reachability Analysis (SNR 2016), Technical Program Committee, Cyber-Physical Systems Week (CPSWeek), Vienna, Austria, April 11, 2016**.

RTSS'15 **36th IEEE Real-Time Systems Symposium (RTSS), Technical Program Committee, Cyber-Physical Systems Track, San Antonio, TX, December 1-4, 2015**.

RSWeek'15 **Distributed Control Paradigms to Enable Resilient Microgrids, Special Session at IEEE Resilience Week 2015, Co-Organizer, Philadelphia, PA, August 18-20, 2015**.

Compel'15 **16th IEEE Workshop on Control and Modeling for Power Electronics (Compel), Technical Program Committee, Vancouver, BC, Canada, July 12-15, 2015**.

RV'14 **14th International Conference on Runtime Verification (RV), Toronto, Canada, September 22-25, 2014**.

CONFERENCE ORGANIZATIONAL SERVICE

VNN'25 **6th International Verification of Neural Networks Competition (VNN-COMP'25), Co-Chair with Changliu Liu, Stanley Bak, Christopher Brix, and Haoze (Andrew) Wu, Affiliated with CAV and SAIV 2025**.

AISoLA'24 **2nd International Conference on Bridging the Gap Between AI and Reality (AISoLA'24), Verification of Neuro-Symbolic Artificial Intelligence (VNSAI) Track, Co-Chair with Daniel Neider, Crete, Greece, October 30-November 3, 2024**.

VNN'24 **5th International Verification of Neural Networks Competition (VNN-COMP'24), Co-Chair with Changliu Liu, Stanley Bak, Christopher Brix, and Haoze (Andrew) Wu, Affiliated with CAV and SAIV 2024**.

ARCH'24 **11th International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH) and 8th Hybrid Systems Verification Competition (ARCH-COMP), Artificial Intelligence and Neural Network Control Systems (AINNCS) Competition Category Chair, September 2024, 2024**.

AISoLA'23 **1st International Conference on Bridging the Gap Between AI and Reality (AISoLA'23), Track C1: Safety Verification of DNNs, Co-Chair with Daniel Neider, Crete, Greece, October 23–28, 2023**.

FORMATS'23 **21st International Conference on Formal Modeling and Analysis of Timed Systems (FORMATS'23), Special Session in Memory of Sergiy Bogomolov, Co-Chair with Martin Franzle, Antwerp, Belgium, September 19-21, 2023**.

VNN'23 **4th International Verification of Neural Networks Competition (VNN-COMP'23), Co-Chair with Changliu Liu and Stanley Bak, Affiliated with CAV 2023**.

ARCH'23 **10th International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH) and 7th Hybrid Systems Verification Competition (ARCH-COMP) Repeatability Evaluation Chair, Experimental Evaluation Chair, and Artificial Intelligence and Neural Network Control Systems (AINNCS) Competition Category Chair, September 2023, 2023**.

VNN'22 **3rd International Verification of Neural Networks Competition (VNN-COMP'22), Co-Chair with Changliu Liu and Stanley Bak, Affiliated with CAV 2022**.

ARCH'22 **9th International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH) and 6th Hybrid Systems Verification Competition (ARCH-COMP) Repeatability Evaluation Chair, Experimental Evaluation Chair, and Artificial Intelligence and Neural Network Control Systems (AINNCS) Competition Category Chair, September 2022, 2022**.

VNN'21 **2nd International Verification of Neural Networks Competition (VNN-COMP'21), Co-Chair with Changliu Liu and Stanley Bak, Affiliated with CAV 2021**.

ARCH'21 **8th International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH) and 5th Hybrid Systems Verification Competition (ARCH-COMP) Repeatability Evaluation Chair, Experimental Evaluation Chair, and Artificial Intelligence and Neural Network Control Systems (AINNCS) Competition Category Chair, IFAC ADHS, Brussels, Belgium, July 7, 2021**.

VNN'20 **3rd International Workshop on Verification of Neural Networks (VNN20) and 1st International Verification of Neural Networks Competition (VNN-COMP'20), Workshop Co-Chair with Changliu Liu, Affiliated with CAV 2020**.

ARCH'20 **7th International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH) and 4rd Hybrid Systems Verification Competition (ARCH-COMP) Repeatability Evaluation Chair, Experimental Evaluation Chair, and Artificial Intelligence and Neural Network Control Systems (AINNCS) Competition Category Chair, IFAC World Congress, Berlin, Germany, July 12, 2020**.

HSCC'20 **23rd ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2020), Poster and Demo Session Chair, Cyber-Physical Systems and Internet of Things Week (CPS-IoTWeek), April 2020**.

GHC'19 **Anita Borg Institute Grace Hopper Celebration (GHC'19), Session Chair, Orlando, FL, October 2019**.

HSCC'19 **22nd ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2019), Publicity Chair, Cyber-Physical Systems and Internet of Things Week (CPS-IoTWeek), April 2019**.

ARCH'19 **6th International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH) and 3rd Hybrid Systems Verification Competition (ARCH-COMP) Repeatability Evaluation Chair, Experimental Evaluation Chair, and Artificial Intelligence and Neural Network Control Systems (AINNCS) Competition Category Chair, Cyber-Physical Systems Week (CPSWeek), Montreal, Canada, April 15, 2019**.

RTSS'18 **39th IEEE Real-Time Systems Symposium (RTSS), Local Organizing Committee, Nashville, TN, December 2018**.

SNR'18 **4th International Workshop on Symbolic and Numerical Methods for Reachability Analysis (SNR), Co-Chair with Prof. Dr. Martin Fränzle, European Joint Conferences on Theory and Practice of Software (ETAPS), Thessaloniki, Greece, April 14-21, 2018**.

ARCH'18 **5th International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH) and 2nd Hybrid Systems Verification Competition (ARCH-COMP) Repeatability Evaluation Chair and Experimental Evaluation Chair, Oxford, United Kingdom, July 15, 2018**.

ARCH'17 **4th International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH) and 1st Hybrid Systems Verification Competition (ARCH-COMP) Repeatability Evaluation Chair and Experimental Evaluation Chair, Cyber-Physical Systems Week (CPSWeek), Pittsburgh, PA, April 17, 2017**.

HSCC-RE'17 **19th International Conference on Hybrid Systems: Computation and Control (HSCC 2016), Repeatability Evaluation Program Committee, Cyber-Physical Systems Week (CPSWeek), Vienna, Austria, April 11-14, 2016**.

ICCPS-WiP'16 **7th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS), Work-in-Progress, Demo, and Poster Chair, Cyber-Physical Systems Week (CPSWeek), Vienna, Austria, April 12, 2016**.

ARCH'16 **3rd International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH), Experimental Evaluation Chair, Cyber-Physical Systems Week (CPSWeek), Vienna, Austria, April 11, 2016**.

ARCH'15 **2nd International Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH), Experimental Evaluation Co-Chair, Cyber-Physical Systems Week (CPSWeek), Seattle, WA, April 13, 2015**.

CSL'12 **4th Annual Symposium on Emerging Topics in Control and Modeling: Networked Systems, Coordinated Science Laboratory, University of Illinois at Urbana-Champaign, Urbana, IL, October 15-16, 2012. Organizing committee chair**.

CPSWeek'11 **Cyber Physical Systems Week (CPSWeek) 2011, Chicago, IL. Designed program booklet, which was reused for CPSWeek 2012, Beijing, China**.

JOURNAL REVIEWING

ACM CSUR **ACM Computing Surveys (CSUR)**, *2020-present*.

IEEE TCAD **IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems**, *2019-present*.

IEEE TPS **IEEE Transactions on Power Systems**, *2019-present*.

IEEE ACCESS **IEEE Access**, *2018-present*.

ACM TOSEM **ACM Transactions on Software Engineering and Methodology**, *2018-present*.

ACTA INF **Acta Informatica**, *2018-present*.

TCS **Elsevier Theoretical Computer Science (TCS)**, *2017-present*.

AUTOMATICA **Elsevier International Federation of Automatic Control (IFAC) Automatica**, *2017-present*.

PIEEE **Proceedings of the IEEE**, *2017-present*.

ACM TCPS **ACM Transactions on Cyber-Physical Systems (TCPS)**, *2016-present*.

IJRNC **International Journal of Robust and Nonlinear Control (IJRNC)**, *2017*.

IEEE TAC **IEEE Transactions on Automatic Control**, *2013-present*.

IEEE CSM **IEEE Control Systems Magazine (CSM)**, *2016*.

IEEE TPEL **IEEE Transactions on Power Electronics (TPEL)**, *2016*.

ACM TECS **ACM Transactions on Embedded Computing Systems (TECS)**, *2015-present*.

IEEE SJ **IEEE Systems Journal**, *2014-present*.

IET CTA **IET Control Theory and Applications (CTA)**, *2015*.

JSSSE **Journal of Systems Science and Systems Engineering (JSSSE), Springer**, *2015*.

JPEDS **International Journal of Parallel, Emergent and Distributed Systems (JPEDS) (previously Parallel Algorithms and Applications), Taylor & Francis**, *2015*.

ACM TAAS **ACM Transactions on Autonomous and Adaptive Systems (TAAS)**, *2012, 2014*.

IEEE JSAC **IEEE Journal on Selected Areas in Communications (JSAC)**, *2012*.

IEEE TC **IEEE Transactions on Computers**, *2009*.

BOOK REVIEWER

Princeton **Princeton University Press, Book Reviewer for Princeton Series in Applied Mathematics, 2017-2018**.

EXTERNAL REVIEWER FOR CONFERENCES

CDC'19 **IEEE Conference on Decision and Control (CDC), 2019**.

ICCAD'18 **IEEE/ACM International Conference On Computer Aided Design (ICCAD), 2018**.

CDC'18 **IEEE Conference on Decision and Control (CDC), 2018**.

PECI'18 **IEEE Power and Energy Conference at Illinois (PECI), 2018**.

ACC'16 **American Control Conference (ACC), 2016**.

ICST'15 **IEEE International Conference on Software Testing, Verification and Validation (ICST), 2015 Tools Track**.

MSC'14 **IEEE Multi-Conference on Systems and Control, 2014**.

PECI'14 **IEEE Power and Energy Conference at Illinois (PECI), 2014**.

ICCPS'13 **ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS), 2013**.

HSCC'13 **ACM International Conference on Hybrid Systems: Computation and Control (HSCC), 2013**.

PECI'13 **IEEE Power and Energy Conference at Illinois (PECI), 2013, 2014**.

HSCC'12 **ACM International Conference on Hybrid Systems: Computation and Control (HSCC), 2012**.

SSS'12 **International Symposium on Stabilization, Safety, and Security of Distributed Systems (SSS), 2012**.

RSS'12 **Robotics: Science and Systems Conference (RSS), 2012**.

HSCC'11 **ACM International Conference on Hybrid Systems: Computation and Control (HSCC), 2011**.

NFM'11 **NASA Formal Methods Symposium (NFM), 2011**.

HSCC'10 **ACM International Conference on Hybrid Systems: Computation and Control (HSCC), 2010**.

OTHER REVIEWING SERVICE

2018 – 2019 **Curriculum Reviewer**.

- National Council of Examiners for Engineering and Surveying (NCEES), Fundamental of Engineering (FE) Exam, Professional Activities and Knowledge Study (PAKS), Survey Creation Committee for Electrical/Computer Engineering (2018-2019).

MISCELLANEOUS

Citizenship **US Citizen**.

PROMOTION TO PROFESSOR SUMMARY

INTRODUCTION AND OVERVIEW

I am a tenured Associate Professor at Vanderbilt University in the Department of Computer Science within the Vanderbilt University School of Engineering (VUSE). This is a one-page summary of my contributions across research, teaching, and service for the purpose of considering my promotion to Full Professor to be effective ideally by Fall 2025 or as soon as practicable thereafter. I particularly highlight those contributions since my promotion to Associate Professor with tenure in 2021 that was based on my activities through 2020, at the time in the Department of Electrical Engineering and Computer Science (EECS).

RESEARCH

My research area is the emerging domain of safe and trustworthy artificial intelligence (AI) and machine learning (ML), particularly in the context of autonomous cyber-physical systems (CPS), and my research program utilizes and advances mathematical and software techniques and tools spanning formal methods, verification, and software engineering. My research group, collaborators, and I have published over 140 papers in prestigious venues. Since becoming tenured, I have branched out in two new domains: medicine/health looking at safety and trustworthiness of machine learning in medical imaging analysis (sponsored by NSF) and trustworthiness of machine learning in security (sponsored by NSA and AFOSR), in addition to continuing work in safety of autonomous systems (sponsored by AFOSR, DARPA, and NSF) and energy CPS (sponsored by CEA and DOE). My total research funding exceeds $34 million, including several major projects across agencies post-tenure, with a total of 10 new research projects since tenure totaling around $8 million (1 DARPA, 2 AFOSR, 2 NSA, 3 NSF, 1 CEA, 1 DOE via DOE CSGF). Beyond these funded projects, I have led/co-led many other unfunded proposals (multiple to DARPA, AFRL, NSF, etc.) since tenure. Since my last promotion, my publications have received around 3150 citations, exceeding my pre-tenure citation count of around 2200 citations, with a current total citation count of around 5350 and h-index of 40. Of my publications, my group has published highly impactful and cited articles in top venues. These publications have been recognized with three best paper/artifact evaluation awards [W31,C39,C34], and also include 3 of the 6 most cited papers in the last five years at the International Conference on Computer Aided Verification (CAV) [C29,C27,C28], the 2nd most cited paper at the ACM SIGBED International Conference on Embedded Software (EMSOFT) [J20], the most cited paper at the International Symposium on Formal Methods (FM) [C25], and the 5th most cited paper in the International Journal on Software Tools for Technology Transfer (STTT) [J29], along with other well-cited publications in other venues (including AAAI, CAV, ECAI, FORMATS, ICCPS, IJCAI, SEFM, TCNS), which illustrates the impact of our research.

TEACHING

Since my promotion, I have taught 10 regular courses (ES140x 4 times, CS6315 5 times, and CS5283 once), including 3 through our online MS program (CS6315 twice and CS5283 once), and am currently teaching CS6315 in spring 2025, totaling around 400 students across the undergraduate and graduate programs. I developed a new online course (CS 6315) for the online MSc program and taught it twice, and have helped coordinate transferring it to an adjunct for fall 2024. Since my promotion, my mean teaching evaluations are higher than before tenure: my mean post-tenure teaching evaluations average 4.54 for overall instructor rating and 4.28 for overall course rating, while my pre-tenure evaluations average as 4.14 for instructor rating and 3.88 for course rating. Since my promotion, I have graduated 1 MS thesis student and 6 PhD students, and in total have graduated 8 MS thesis students and 10 PhD students, and currently supervise 1 MS thesis student, 5 PhD students, 1 postdoctoral research scientist, and 1 postdoctoral research engineer. Several of my former PhD students and postdocs have received prestigious awards (such as NSF CRII, NSF CAREER, AFOSR YIP, etc.) and are tenured now themselves.

SERVICE

Since my promotion, I served as CS Director of Graduate Recruiting (DGR) for a year, have served as Director of Graduate Studies (DGS) for the CS PhD program, and serve as Associate Chair of CS since fall 2024. Under my leadership, the CS PhD program now enrolls about 150 students, with the largest number of PhD graduates (21) in VUSE in the 2023-2024 AY. I have led revisions to the CS PhD admission process, streamlining administrative operations, revised the Graduate Catalog, coordinate approval of 3 new permanent graduate courses, helped hire current GPCs, advocating for increased staff, and providing feedback for the upcoming CCC. Beyond these, I have led all the other necessary programmatic tasks, such as graduate course scheduling, TA assignments (and managing a $\$2M$ budget), assigning preliminary examinations, etc. I continue to serve as a mentor to early career faculty in the department, including involving several assistant professors in extramural research projects (Meiyi Ma and Ipek Oguz on the NSF FMitF and Kevin Leach on an NSA project), and continue to engage others (proposal submissions in 2024 with Meiyi Ma, Thomas Beckers, Yu Huang, Kevin Leach, among others), illustrating my commitment to collaboration and mentorship. I have led Vanderbilt's sponsorship of the Grace Hopper Celebration (GHC), including fundraising, legal approvals, and coordinating with student organizations (ACM-W) to send students to attend. I served on the Executive Committee of the Graduate Faculty Council (GFC) of the Graduate School, with a primary activity of hiring the Graduate School's current Associate Dean for Academic Affairs, in addition to serving on the GFC and providing input for Graduate School activities. Beyond these activities at Vanderbilt, I expanded my research service, organizing events such as AISOLA, VNN-COMP, and ARCH-COMP, serving as editor for the International Journal on Software Tools for Technology (STTT) and the Annals of Mathematics and Artificial Intelligence (AMAI), along with program committee membership and other organizational roles for many conferences (AAAI, CVPR, ICCV, KR, UAI, CAV, HSCC, ICCPS, EMOSFT, FORMATS, SPIN, NFM, etc.), totaling several dozen such roles since tenure and including an Outstanding Reviewer award at EMOSFT'23. Finally, I co-led the 2022 NSF Workshop on Safety and Trust in Artificial Intelligence (AI) Enabled Systems (SafeTAI), which provided input for the creation of the $\$20M$ Safe learning-Enabled Systems (SLES) program.

RESEARCH STATEMENT

1 INTRODUCTION AND OVERVIEW

Artificial intelligence (AI) increasingly impacts all facets of life, and while it holds significant promise to improve human life and society, it still has significant barriers to that realization, particularly in the context of safety, security, and trustworthiness. The significance of AI's safety and trustworthiness is highlighted by President Biden's call to action during his January 15, 2025 Farewell Address[1]:

> Meanwhile, artificial intelligence is the most consequential technology of our time—perhaps of all time. Nothing offers more profound possibilities and risks for our economy and our security, our society, our very—for humanity.
>
> Artificial intelligence even has the potential to help us answer my call to end cancer as we know it. But unless safeguards are in place, AI could spawn new threats to our rights, our way of life, to our privacy, how we work, and how we protect our nation.
>
> We must make sure AI is safe and trustworthy and good for all humankind.

To address such risks and challenges, ***my research agenda is to develop and apply formal methods to enable safe, secure, and trustworthy AI.*** My work especially focuses on autonomous cyber-physical systems (CPS) that incorporate machine learning components, such as neural networks, which are inherently safety-critical, but I have expanded to other safety/security-critical domains since tenure, including medicine and cybersecurity. The barriers to the potential realization of AI's benefits are demonstrated in part by high-level actions such as President Biden's October 2023 Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence[2] and internationally by the European Union AI Act.[3] Formal methods are a critical approach to enabling the vision of safe and trustworthy AI, for instance having been highlighted in President Biden's October 2024 "Memorandum on Advancing the United States' Leadership in Artificial Intelligence; Harnessing Artificial Intelligence to Fulfill National Security Objectives; and Fostering the Safety, Security, and Trustworthiness of Artificial Intelligence."[4], as well as in emerging industrial approaches, such as Amazon/AWS Bedrock Guardrails that relies on formal methods and automated reasoning[5].

Since tenure, my research agenda since has evolved in three distinct areas, while also continuing to develop and apply formal methods for safety-critical and autonomous CPS, which has been my primary research focus throughout my academic career. Specifically since tenure, in addition to autonomous CPS, my research agenda has broadened into trustworthy AI and formal methods applied to cybersecurity, medical imaging analysis, and physics-based machine learning, and these contributions since tenure are detailed below.

2 SUMMARY OF RESEARCH ACTIVITIES

The next list is a summary and highlights of my research activities, both aggregate and since tenure.

- Publications: over 140 total refereed publications, comprising 31 journal articles (10 since tenure), 75 refereed conference proceedings papers (36 since tenure), 2 book chapters, and 44 workshop papers, plus additional more lightly-refereed conference papers, demos, and posters, in venues such as AAAI, CAV, ECAI, EMSOFT, FM, ICCPS, ICDM, IJCAI, ICSE, HSCC, RTSS, MEMOCODE, NFM, SPIN, ICDCS, FORMATS, FORTE, UAI, IEEE TNNLS, IEEE TAC, ACM TECS, ACM TCPS, STTT, IEEE TSG, IEEE TIE, IEEE TII, TCS, IEEE TEC, and DEDS, among others, of which four received best/distinguished paper awards and two received best artifact/repeatability awards
- National Awards: AFOSR Trusted AI at Scale Award [CG25], AFOSR YIP (twice) [CG9,CG17], and NSF CRII [CG11]
- Highly Cited Papers: Of these publications, my group has published 3 of the 10 most cited papers at CAV, the 5th and 17th most cited papers at STTT, the most cited paper at FM, the 2nd most cited paper at EMSOFT, and the 15th most cited paper at HSCC, illustrating the broad impact of our work on the research community

[1] Remarks by President Biden in a Farewell Address to the Nation, January 15, 2025

[2] Executive Order 14110 of October 30, 2023: Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence. While some of this guidance has as of now been rescinded with the administration change, these actions highlight the importance of safe, secure, and trustworthy AI at the highest levels.

[3] `https://artificialintelligenceact.eu/`

[4] Memorandum on Advancing the United States' Leadership in Artificial Intelligence; Harnessing Artificial Intelligence to Fulfill National Security Objectives; and Fostering the Safety, Security, and Trustworthiness of Artificial Intelligence

[5] `https://aws.amazon.com/bedrock/guardrails/`

- National Research Leadership: I co-led the 2022 NSF Workshop on Safety and Trust in AI-Enabled Systems (SafeTAI), which served to provide research community input for the creation of the 2023 NSF Safe Learning-Enabled Systems (SLES) program, including invited presentations from DARPA I2O Director Dr. Kathleen Fisher and Mozilla Foundation Fellow Deborah Raji
- Co-developed numerous publicly available software artifacts and tools, and participated in repeatability/artifact evaluations and competitions, including winning the 2022 FORMATS Best Artifact Evaluation Award and the 2025 ICCPS Best Artifact Award, and several of which have been used in industry at companies and labs such as AFRL, Collins, GM, MathWorks, Northrop Grumman, Toyota, UTC, VMware, among others
- Presented a dozen invited plenary/keynote talks at conferences/workshops, a total of 8 since tenure
- Sponsored research support: over $4.5 million research funding as PI and over $34.5 million as co-PI / senior personnel across 30 research projects, from federal research sponsors including AFOSR, AFRL, ARO, DARPA, NSA, NSF, ONR, and USDOT, and companies including MathWorks, NVIDIA, and SRC, as well as 2 PhD advisee DoD NDSEG Fellowships and 1 PhD advisee DOE CSGF Fellowship
- Mentored 7 postdocs (3 since tenure), 15 PhD students (10 graduates, 6 PhD graduates since tenure), 8 MSc theses, and several dozen undergraduate researchers

From these research activities, I am proudest of the achievements and progress of my former and current research advisees, discussed next. Since becoming a professor, I have supervised/co-supervised 7 postdoctoral research scholars, 15 PhD students, and 8 MSc thesis students, among whom, the 4 postdocs have moved to permanent positions, 10 PhD students have graduated, and 8 MSc students have moved to permanent positions or further studies. My first PhD student, Dr. Omar Ali Beg, completed his dissertation and defense and graduated at the end of summer 2017, receiving his PhD in Electrical Engineering from my former institution, UT-Arlington, and is presently a tenure-track Assistant Professor of Electrical Engineering at the University of Texas Permian Basin. Through his recruitment, Dr. Beg received a Rising STARs (Science and Technology Acquisition and Retention) grant from the University of Texas System, and for which I provided a letter of recommendation.[6] My second PhD student, Dr. Luan Viet Nguyen, completed his dissertation in spring 2018 in Computer Science and Engineering from UT-Arlington, served as a postdoc at Notre Dame after having been a postdoc at the University of Pennsylvania for a year, and joined the University of Dayton as a tenure-track Assistant Professor in fall 2020, where he has won awards such as an NSF CRII in 2023. My third PhD student, Dr. Shafiul Chowdhury, co-advised with Prof. Christoph Csallner at UT-Arlington graduated in 2019 and joined Facebook as a research scientist. My fourth PhD student, Dr. Hoang-Dung Tran, completed his PhD from Vanderbilt in summer 2020, which received the IEEE Technical Committee on Cyber-Physical Systems Outstanding Dissertation Award in 2021 and the $\approx \$80k$ SIU Gold Prize in Computer Science in 2025, and joined the University of Nebraska Lincoln as a tenure-track Assistant Professor of Computer Science and Engineering in fall 2020, where he is doing extremely well, for instance winning an NSF CAREER in 2025. Subsequent PhD students Dr. Patrick Musau joined Google, Dr. Nathaniel Hamilton joined Parallax Research, Dr. Xiaodong Yang joined Visa Research, and Dr. Neelanjana Pal joined Mathworks, with Drs. Diego Manzanas Lopez and Tianshu Bao staying at Vanderbilt in postdoctoral and research scientist positions.

Several of my PhD students participated in research internships at organizations such as AFRL (Omar Beg, Luan Nguyen, Hoang-Dung Tran, Nathaniel Hamilton, Preston Robinette), NSA (Preston Robinette), Sandia (Anne Tumlin), Google (Preston Robinette), Apple (Preston Robinette), the MathWorks (Shafiul Chowdhury, Neelanjana Pal), and Toyota (Luan Nguyen and Xiaodong Yang), giving them insight into industrial research, as well as providing guidance for the potential industrial and broader impact of our research. My former postdoc, Dr. Khaza Anuarul Hoque, is currently a tenure-track Assistant Professor of Electrical Engineering and Computer Science at the University of Missouri Columbia, and was a Fonds de Recherche du Québec - Nature et Technologies (FRQNT) Postdoctoral Fellow with Prof. Alessandro Abate at the University of Oxford after his postdoc in my group. My former postdocs Drs. Weiming Xiang and Joel Rosenfeld, both started tenure-track positions at Augusta University and the University of South Florida, respectively, in fall 2019, with both Profs. Rosenfeld and Xiang now being tenured Associate Professors and having both won national level awards (NSF CAREER, AFOSR YIP). My current students are progressing in their research toward completion of their degrees, several of whom have won various awards, and of note, Preston Robinette was selected as an NDSEG Fellow in 2021 and Anne Tumlin was selected as a DOE CSGF recipient in 2024. Beyond the impact of my advisees' research work done while under my supervision, I believe the long-term impact will be in whatever small part I can claim in having helped them achieve their own research and career goals.

To achieve ***the vision of safe, secure, and trustworthy AI***, ***my main research focus is to develop and apply methods to verify formally and automatically that systems incorporating AI satisfy their***

[6] `https://www.utsystem.edu/offices/academic-affairs/research/stars-program`

requirements and specifications. Specifically, I develop automated formal methods and their implementations in software tools to solve the ***formal verification problem***, which is to prove mathematically that a given formal model of a system satisfies a formal specification. My research draws on—and pushes the frontier of—tools and techniques from areas such as ***formal methods***, ***hybrid systems***, ***software engineering***, and ***control theory***.

3 CUMULATIVE OVERVIEW OF RESEARCH CONTRIBUTIONS

Next I highlight my cumulative research contributions over the duration of my career, specifically in the context of autonomous CPS, then detail my contributions since tenure.

3.1 Highlights, Impact, and Significance of Past Research

My research has impacted two CPS sectors: the ***foundations of CPS*** through theoretical contributions and in ***applications across several CPS domains***. The CPS domains where we have applied our methods range from ***aerospace*** [C3,C4,C5,LC4,C7,C13,LC5,J5,C15,C23,J28] to ***robotics*** [C1,C2,J1,C6,C9,LC5,J3,J4,J21,C36], as well as ***power and energy*** [LC1,LC2,LC3,W1,J2,MA3,J10,J6,J16], and ***automotive*** [LC6,CG4,C18,C20,J19,J20,C43]. I have published over 140 papers in prestigious journals, conferences, and workshops on our results to improve AI and autonomous CPS safety, security, and reliability across domains.

3.2 Contributions to Autonomous Cyber-Physical Systems (CPS)

Broadly, my research contributions are split between the *foundations of CPS* and across *CPS domains including aerospace, robotics, power/energy, automotive, and biotechnology*, as discussed in more detail next.

Foundations of Cyber-Physical Systems. CPS foundations are in active development, and my research has at its core new ways of thinking about CPS to enable the transformation from classical implementations of control systems in embedded systems to distributed networks of interacting computers controlling geographically distributed physical phenomena, which increasingly incorporate data-driven components, such as neural networks and other learning-enabled components (LECs) in CPS. Some of my foundational CPS contributions include the following.

Formal Methods: Verification of Neural Networks and Safe Autonomy: Starting around 2017, my group and I began developing methods for the verification of neural networks, which has been a major focus of our research the past few years, driven in part by our participation in DARPA's Assured Autonomy program. Our earliest work developed some of the first results for verifying neural networks with nonlinear activations functions—beyond the popular piecewise linear rectified linear unit (ReLU) activations—by exploiting monotonicity of several nonlinear activations, such as hyperbolic tangents (tanh) and sigmoids [J13]. In our approaches, we typically consider feedforward or convolutional neural networks (CNNs), which can be viewed in an abstract mathematical sense as a function from some input space to some output space, $F : \mathbb{R}^n \mapsto \mathbb{R}^m$. Within this approach, one often focuses on safety and robustness specifications, often defined as some predicate over the output space, i.e., $S \subseteq \mathbb{R}^m$. We have developed methods to compute the image (range) of the network F under a set of inputs, $X \subseteq \mathbb{R}^n$, and then check whether its intersection with the predicate S is empty, $F(X) \cap S = \emptyset$, all of which computationally is similar to hybrid systems reachability, so we refer to these approaches as reachability analyses of neural networks. For robustness to adversarial perturbations of neural networks used for image classification, one often considered a perturbation bounded under some norm, commonly the ℓ^∞-norm, which allows any pixel to vary up-to some amount from a given image $x \in \mathbb{R}^n$ (where we assume the image has been stacked into a single vector instead of as a representation in $\mathbb{R}^{w \times h}$ for width w and height h), and where the output space is now the set of classes (typically done by taking the so-called softmax or argmax of F over the original output space $\mathbb{R}^m$ and selecting the dimension $d \in \{1, \ldots, m\}$ with the greatest value). The so-called local adversarial robustness is then formulated as, given an image $x \in \mathbb{R}^n$ and a perturbation bound ϵ, if $F(x) = d$, is it the case that $\forall x' \in \mathbb{R}^n$ such that $\|x - x'\|_\infty \leq \epsilon$, $F(x') = d$? If yes, then the network F is said to be robust up-to ϵ for x as an ϵ-perturbation would not change its output class for x, and when done over a reasonable set of data (such as multiple images in a training/test data set), evaluates robustness of F, beyond the traditional accuracy evaluations done. This formulation has been implemented as the basis of our Neural Network Verification (NNV) software tool [C27,C40], which has effectively performed robustness verification of realistic CNNs, such as the VGG16 and VGG19 image classifiers [C29], as well as performing well with other benchmarks such as ACAS-Xu [W23,C25]. Beyond these approaches, we have also developed counterexample-guided abstraction refinement (CEGAR) methods for neural network verification, and showed these can greatly speed verification of neural networks [C28]. Some of our recent work in this direction includes formulating robustness specifications for semantic segmentation, and evaluating semantic segmentation networks within NNV [C31]. Most recently, we have extended NNV to consider other machine learning tasks, including video classification [C52], fairness specifications [C49], regression problems [C41], and continued to improve scalability [C40].

As neural networks and other LECs are increasingly used for perception, sensing, control, and planning tasks within autonomous CPS, we have also developed system-level verification methods where neural networks are in the feedback control loop [J20,J21]. Assuming a neural network periodically produces control inputs for a plant

model, we then consider a bounded model checking (BMC)-like approach, alternating the application of the control input over a control period from a set of initial states (e.g., $F(X_0)$ for some $X_0 \subseteq \mathbb{R}^n$ representing both the plant state space and the neural network input space) and computing reachability of the plant under that input, then repeating. With these approaches, we have shown that adaptive cruise control (ACC) systems implemented as neural networks trained with deep deterministic policy gradient (DDPG) reinforcement learning in automotive systems maintain or violate safety requirements [J20]. With Northrop Grumman, we have also verified safety specifications of autonomous underwater vehicles (AUVs) that use neural network controllers. Such system-level verification for closed-loop autonomous CPS relies on effective methods for verifying hybrid systems models of control theoretic plants, which my group has developed extensively as detailed next.

Formal Methods: Reachability Analysis and Model Checking for Hybrid Systems: Our research has made contributions to ***reachability analysis and model checking for hybrid systems*** of various classes. I developed new reachability techniques that ***exploit symmetries*** in networks of hybrid automata, ***significantly alleviating the state-space explosion problem by orders of magnitude*** compared to other approaches, addressing a fundamental challenge in applying model checking [C8]. With collaborators from the University of Toronto, I developed new ***bounded model checking (BMC)*** methods for hybrid automata using a new quantified encoding, which built upon BMC results for purely discrete systems that used quantified Boolean formula (QBF) solvers instead of SAT solvers [W6]. With Dr. Stanley Bak of AFRL's Information Directorate, I developed ***the first reachability algorithm for hybrid systems that may be implemented with real-time guarantees*** due to its novel features and no reliance on external libraries, and we implemented it on several embedded platforms to illustrate its real-time capabilities, such as ARM and Arduino processors [C9,J4]. My group has also developed more classical control theoretic results for stability analysis of switched and hybrid systems [J14,J15,J8].

With AFRL collaborators, I developed an ***intermediate representation for hybrid systems***, as well as its implementation in the publicly available HyST software tool [S5], which makes comparing different model checking and verification approaches significantly simpler, and helps lead to a science of CPS with fair comparisons and reproducible research results [C10,OC2]. More fundamentally, we have also developed and implemented novel abstraction procedures and transformation passes for the hybrid systems intermediate representation in our HyST tool, such as ***continuization*** [C13], ***hybridization*** [C14], and ***order reduction*** [J7]. ***Continuization*** transforms a nonlinear hybrid automaton into a purely continuous system such that all the behaviors of the original hybrid automaton may be matched in the continuous system (i.e., it is a sound abstraction) [C13]. ***Hybridization*** transforms a nonlinear continuous system, or a hybrid automaton, into another hybrid automaton with simpler continuous dynamics that is often easier to analyze [C14]. ***Order reduction*** takes a system with n real-valued state variables and transforms it into another system with k real-valued state variables such that $k \ll n$, and is a typical approximation used in control for which we have developed guaranteed error bounds for formal verification [J7]. *Star sets* are an effective state-space representation technique, which we have used to verify hybrid systems with very high-dimensional state spaces (billion dimensional systems, $\mathbb{R}^{10^9}$) [C22].

Existing modeling and verification methods for hybrid systems are insufficient for many interesting types of controlled physical phenomena, such as fluids, thermodynamics, and mechatronic systems whose dynamical behaviors are more appropriately modeled with partial differential equations (PDEs) or differential algebraic equations (DAEs), as opposed to the ODEs allowed in hybrid automata. To address this deficiency in modeling expressiveness and corresponding verification methods, my group has been working to develop modeling and reachability analysis methods for PDEs [OC6,W15] and DAEs [C24,W17], as well as variants of hybrid automata in a new version of HyST that allow for specifying dynamics as PDEs and DAEs. Overall, the HyST effort may someday lead to something akin to "llvm for hybrid systems," where generic (language agnostic) transformation passes ease the verification burden, similar to how llvm has helped progress in compilers and in verifying compiler optimizations.

Formal Methods and Software Engineering: Formal Specifications for Cyber-Physical Systems: Supported in part by AFOSR [CG12], AFRL [CG5], NSF [CG11], and Toyota, we have developed and applied formal specification languages for describing correct and incorrect behaviors for CPS. Building upon recent foundational work on specifications for multi-trace properties, specifically hyperproperties which are sets of properties (equivalently, sets of sets of traces), we developed a new specification language for hyperproperties for real-valued and real-time signals called HyperSTL that combines signal temporal logic (STL) with hyperproperties [C20]. One interesting observation of this work is that (local) Lyapunov stability is a hyperproperty, and not a property, as an individual trajectory being unstable does not imply a system is not Lyapunov stable. The intuition behind this is that a set of traces are needed to falsify Lyapunov stability, as a single trace may simply not have been in a neighborhood of a region of attraction about an equilibrium point. We have developed methods to falsify STL specifications that also combine frequency-domain information, which are commonly used by controls engineers [C18].

Additionally, we have considered specifications for CPS from a cyber-physical perspective, where each of cyber

(such as a software controller), physical (such as a plant), and cyber-physical (such as sensors/actuators) components are subject to specifications over their respective states. With this cyber-physical perspective, we built ***specification inference*** methods to automatically find candidate specifications from CPS models and implementations, specifically within the context of the MathWorks' Simulink/Stateflow (SLSF) [C11,J12]. Mismatches between the specifications of these cyber, physical, and cyber-physical specifications then imply candidate bugs, where a mismatch is defined as the specification between the interfaces of these components being more or less expressive (restricted, constrained) than their connected components. For example, it is common in the software controllers for closed-loop CPS to incorporate information about the plant under control, such as how physical states are sensed and observed through digital to analog conversion (DAC). If a specification change occurs in either the physical system (such as a velocity or other physical state being of greater magnitude than was assumed in the design of the cyber components) or the cyber components (such as a software update or upgrade), then by comparing the restrictiveness of the inferred specifications, we have automatically found possible cyber-physical specification mismatches and bugs [C11,J12].

Distributed Cyber-Physical Systems: Many CPS are distributed computationally and/or physically—such as air-traffic control systems like the FAA/NASA NextGen program or networked autonomous motor vehicles—and I have focused extensively on such distributed CPS. With colleagues, I developed extensions of Leslie *Lamport's happened-before relation* for networks of hybrid automata operating with real-time constraints, and applied these results in *predicate detection algorithms* to establish whether specifications *may* or *must* have been satisfied [C6]. My master's thesis described the first approach for *fault-tolerance in distributed CPS* [E1], which makes it possible to use distributed algorithms like consensus in distributed CPS by building on distributed computing results such as ***failure detectors*** and ***self-stabilization*** [C2,C1,J1,J3]. I have also developed ***new deductive proof methods to establish safety, liveness, and stability properties*** in the context of fault-tolerant distributed algorithms for CPS [C1,J3]. More recently, my group has developed distributed runtime verification methods applied to swarm robotics systems [C23] building on our real-time reachability methods discussed earlier, where each agent in the system computes its own local reachable states and exchanges them with neighbors, but accounting for imperfect clock synchronization to evaluate global safety. My doctoral dissertation modeled and verified distributed networks of interacting CPS, discussed in more detail next.

Parameterized Verification for Networked Hybrid Systems: My doctoral dissertation and the related papers [OC1,C3,C4,LC4,C8] established the ***first positive results for uniform verification of safety specifications in parameterized networks of hybrid automata***, which is frequently known as ***parameterized verification***. In essence, the parameterized verification problem is to prove that a system $A(N)$, which is parameterized on the number of participants, N, satisfies a specification $P(N)$ regardless of the number of participants, i.e., to prove $\forall N \in \mathbb{N}$, $A(N) \models P(N)$, where $\mathbb{N}$ is the set of natural numbers. Examples arise in many domains, from ***cache coherence protocols*** in computer architecture to ***mutual exclusion algorithms*** in concurrency and distributed systems. For example, a mutual exclusion algorithm should satisfy the specification that at most a single process is in a critical section simultaneously, formalized as $\forall i, j \in \{1, \ldots, N\} | (i \neq j \wedge q_i = cs) \implies (q_j \neq cs)$, where $q_i = cs$ indicates process i is in the critical section.

For distributed networks of CPS, such as in ***groups of aircraft, cars, or robots***, or in subcomponents like ***clock synchronization algorithms***, a more expressive model of each participant is needed compared to purely discrete ones, so I modeled each participant in the network as a hybrid automaton. In these distributed CPS, a typical safety specification that arises is collision avoidance, which is formalized as a physical dual of classic mutual exclusion: $\forall i, j \in \{1, \ldots, N\} | (i \neq j) \implies ||x_i - x_j|| \geq s$, where x_i represents a position of participant i in some Euclidean space (e.g., $\mathbb{R}^3$), s is a positive real indicating some safe amount of spacing between participants, and $|| \cdot ||$ is the Euclidean norm. While existing negative results showed it was undecidable to solve this problem algorithmically, my approach developed a *small model theorem* that showed, under some mild assumptions, that there exists a finite (and often small) bound $N_0 \in \mathbb{N}$ that suffices to prove $A(N) \models P(N)$ holds for all N if $A(N_0) \models P(N_0)$ [C4]. More technically, the "small" in the small model theorem refers to the size of satisfying assignments (models) of formulas from a certain class of syntactically-restricted multi-sorted first-order logic used to encode inductive invariance proof conditions.

I applied this theoretical result in conjunction with heuristic ***invariant synthesis and abstraction procedures*** implemented in my publicly-available Passel software tool [S1] that uses Microsoft's Z3 SMT solver to automate ***inductive invariance proofs*** to verify numerous realistic systems, from real-time mutual exclusion algorithms to the FAA/NASA NextGen SATS landing protocol [LC4]. Liveness verification is also possible by finding ***ranking functions***. These results may enable automatic verification in other distributed CPS arising in the Internet of Things (IoT), such as networked medical devices, swarm robots, or vehicle-to-vehicle communications in motor vehicles.

Cyber-Physical Systems Domains. In addition to CPS foundations and theory, my research is applied across CPS domains, including aerospace, robotics, power and energy systems, automotive, and biotechnology.

Aerospace Systems: In addition to the ***FAA/NextGen air traffic control verification*** aforementioned

[C3,LC4], I have worked extensively in verifying aerospace systems in collaboration with AFRL and NASA. With Dr. Scott Erwin of AFRL's Space Vehicles Directorate, I developed methods to ***automatically verify conjunction (collision) avoidance in autonomous groups of satellites*** orbiting Earth and ***eventual rendezvous of satellites*** when desired, and also established the impossibility of solving this problem using reachability analysis by relating it to results in mathematical billiards [C5]. Our work to detect cyber-physical specification mismatches was inspired by classic aerospace software failures, such as Ariane 5's flight 501, and may lead to ways to compose systems safely that is an even greater challenge today [C11,J12]. As discussed earlier, with Dr. Stanley Bak of AFRL's Information Directorate, I developed the first reachability algorithm with real-time guarantees now being ***deployed in avionics systems*** by Dr. Alwyn Goodloe of NASA Langley [C9,J4], and we also developed automated abstraction methods to analyze real-time control systems, with application to ***yaw damper control systems*** [C13]. We have continued collaborations with Dr. Kerianne Hobbs of AFRL/ACT3, for example, showing safety of RL controllers used in aerospace systems and closed-loop ACAS-XU [J28].

Robotics: My earliest research has applications in swarm robotics, where geographically and computationally distributed groups of robots communicate and coordinate to meet some objectives, such as forming a flock and reaching a goal location, while maintaining some safety specifications, such as collision avoidance, all in the presence of failures [C2,C1,J1,J3]. Recently, with collaborators from the University of Virginia and Florida International University, I developed distributed algorithms for formation control building upon previously verified primitives [LC5]. One example is our ***planar formation control algorithm that combines high-level specifications written in linear temporal logic (LTL) with a verified one-dimensional flocking algorithm***, and allows for exponentially convergent formation of shapes such as wedges, vees, and general open kinematic chains, all while avoiding collisions [LC5]. Other recent robotics applications include the distributed runtime verification approach discussed earlier, which has been used to prove collision avoidance safety specifications in swarm robots [C23].

Power and Energy Systems: I have a long-running interest in power and energy systems, which began during my time as an intern at Schlumberger, the world's largest oilfield services company. For example, I wrote software deployed in the world's first downhole sampling-while drilling tool while at Schlumberger, which resulted in a publication that ***won a best paper award*** [LC1] and ***resulted in a patent*** [P1]. In power and energy, I have published on using ***adaptive control in motor control*** [LC1], *reachability analysis* and model checking of open-loop ***power electronics*** [LC2], reachability analysis of closed-loop power electronics [LC3,C11], and the design of a *novel DC-to-AC architecture for interfacing DC-producing renewable energy sources like photovoltaics to the AC grid* [J2,MA3]. I have released publicly available power and energy benchmarks to the hybrid systems community to help create scientific, fair, and reproducible comparisons between different formal verification approaches [W1,W7,OC5]. Most recently, I have shown how to use formal approaches such as reachability analysis in the context of typical ***model validation for power electronics***, which formally quantifies the similarity between experimental data recorded from power converters with mathematical models and with computer-based simulation models in SPICE and PLECS [J10,J6].We have also utilized invariant inference and runtime monitoring of STL specifications for anomaly and attack detection in distributed electrical microgrids [J6,J16].

Automotive Systems: With colleagues from the University of Waterloo, I showed rates of motor vehicle recalls in the US, Canada, and Europe due to defects in computer-related components (termed electrical and electronics [E/E] components in the ISO 26262 functional safety standard for road vehicles) are increasing [LC6]. This work was presented at the NHTSA's 24th International Technical Conference on the Enhanced Safety of Vehicles (ESV), and *highlighted to regulatory bodies in attendance such as the NHTSA, Transport Canada, and Europe's RAPEX the impending computer-related safety and security problems in motor vehicles* [LC6]. To help address such issues, I collaborated with UT-Arlington's Formula SAE racecar team, and identified and corrected several bugs in their automotive systems that use controller area networks (CAN) [MA2,MA6]. Additionally, my PhD student Luan Nguyen [DA2] spent two research internships at Toyota, where we applied our foundational results on cyber-physical specifications to engine control problems [C18,C20], and another PhD student, Xiaodong Yang, is currently interning at Toyota focusing on robustness analysis of perception systems.

3.3 New Research Directions Since Tenure

Since tenure, I have explored three new research directions aligned with trustworthy AI and formal methods, namely new application domains, in addition to continuing to contribute to CPS and autonomy applications. These new research directions since tenure in trustworthy AI are in the domains of security, medical imaging, and physics-informed machine learning.

Formal Methods for Trustworthy AI and Machine Learning in Cybersecurity: As AI and machine learning increasingly are utilized for cybersecurity tasks, it is critical to consider adversaries and mechanisms to bypass such automated systems. My group has explored this along several complementary directions: using AI to bypass cybersecurity defenses, and also to analyze and improve cybersecurity defense. There are close relationships

between these methods and adversarial perturbations, more broadly within adversarial machine learning, which is closely connected to our work on neural network verification. In two NSA projects [CG26,AG4], we are exploring how neural network verification can be utilized to quantify coverage measures of security systems like malware classifiers, which increasingly utilize AI. For example, we characterize certified robust accuracy (CRA) of malware classifiers [OC16,C45], and also explored the benefit of parallelization in a collaboration with GTRI and ORNL utilizing ORNL's Frontier supercomputer [Po13].

In another line of work, we explored information hiding within various media, particularly utilizing machine learning to embed or filter information. Such information hiding has applications and relation to adversarial perturbations in machine learning, watermarking, steganography, and filtering of these types of , depending on whether such additional information is desirable (e.g., watermarks in some cases) or undesirable (e.g., adversarial steganographic content). For instance, our most recent work develops a framework to remove visible watermarks from images (in review at ICML'25), utilizing a combination of automatic semantic segmentation to identify watermarks, then in diffusion-based inpainting to recover reasonable backgrounds, and we have shown this as a risk for copyrighted media (e.g., eliminating visible watermarks from publisher media). In another line of work (in review at ESORICS'25), we have developed an approach to watermark models, that service providers could use to identify if weights have been disturbed, for instance as a defense against hijacking or possible backdoors (trojans) inserted into models. In our earliest work in this direction [C42], we developed an image into image steganography approach, to hide images within other images, but this had some degradation in image quality based on the hidden information. We extended this approach to hide audio data within image data and audio data, and improved the quality of when the media holding the steganographic content was image-based, building on a diffusion model approach instead of our original variational auto-encoder approach [C48].

While the main PhD student (Preston Robinette) leading this line of work graduates soon, there are several angles we hope to explore in the future. For example, we discussed but did not yet explore much the information theoretic background of these problems, and new theoretical advances may be interesting and important, particularly given the importance of watermarking in generative AI, across all of models, of model outputs, and of training data for models (e.g., for copyright reasons). Another avenue is to further explore the connection between information hiding and adversarial perturbations, along with the overlap of these domains with neural network verification and robustness. For instance, perhaps local adversarial robustness can be extended to ensure some media does not contain steganographic content with a provable guarantee, or perhaps adversarial perturbation generation methods can embed steganographic content. Finally, there are many ethical and legal issues that have arisen in these projects, and I am interested to explore those in the future, perhaps through collaborations with lawyers or social scientists.

Formal Methods for Trustworthy AI in Medical Imaging Analysis: With Profs. Ipek Oguz and Meiyi Ma, we have been developing neural network verification methods in the context of medical imaging analysis, creating a collaboration with the Vanderbilt Institute for Surgery and Engineering (VISE) and VUMC, supported by an NSF FMitF project [AG2]. This approach specifically targets computer vision tasks like semantic segmentation, widely used within medical imaging for identifying tumors, for example, which builds upon some of our early work in neural network verification of semantic segmentation [C31]. This project is ongoing, but we have made several contributions across scaling neural network verification, and making it applicable to medical imaging tasks, along with creation of various medical imaging analysis verification benchmarks [OC15]. For example, we have added support within our NNV tool for volumetric data, which often arises in medical imaging, where medical scans may yield 3-dimensional data instead of 2-d images, requiring different approaches and network architectures. This extension also has enabled our analysis of video data that is in essence 3-d [C52], and we are exploring this as well for video medical imaging data (such as recordings of ultrasounds).

Aligned with the goals of NSF's FMitF program, this work has also been presented at medical imaging research community events, such as a plenary tutorial session of nearly two hours with about 100 attendees at the 2025 SPIE Medical Imaging conference [KT11]. This impact is significant, as this community often does not engage with the formal methods and verification community, and fostering such cross-community collaboration is essential both for ensuring our verification methods are applicable to this domain, and also gaining insight into the challenges and problems of this community. For example, software defects are a leading cause of medical device recalls[7], and there are significant challenges that remain as AI and ML components and systems increasingly are put into such safety-critical medical devices, as well as the broader usage of AI and ML within medicine[8]. In addition to the aforementioned collaboration with GTRI using ORNL's Frontier supercomputer where we have looked at security problems, we additionally have analyzed robustness of medical imaging segmentation neural networks, as a representative open use case without the challenges of the malware studies [Po13].

[7] See e.g., Simone, Lisa K. "Software-related recalls: an analysis of records." Biomedical instrumentation and technology 47, no. 6 (2013): 514-522.

[8] See e.g., FDA Artificial Intelligence and Machine Learning (AI/ML)-Enabled Medical Devices

Trustworthy AI in Physics-Based Machine Learning: Building on our expertise in dynamical systems modeling, we have pursued new directions at the intersection of partial differential equations (PDEs) and machine learning, specifically developing and applying new classes of machine learning methods that incorporate physics information. These methods improve predictive tasks in several ways, namely they may require less data (that may be predicted using physics-based models between data points) and they may have higher accuracy. Several approaches have been developed in these directions developed and applied to specific physics-based modeling problems, in vehicular traffic forecasting [C47,C53] and environmental modeling [C32,C46,C33], such as predicting river temperature. Our work so far has focused mostly on improving prediction performance under various constraints (limited data) by combining PDE-based modeling with machine learning models. For example, our earliest work in this direction developed a new graph neural network (GNN) architecture combined with PDEs [C32], and showed improvement in predicting stream water temperature. As vehicular traffic forecasting often is also done on graphs where different regions represent nodes and connections, we have also developed similar architectures for traffic forecasting.

This is an exciting direction we continue to explore, and are now beginning to incorporate some earlier efforts on PDE and DAE reachability [C24,OC6] with these methods, to create an overall physics-based machine learning verification and falsification framework, beyond what we have already developed for neural ODEs [C35,C40]. In the future, I am to explore this direction further, combining what we have been doing on the neural network verification side with advancements on the physics-based machine learning side, as we have started to do with uncertainty quantification to a degree [C53]. For instance in one direction, we are now exploring developments of spatial logics and incorporating these into the training processes, similar to what we have done earlier in reinforcement learning on signal temporal logic specifications (STL) [C37], utilizing the robust (quantitative) semantics of the STL formulas within the loss function during training. A falsification or verification framework for these specifications could be a next direction we explore over the next few years, which will build upon our advancements both on the model side (e.g., PDE-based neural networks) and the neural network/hybrid system verification domain. This direction is also of broad interest, for instance at DOE, where I gave an AI Forum keynote in May 2024 [KT7], and I plan to continue developing such engagements with DOE, such as through my PhD student Anne Tumlin's DOE CSGF.

4 ONGOING RESEARCH AND PLANNED RESEARCH DIRECTIONS

Currently, I am focusing on several active research projects related to safe, secure, and trustworthy AI, CPS foundations, and CPS applications, sponsored by DARPA [AG3], DoD/NSA [AG4], and NSF [AG2,AG1].

As detailed earlier, through our DARPA ANSR project [AG3] and earlier DARPA Assured Autonomy project [CG21], we have developed several results for establishing robustness of machine learning systems, such as neural networks [C31,C29,C27,C28,J13], as well as verifying system-level properties when such learning-enabled components (LECs) are used within CPS, such as for control [J20], planning, computer vision, and perception tasks. Much of my group's ongoing work is related to this direction, and I believe this is a fruitful direction over the next several years, especially with the continued growth of AI and recognition of its challenges, like hallucinations. While our primary focus has been in applications of CPS autonomy, there are broader applications we are starting to explore, such as adversarial perturbations in medical imaging systems that may cause misdiagnoses, and our early results on semantic segmentation verification drove our move to this collaborative direction in our NSF FMitF project.

The impact of our work in this domain is represented users of our Neural Network Verification tool [C40,C27] by industrial users at Northrop Grumman, Toyota, GM, Boeing, VMWare, and others, as well as citation of our work in the EU Report *"Concepts of Design Assurance for Neural Networks (CoDANN): AI Roadmap"*.[9] I have also co-organized workshops and competitions in this direction, such as the Verification of Neural Networks Competition (VNN-COMP), co-located with CAV that I have co-chaired since 2020, and the Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH) and the ARCH Competition (ARCH-COMP), where I have led a category in system-level verification for artificial intelligence and neural network control systems (AINNCS) since 2019.

4.1 Future Research Plans

Currently, I am focused on my ongoing sponsored projects related to trustworthy AI across security, medical imaging, and physics-informed machine learning, as well autonomous CPS with applications in aerospace, automotive, power/energy systems, and robotics. In the future, I plan to continue my efforts in CPS foundations and in CPS domains such as aerospace, robotics, and power/energy, but also to increase my efforts in ***CPS security foundations*** and in both ***medical and automotive CPS***, which I have begun to do since tenure. To specify security, we are building upon our HyperSTL language for specifying security constraints as hyperproperties over real-time and real-valued signals, in addition to typical discrete-time and discrete-state hyperproperties through HyperLTL where

[9] Concepts of Design Assurance for Neural Networks (CoDANN): AI Roadmap, European Union Aviation Safety Agency (EASA), March 2020, https://www.easa.europa.eu/document-library/general-publications/concepts-design-assurance-neural-networks-codann

such an abstraction makes sense [C20]. For inter-vehicular networks, I plan to formally verify vehicle-to-vehicle network protocols such as DSRC for security and real-time guarantees. For intra-vehicular networks, such as CAN, I plan to develop a ***verified control system stack***, starting with low-level verified components, such as the verified Cambridge ARM ISA, layering the verified seL4 microkernel (or eChronos RTOS) above, and then developing verified control system programs at the network and application layers, which will build on our hybrid systems verification methods. This may yield a verified control system stack that has the ***highest safety and security guarantees***.

In my time as a faculty member, ***I developed significant experience in leading successful proposals, and have been awarded in total over thirty funded research grants, contracts, fellowships, and gifts as PI or co-PI***. In the future, I plan to continue pursuing support for my research through NSF, DoD, other federal agencies, state agencies, and industry, and to continue pursuing interdisciplinary projects, particularly targeting larger projects. In addition to the successful proposals that I led or co-led, I have been involved in over 85 proposals, and led several large proposals (NSF PIRE, DoD MURI, DARPA CASE), and participated in other large proposals (DARPA TIAMAT, DARPA ICS, NSF CPS Frontiers, NASA ULI, etc.), which are representative of the types of large projects I will continue to pursue in the future.

For potential industry collaboration and sponsorship, I have built an extensive network of contacts in many CPS domains including aerospace (Boeing, Lockheed Martin, Raytheon, Rockwell Collins, and UTC/UTAS), automotive (Bosch, Denso, GM, and Toyota), computer-aided design (Cadence, IBM, MathWorks, Mentor Graphics, Microsoft, National Instruments, SRC, and Synopsis), industrial systems (GE and UTC), and semiconductors (ARM, Freescale, Intel, NVIDIA, Qualcomm, and Texas Instruments). Of these, for example, the MathWorks collaborated on our AIDE-CPS and DeepFuzz-CPS projects [CG15,CG22] investigating bugs that we may found in their products [CG13], which aided in the success of our ICSE papers [C21,C26,D6], whose lead author [DA3] interned with the MathWorks. ***In the coming years, more CPS domains will mandate the use of rigorous design methods encouraging the use of formal methods and there will be increased certification efforts.*** This trend is in part due to new standards—such as in medical device development through IEC 62304, in aerospace through DO-178C and DO-333, and in automotive through ISO 26262—as well as recent high-profile recalls, such as the 2015 NHTSA recall for remote attacks on Jeeps by Charlie Miller and Chris Valasek. The FDA already solicits software safety research for medical devices, the USDOT (via NHTSA and FHWA) is starting projects in automotive software and security research, NASA and FAA support formal methods in CPS, NIST has a CPS program, and many industrial firms developing CPS need high reliability, so there are ample opportunities for both sources of challenging problems to advance the start-of-the-art in CPS as well as funding. As Vanderbilt University Medical Center (VUMC) is a top medical institution with many researchers developing novel medical devices, particularly surgical robotics through the Vanderbilt Institute for Surgical Engineering (VISE), I have begun preliminary collaborations with VISE/VUMC faculty in trustworthy medical imaging analysis AI as well as software safety for medical devices [IT28] and plan to continue this direction in the future.

TEACHING STATEMENT

1 INTRODUCTION AND TEACHING PHILOSOPHY

The opportunity and privilege to teach and mentor are primary motivations for my pursuit of a career in academia. ***Teaching results in everyone—students, professors, humanity—knowing more, due in part to the bidirectional feedback between student and teacher, as well as between research and teaching, all of which together can enhance each other.*** Teaching and mentoring are perhaps the most rewarding duties of professorial life, and I have successfully fulfilled these roles in the past, and continue to do so. Overall, I expect my students and mentees to accomplish things greater than myself so that humankind makes progress in the pursuit of knowledge, understanding, and innovation, and of course, have fun doing so. For them to achieve this, I equip them with fundamental knowledge and the best skills and tools, so they may turn their own goals and ambitions into reality during their lifetimes of learning. ***My experience teaching and mentoring students across diverse domains from computer science, electrical/computer engineering, and systems engineering illustrates my dedication to these goals, as well as to the broader vision to develop a workforce with the necessary education to design safe, secure, and trustworthy AI and autonomous cyber-physical systems (CPS).***

Feedback in both directions of the learning process—from the teacher to the student through prompt graded assignments and from the student to the teacher through evaluations, as well of course with in class and office hour discussions—identifies areas to improve for the students and professor, so everyone may learn and perform better. It is often difficult to reach all students in a class given their varying backgrounds. One way I strive to reach many students is with feedback when meeting individually with them, so I may better understand their backgrounds and misconceptions to tailor the material for them. It is essential to reiterate material seen in lecture in other activities such as discussion sections, homeworks, and labs, which helps to ensure the diverse body of students is understanding and appreciating the material. I appreciate constructive criticism provided by teaching assessments, as it helps me reflect on my teaching to become a more effective instructor. I frequently use ***early feedback assessments after the first few weeks of a course*** to help me evaluate how I am doing as well as the class's background, which can identify what changes I must make to be the most effective teacher possible, while there is still sufficient time in a course to make changes. While students may need guidance to understand material, I believe they learn the most making discoveries themselves, so I help them, but do not just fill them with answers to regurgitate. To paraphrase, ***students are candles to be lit, not bottles to be filled***, so I strive to instill a thirst for knowledge and passion for discovery toward humanity's pursuit of understanding.

Additionally, I have availed myself to opportunities to improve my teaching, such as participating in the Vanderbilt Center for Teaching (CFT)'s Junior Faculty Teaching Fellows (JFTF) program during the 2018-2019 school year, where I gained further insight in how to be an effective teacher learning from the CFT's expert educators and other junior faculty in my cohort. Given our transition to online and hybrid teaching in 2020 due to COVID-19, in summer 2020 I participated in the CFT's Online Course Design Institute (OCDI) which provided valuable tools for the transition to remote learning, as did again interacting with faculty in my cohort. In the future, I hope to avail myself of similar opportunities so I may continue learning how to be an effective mentor and educator, as at least measured by my higher post-tenure teaching evaluations, such activities have made me a better instructor.

2 TEACHING AND MENTORING EXPERIENCE

During my dozen years as a faculty member, ***I have taught hundreds of undergraduate and graduate students through nearly thirty courses as the primary instructor of record, and I have substantially developed curriculum to the state-of-the-art in every course***. Since tenure, I have taught ten courses, and of these, *4 were at the undergraduate level* and *6 were at the graduate level*. Individual mentoring of students to successful completion of their research and degree requirements is an essential responsibility as a faculty member. ***I currently advise*** 5 ***PhD students, three postdoctoral research scholars/research scientists, and an undergraduate researcher, and have supervised*** 10 ***PhD alumni and numerous MS theses, including 6 PhD graduates and 1 MS thesis since tenure.*** My prior postdoctoral, PhD, and MSc advisees have successfully transitioned to the next phases of their careers, where for example, several are now in tenured and tenure-track faculty positions themselves at the University of Nebraska Lincoln, the University of South Florida, the University of Southampton (UK), Augusta University, the University of Missouri, and the University of Texas Permian Basin. Additionally, I have a long history of commitment to teaching, and helped teach six courses as an undergraduate teaching assistant while at Rice, as well as three courses as a graduate teaching assistant at Illinois.

2.1 Overview of Courses Taught

Overall across all courses, the mean instructor evaluation rating I have received is 4.19 out of 5.0 and the mean course evaluation rating for my courses is 4.05 out of 5.0, as aggregated in Tables 1 and 2. Since earning tenure, my mean instructor evaluation rating is 4.55 and mean course evaluation rating is 4.30 as detailed in Table 1, significantly

higher than my pre-tenure mean ratings of 4.14 and 3.88, respectively, as detailed in Table 2 and which are higher than school averages. I have continued to revise my courses, incorporate feedback, and strive to continue developing my skills as an instructor, and my efforts have been effective as illustrated by these evaluation improvements. Overall, I have improved my teaching evaluations over time as I have gained experience as an instructor and taken advantage of teaching resources, such as the CFT's JFTF and OCDI programs. For example, within the ES140x series that I have now taught seven times, these evaluations have gone from being slightly below school/departmental averages to now being consistently above them, generally improving with each additional offering. What follows is an overview of the courses I have taught, including course development, curricular changes, and a sampling of student feedback.

			Instructor Evaluation		Course Evaluation	
Institution	Course	Semester	Johnson	School	Johnson	School
Mean (Post-Tenure)	ALL	ALL	4.55	4.23	4.30	3.92
Mean (Pre-Tenure)	ALL	ALL	4.14	4.18	3.88	3.85
Mean (All)	ALL	ALL	4.31	4.20	4.05	3.88
Vanderbilt	CS6315	Spring 2025	4.89	4.27	4.67	4.00
Vanderbilt	ES1401	Fall 2024	4.63	4.28	4.35	3.98
Vanderbilt	ES1402	Fall 2024	4.43	4.28	4.26	3.98
Vanderbilt	ES1403	Fall 2024	4.19	4.28	4.13	3.98
Vanderbilt	CS6315	Spring 2024	4.75	4.26	4.35	3.96
Vanderbilt	ES1401	Fall 2023	4.10	4.24	3.90	3.92
Vanderbilt	ES1402	Fall 2023	4.48	4.24	4.36	3.92
Vanderbilt	ES1403	Fall 2023	4.48	4.24	4.33	3.92
Vanderbilt	CS6315	Spring 2023	5.00	4.23	4.75	3.93
Vanderbilt	CS6315 (Online)	Spring 2023	4.79	4.23	4.36	3.93
Vanderbilt	ES1401	Fall 2022	4.50	4.20	4.13	3.91
Vanderbilt	ES1402	Fall 2022	4.65	4.20	4.26	3.91
Vanderbilt	ES1403	Fall 2022	4.45	4.20	4.18	3.91
Vanderbilt	CS6315	Spring 2022	4.33	4.18	4.44	3.87
Vanderbilt	CS6315 (Online)	Spring 2022	4.80	4.18	4.33	3.87
Vanderbilt	CS5283 (Online)	Fall 2021	4.50	4.20	3.94	3.89
Vanderbilt	ES1401	Fall 2021	4.38	4.20	4.13	3.89
Vanderbilt	ES1402	Fall 2021	4.71	4.20	4.52	3.89
Vanderbilt	ES1403	Fall 2021	4.48	4.20	4.29	3.89

Table 1: Teaching evaluation summary since tenure.

2.2 Courses Taught Since Tenure

In this section, I describe the classes I have taught since tenure.

Introduction to Engineering, Computer Science Modules (Vanderbilt ES 140x: ES1401, ES1402, ES1403) Over fall 2017, I taught one of two sections of computer science modules for Vanderbilt's Introduction to Engineering (ES 140x) course, which is required for all engineering majors, after redesigning the curricula with Prof. Julie Johnson, my co-instructor who taught the other section. My involvement in this course began in part through a women in computing initiative I lead at Vanderbilt [CG10], where we are attempting to replicate Harvey Mudd's success in increasing the percentage of women computer science majors from around twenty percent (our current rate) to around forty to fifty percent. One of the three pillar's in Harvey Mudd's successful initiative was in recreating introductory computer science courses, which is what we have attempted to do through this course redesign. The modules are broken into three distinct one-hour courses lasting around a month each over the semester, and students select modules such as computer science, mechanical engineering, etc. based on their interests. In this course, we introduced students both to fundamental computer science concepts and software programming assuming no prior knowledge of programming, although some students did have prior experience from high-school courses, typically in Java. To help level the playing field, we used a graphical programming language called AppInventor from MIT, which is used to develop Android apps, and for which our informal surveys in class indicated 1 of 75 students had previously seen the language. The course culminated in students developing apps to control iRobot Create mobile robots to reproduce shapes drawn on the Android device in the physical world, using a Bluetooth connection between

Institution	Course	Semester	Instructor Evaluation		Course Evaluation	
			Johnson	School	Johnson	School
Mean (Pre-Tenure)	ALL	ALL	4.14	4.18	3.88	3.85
Vanderbilt	CS6315	Spring 2021	4.88	4.24	4.75	3.97
Vanderbilt	ES1401	Fall 2020	4.48	4.16	3.88	3.85
Vanderbilt	ES1402	Fall 2020	4.33	4.16	4.05	3.85
Vanderbilt	ES1403	Fall 2020	4.16	4.16	3.89	3.85
Vanderbilt	CS5283 (Online)	Summer 2020	4.57	4.54	4.43	4.25
Vanderbilt	CS8395	Spring 2020	4.78	4.27	4.67	4.03
Vanderbilt	ES1401	Fall 2019	4.17	4.14	4.00	3.87
Vanderbilt	ES1402	Fall 2019	4.22	4.14	3.92	3.87
Vanderbilt	ES1403	Fall 2019	4.12	4.14	4.04	3.87
Vanderbilt	EECE2123	Fall 2019	3.33	4.14	2.78	3.87
Vanderbilt	CS6315	Spring 2019	4.19	4.24	4.00	3.96
Vanderbilt	ES1401	Fall 2018	3.83	4.14	3.75	3.85
Vanderbilt	ES1402	Fall 2018	4.41	4.14	4.23	3.85
Vanderbilt	ES1403	Fall 2018	3.86	4.14	3.71	3.85
Vanderbilt	CS4283/5283	Spring 2018	4.64	4.18	4.25	3.92
Vanderbilt	CS6375	Fall 2017	3.50	4.11	3.13	3.75
Vanderbilt	ES1401	Fall 2017	3.50	4.11	2.91	3.75
Vanderbilt	ES1402	Fall 2017	3.53	4.11	2.88	3.75
Vanderbilt	ES1403	Fall 2017	3.37	4.11	3.26	3.75
Vanderbilt	CS6315	Spring 2017	4.71	4.10	4.71	3.77
Vanderbilt	CS2231	Fall 2016	3.22	4.15	2.56	3.86
UT-Arlington	CSE 6323	Fall 2015	4.90	4.27	4.90	n/a
UConn	SE5302	Summer 2015	5.00	3.90	4.00	3.30
UT-Arlington	CSE4340/5349	Spring 2015	3.20	4.28	3.40	n/a
UT-Arlington	CSE2312	Fall 2014	4.40	4.23	4.45	n/a
UT-Arlington	CSE6359	Spring 2014	4.80	4.32	4.53	n/a
UT-Arlington	CSE2312	Fall 2013	3.80	4.29	3.65	n/a

Table 2: Teaching evaluation summary before tenure.

the Android device and a Raspberry Pi connected to the iRobot Create through a serial port.

Overall, the vast majority of students succeeded in this project, which we found impressive given the about one month duration of the course. The structure of this course was divided into four assignments: the first was a basic app to introduce concepts of data structures such as lists, variables, iteration, events, and procedures, followed by an app to draw pictures on the Android device. These assignments were followed by two apps to (1) modify the drawing app so that when a complex shape (e.g., a square) was selected from a set of possible shapes to draw, it was drawn in a reactive systems fashion and took some amount of real-time to draw, mimicking the amount of actual time it would take the robot to move with forward and rotational velocities, and then (2) the final app to have the robot reproduce the drawn picture by moving around its physical environment driven by actuation commands from the Android app. The fundamental computational and cyber-physical thinking concepts introduced ranged from syntax/semantics, variables, iteration, recursive data structures such as lists, induction, reactive systems, basic networking, embedded systems, sensing/actuation, open-loop control, and closed-loop feedback control.

Since fall 2018, I have taught ES140x every fall, but made significant revisions to the curriculum, specifically eliminating AppInventor and using Python to control mobile robots, DJI/Ryze Tello quadcopters (`https://www.ryzerobotics.com/tello`). This revision still emphasizes computational thinking by building on physical abstractions, but is in a more powerful and more widely applicable language. With this revision, the course now serves as a broader introduction to computer science, specifically covering aspects of programming, networking, computer vision, robotics, and control theory. I have continued to refine and build on this curriculum since tenure, and having taught it each fall. During fall 2020, 2021, and partly 2022, based on our hybrid in-person and online teaching style, I created and

integrated a simulation framework so students may test their programs without the Tello drone hardware, as well as utilize a flipped-classroom style with some recorded lectures on the Python introduction materials.

Some representative student comments across various semesters include the following.

- "The final project contributed greatly to my learning experience. This project was hands-on and required group collaboration. It also required the application of skills taught during lectures."
- "The class was very engaging. Although I do have experience with Python, Professor Johnson made the content interesting and fun rather than projecting it as a boring lecture. Above all, I saw everyone operating the drones, and I am certain that he made this class a fun way to introduce people to computer science."
- "I think the assignments were the perfect difficulty level. As someone with no Python experience and very little coding experience, I was able to complete all of the assignments although they were a bit challenging. I also very much enjoyed the final project, where we could really see our coding applied to something physical/tangible."
- "I enjoyed having a true hands-on way of seeing my programming in action. Programming was interesting and fun to use."
- "Taylor Johnson was a fantastic teacher who was very approachable when I needed help during the course."
- "The resources we had available made it very easy for me to understand the material and learn to write Python. Professor Johnson's lectures were informative, and he was able to explain everything that we needed to understand sufficiently. I felt that the time we had in class to experiment with the language and figure out how it worked was also extremely helpful."
- "I liked the group format because I could work with my partner and still learn individually. I also liked the overall concept of working with drones and I enjoyed free time where everyone was working on their drones."

Automated Verification (Vanderbilt CS 6315): In spring 2022, 2023, 2024, and 2025, I have taught a graduate course on formal methods and verification (CS 6315: Automated Verification at Vanderbilt. In summer and fall of 2021, I created an online version of CS6315, including creation and recording of 14 weeks of video lectures, online activities, etc., and taught that twice in spring 2022 and 2023 for our online CS MSc program, as well as coordinating with Dr. Art Sedighi who taught it as an adjunct in fall 2024. The creation of the online materials also benefited the in-person 6315 offerings, as we utilize the same Brightspace course inclusive of the recorded lectures, which provides the material that we go through fully also available asynchronously in case students want to review what we covered synchronously. Previously I taught this in spring 2019, spring 2017, and fall 2015 (then the course was CSE 6323: Automated Software Engineering at UT-Arlington)). We have primarily used Prof. Rajeev Alur's 2015 textbook *"Principles of Cyber-Physical Systems,"* which introduces CPS through a formal methods perspective and discusses core automated software engineering algorithms, such as LTL model checking with reachability and repeatability analyses. There is no perfect formal methods book, so we have supplemented this with other texts, such as Aho and Ullman's "Foundations of Computer Science" for reviewing introductory background, Huth and Ryan's "Logic in Computer Science: Modelling and Reasoning about Systems" as well as portions of Lee and Seshia's "Introduction to Embedded Systems", along with foundational papers such as Plotkin's "A Structural Approach to Operational Semantics". In the course, we make a key activity to use and explore numerous automated formal methods tools, including the nuXmv/NuSMV model checker, Microsoft Research's Z3 SMT solver, UPPAAL, Frama-C, and the Spin model checker. The curriculum for the course is based partly on the SE 5302 course I taught at the University of Connecticut, discussed below.

Some representative student comments include the following.

- "Dr. Johnson does a great job of answering questions on the fly. He is very obviously very knowledgeable and passionate about the topic and it shows through his instruction. I enjoyed learning about the actual applications of automated verification and enjoyed the homework assignments involving the actual applications (SAT Solving, etc). I like how flexible Dr. Johnson is when it comes to in–course projects and that he is more than willing to give helpful feedback when students have questions or run into issues while working on individual assignments."
- "Professor Johnson was one of the best professors I have had at Vanderbilt. The expectations for the course were extremely clear from day one. The amount of async material was manageable for the part–time track. Professor Johnson was very kind and often allowed for extensions on assignments which significantly helped those of us who work full–time during the day. The synchronous class meetings were beneficial and informative. The assignments and quizzes were aligned with what we learned in the lectures. Thank you professor for a great course!"
- "This topic is far outside of my day job and normal interests, but Dr. Johnson went above and beyond to make it engaging and applicable. He is clearly an expert in the subject matter and interacts very well with the key

demographic in the class (CS professionals in industry.) I left with a much deeper respect for this topic and professor."

- "Prof Johnson is highly knowledgeable, articulate, and supportive. He is arguably among the best professors."
- "Overall, I found the class to be excellent. I learned a great deal and even developed a genuine interest in verification methods, a topic I previously had no interest in."
- "This class filled a lot of gaps in my computer science knowledge, which was greatly appreciated. The assignments were appropriate, relevant, and the instructor gave plenty of time to work on them. The instructor is extremely knowledgeable in the area of verification and provided insight not only in the common tools and methodologies; but also, into current event related issues around the subject. The information provided during the course is extremely valuable and not taught at every University. Dr. Johnson is very clear and knowledgeable on the theoretical concepts and was also flexible with the class schedule when we had an interest in a particular topic. This class was part of the reason I came to Vanderbilt, and it met and exceeded my expectations in terms of the amount that I learned."
- "My biggest achievement in this class is to combine theoretical knowledge with practical verification tools. While learning the basics, I can also master some of the application techniques of automatic recognition technology, such as Z3, NuXmv and so on."
- "Overall, I really enjoyed the class and thought it was well taught!"

Additionally, several students who have taken the course have reached out to me afterward, informing me how they have used what they learned within CS6315 in their jobs. For example, one spring 2022 student emailed me the following statement about 6 months after taking the course: "I wanted to reach out and let you know that I recently gave a presentation on Automated Verification, including SAT/SMT and Constraint Programming/CSP. This was in front of my company's engineering group with an audience of around 50-60. I found a specific application in system configuration that I could map onto the NP-complete/SAT problem. The solution was implemented in Z3."' Some often find formal methods a bit esoteric (and frankly useless in the extreme case), but this type of impact illustrates their importance both as fundamental background for our students, but also for nearly immediate industrial impact, albeit I believe the true impact is longer-term based not only on the usage of this type of technology, but the way of thinking about systems and their correctness instilled by this perspective.

Computer Networks (Vanderbilt CS 4283 / CS 5283) In fall 2021, I taught CS 5283 as a part of our online CS MSc program, which I previously had developed materials for prior to tenure. Previously, in spring 2018, I taught this as a cross-listed undergraduate/graduate course on computer networks, and in the course, my philosophy is to teach over the semester to answer the questions "'how does the Internet work"' and more broadly "'how do networks work?"' Through this course, we assume a basic operating systems background, then describe computer networks using the OSI and TCP/IP layered models, followed by discussions of UDP, TCP/IP, routing in the Internet through protocols like BGP, various other networking IETF RFCs, then several wireless networking protocols and media including Bluetooth, Zigbee, and IEEE 802.11. This was my first time teaching networks, and I enjoyed learning this material to a greater extent by teaching the course, as it ties in well with my research foci around networked distributed cyber-physical systems. We illustrated upcoming networking advances such as vehicle-to-vehicle (V2V) communications with DSRC, and gaining a greater understanding in the operation of such protocols will allow me to understand whether there is a need for verification in such protocols and what challenges may need to be addressed to do so. Beyond these, we discussed broader societal issues, such as net neutrality, the international operation of the Internet, and other subsystems of the modern computer networking infrastructure (such as ARP, DHCP, DNS, BGP, etc.). In fall 2019, I prepared the asynchronous content for the online variation of this course to be a part of Vanderbilt's online CS MSc with 2U, and taught the synchronous (interactive) content for that course in summer 2020. Especially given our transition to hybrid, online, and remote learning, this experience of putting together a mixed asynchronous and synchronous all-online course has been quite valuable for my teaching.

Some representative student comments include the following.

- "I think Dr. Johnson is a great professor. He is really kind, helpful, and compassionate. You can tell he wants students to learn as his primary goal. He is extremely knowledgeable and interesting to listen to. I would definitely take him again. I think the most important thing about Dr. Johnson is that his teaching made me even more curious to learn about networking—I spent hours watching other YouTube videos on different concepts and principles that I wanted to learn more about. The fact that I watched hours of his asynch content, and still wanted to watch more videos says a lot about his teaching abilities. I'm also impressed that he was able to fit SO MUCH into this one course—it was great. We covered all of the conceptual underpinnings of networking, wireshark, SDN, Python socket programming—that is a lot of content! I got a lot more out of this class than I even expected to, it was awesome.."

- "The slides and async content were put together well, and Dr. Johnson is very good at explaining complex topics. I'm very new to networking so it was helpful to learn about the concepts at a higher level than examining code like other classes."
- "Professor Johnson explained the content in an easy-to-understand manner without assuming too much about our prior knowledge. His lectures were where I learned the most and gave me the ability to apply my knowledge into my coding assignments."
- "The TCP implementation assignment was quite interesting. The lectures were insightful and in depth without being boring."
- "Professor Johnson is a great teacher - you can tell he is extremely passionate about the subject material and wants his students to learn and to succeed. His lectures were easy to understand and his quizzes and assignments were perfect for students to display their knowledge on the subject matter (without tricking them)."

2.3 Courses Taught Before Tenure

In addition to the courses discussed above, some of which I have taught both before and after tenure, I taught the following courses before tenure as well.

Machine Learning Verification (Vanderbilt CS 8395) In spring 2020, I taught the first iteration of a new graduate seminar related to our ongoing work on machine learning verification, covering recent papers on machine learning verification frameworks such as NNV, Reluplex, AI^2, ReluVal, Neurify, Marabou, among others. In this course, for about the first two thirds of the class, students read and wrote weekly reviews for two papers a week, then we discussed the papers in the seminar. Additionally, in part given the transition to online teaching as well as the increasing availability of conference presentation videos on sites such as YouTube, we also incorporated video presentations of the selected papers from the authors of the papers. The students developed and presented machine learning verification projects during the last third of the class. A representative student comment includes the following.

- "I liked reading the papers and writing reviews for them, it helped me learn a lot not only about the papers but about writing good papers. The final project is a nice element and I like that it allows me to explore concepts more in depth."

Digital Systems (Vanderbilt EECE 2123) In fall 2019, I taught the first iteration of the new EECE2123 Digital Systems course, including creating the new lab, updating the lab hardware, etc., which was a significant amount of effort. Improvements remain from the first iteration, but that will continue to improve, having provided feedback on the first iteration for the spring 2020 instructor Diego Mesa. I led the curriculum revision committee and creation of this new course, eliminating our previous required Computer Organization (CS 2231) and Digital Logic (EECE 2116) courses, updating the curriculum along the way. In the course, students learn "how do computers compute?", which was reinforced through a subset of the ARM ISA implemented on an FPGA on which the students ran ARM assembly programs they wrote. We utilized a variety of other modern tools, such as Docker containers for cross compilation of ARM code on students' x86 laptops, and illustrated basic security concepts, such as buffer overflows.

Some representative student comments include the following.

- "Overall, the course gave me a lot of insight on how computers work and how data is represented."
- "Professor Taylor clearly can be an excellent professor, very knowledgeable and handily answered any question on the material in an understandable way."
- "The labs helped me to gain a more in–depth understanding of how processors work through attempting to design processor elements and circuits on our own."
- "The hands-on interaction with hardware was something that allowed me to learn more lower-level implementation of computers."
- "Most of the labs connected to concepts in the course and it all built up to a final project incorporating everything we learned."

Discrete-Event Systems: Supervisory Control and Diagnosis (Vanderbilt CS6375) In fall 2017, I taught a discrete-event systems course in part using Cassandras and Lafortune's *"Introduction to Discrete Event Systems"* 2008 book (2nd edition). In this course, after introducing requisite background material on logic, set theory, etc., we covered numerous discrete-event systems models and classes of time and state (e.g., continuous vs. discrete), such as finite state automata (FSAs, NFAs, DFAs), transition systems, regular expressions, formal languages,

discrete-time Markov chains (DTMCs), continuous-time Markov chains (CTMCs), differential equations, and hybrid automata. We discussed a variety of fundamental analysis questions, such as reachability analysis for safety and repeatability analysis for liveness, and briefly introduced some model checking tools such as nuXmv and Spin, and also studied the relationships between trace-based and language theoretic definitions and analyses. We elucidated throughout the course the unifying theme of all these classes of models, that their operational semantics may be defined in terms of executions or traces, intuitively conceptualizing these as sequences of states, much like time-series data of a simulation.

Some representative student comments include the following.

- "The project for this class forced me to learn a lot and to deeply engage with the problem I was given to solve."
- "The homework was helpful for cementing the concepts."

Formal Methods (SE 5302 at the University of Connecticut): In summer 2015, I developed and taught formal methods as an adjunct instructor to about thirty engineers in industry who were geographically distributed—a third from each of the US, Europe, and Asia. The course was ***all online and was part of the United Technologies Corporation (UTC) Institute for Advanced Systems Engineering (IASE)*** at the University of Connecticut. I was sought out to teach this course based on my expertise in formal methods for CPS. This synergistic teaching activity *allowed me to instill the latest concepts in engineers practicing in industry designing safety-critical CPS, such as the elevators, fire alarm systems, and avionics systems produced by UTC subsidiaries such as Otis, Kidde, and UTAS, as well as to learn about the latest industry challenges and needs.* We incorporated guest lectures from UTC employees and from the MathWorks, who respectively described UTC's perspective on formal methods, and the latest formal methods tools that are integrated within Matlab and Simulink/Stateflow (such as abstract interpretation with Polyspace and model checking with Simulink Design Verifier), which is widely used in industrial CPS development. In the teaching evaluations, 15 of 26 students responded for a response ratio of 58% yielding a median overall rating of my teaching of 5.0 out of 5.0, and 12 of the 15 respondents stated they learned "more" or "much more" in this course than in other courses. Some representative student comments include the following.

- "Professor Johnson had organized the course material very well from Syllabus, quizzes, homeworks, homework solutions and lecture slides."
- "The thing that has surprised me the most, is the fact of starting every class with an outline of what we were going to learn, followed by a summary from the previous class, and new content added later, everything closed with another final outline of the class. In this way, everything is much clearer, and it helps to keep or understand better some concepts, having 2 class chances for every topic. I find it a very interesting way of teaching, unfortunately not used by many teachers."

Mobile Systems Engineering (UT-Arlington CSE 4340 and CSE 5349): In spring 2015, I created one elective undergraduate computer engineering course on mobile systems using ***the perspective of distributed computing theory to provide a foundation***, but also incorporating modern practical development tools and practices, such as using Java for Android mobile devices in Android Studio and using version control with Git on GitHub. We fundamental distributed systems concepts such as ***Lamport's happened-before relation, partial orders, and canonical distributed algorithms (clock synchronization, leader election, consensus, mutual exclusion, predicate detection, Paxos, and the recent Raft consensus algorithm)***. For programming assignments, we used an Android framework called StarL for programming distributed algorithms for deployment to Android devices controlling mobile robots, and we used ***rapidly exploring random tree (RRT) algorithms for path planning***. In their projects, *students programmed groups of mobile robots to communicate and use distributed coordination to solve a problem akin to a distributed traveling salesman problem*, where robots had to visit sequences of waypoints in environments with obstacles, and deadlocks could occur if distributed coordination was not performed properly.

This was my first time preparing and teaching this course. It was a challenging course to teach due to the different levels of the undergraduates and graduate students (the undergraduates were, somewhat surprisingly, significantly better qualified and capable). The teaching evaluations, like the grades, were bimodal, with an average instructor effectiveness of 3.2 out of 5.0 and 1.5 standard deviation. This was a useful experience in learning how to better handle a class with different populations of students. Some representative student comments include the following.

- "Great course, learned alot about distributed systems. The StarL assignments were pretty difficult since I was not familiar with it, but really helped me to learn how some of the distributed systems things work."
- "The professor made sure that we had understood the material during each class, and answered questions if we did not. The homeworks and programming assignments gave practical application to the material in the lecture and allowed us to practice it. The assignments also gave us room to think and create solutions to problems."

Cyber-Physical Systems (UT-Arlington CSE 6359): In spring 2014, I created and taught one graduate research-oriented interdisciplinary engineering course around my core research expertise of CPS. The course enrolled 9 students, about half from CSE and half from EE. The course was divided into two main parts, first a lecture component where I covered material on CPS, followed by an interactive paper and project presentation component, and from the teaching evaluations, the students greatly enjoyed this format. We first studied the latest developments from real-time/embedded systems, control theory, software engineering, and communications/networking using a free textbook for the course by Profs. Ed Lee and Sanjit Seshia, *"Introduction to Embedded Systems - A Cyber-Physical Systems Approach,"* followed by student-led projects and presentations. For teaching evaluations, there was a 100% response rate, with my instructor effectiveness average of 4.8 out of 5.0 with a 0.3 standard deviation.

Computer Organization and Assembly Language Programming (Vanderbilt CS 2231 and UT-Arlington CSE 2312): During fall 2016, 2014, and 2013, I taught the sophomore-level computer organization and assembly course required for all Vanderbilt CS/CmpE and UT-Arlington CSE undergraduates. I redeveloped the course using modern methods and tools such as ***QEMU, ARM assembly, and gdb***, and the latest 5th edition of Profs. David Patterson and John Hennessy's *"Computer Organization and Design: The Hardware/Software Interface."* I implemented substantial changes from the status-quo for this course, such as utilizing a different instruction set architecture (ISA), ARM, which I believe is easier to understand and of more relevance today. Overall, the department has partially adopted my redesign, and ***my materials from fall 2013 and fall 2014 have been reused in at least a total of seven sections taught by other instructors*** in spring 2014, summer 2014, fall 2014, spring 2015, summer 2015, and fall 2015. My teaching evaluations for fall 2014 were above university averages, where 24 of 46 students responded with my average instructor effectiveness rating of 4.4 out of 5.0, with a standard deviation of 0.7. Some student comments from my evaluations include:

- "He always introduced new topics in a comprehensive manner, and did lots of review to ensure we knew the material. The homework assignments were detailed and were a good study tool. He is a very good communicator."
- "He did really well with teaching the course. The examples that he did in class really helped, and allowed for me to pay attention more."
- "He tried his hardest to make information interesting and answered all of our questions. We alwasy [sic] reviewed what we had gone over from the privous [sic] lecture so the information stayed fresh and we could answer his questions. Over all I really enjoed [sic] the professor and the class."
- "The early information was easy, when the programming started it was difficult, but there are many resources the professor makes available, also he is easy to communicate with when you go to his office hours or email him."
- "The programming assignments contributed a lot to my understanding of assembly. I felt they were fair."

3 FUTURE TEACHING PLANS

In the future, I would enjoy teaching a variety of undergraduate and graduate-level computer science and engineering courses, such as those that I have already taught, as well as compilers, distributed systems, control systems, embedded/real-time systems, logic, and automata theory/theory of computation. In the longer term, ***I plan to further develop new graduate and undergraduate courses in systems and software engineering for embedded systems and CPS, safe and trustworthy AI, as well as an undergraduate formal methods course***. Toward these goals, I plan to create this with a focus on formal methods capability to enable trustworthy AI, and will teach its first offering in fall 2025 as CS 3892: Formal Methods: Safe and Trustworthy Artificial Intelligence (AI), which will serve as an undergraduate project course (similar to senior design) and also satisfy Vanderbilt's Immersion requirements for CS students. Based in part on my industry experience, I also believe there is a need for an ***undergraduate CPS course for students across computer science and engineering disciplines*** (electrical/computer, industrial/systems, and mechanical/aerospace). Such a course will focus on the design, modeling, analysis, and implementation of CPS using modern, standard tools like the MathWorks' Matlab/Simulink or NI's LabView, real-time operating systems, practical electronics and mechanical design, and appropriate embedded hardware. This will facilitate an appreciation of the challenges software engineers face when developing software in actual control systems underlying modern CPS, as well educate computer science students in control theory and engineering, so that these diverse domains have a common language to express their ideas and challenges. This will also instill collaborative and cross-disciplinary design practices in the engineers of tomorrow who will be designing CPS that need increasingly high reliability as more functions become automated with little-to-no human control, or in some cases, even supervision.

SERVICE STATEMENT

1 INTRODUCTION

Service in academia involves commitment to the profession, the scholarly community, our students, our organizations (universities, schools/colleges, departments, professional societies), and the broader community that we serve through our teaching and research, ideally for the betterment of society as a whole. With this philosophy in mind, I have undertaken numerous service responsibilities and opportunities within my institutions, my profession, and the broader community. Since tenure, I have significantly increased my service activities both within and beyond Vanderbilt.

2 SERVICE AS A LEADER

Since tenure, I have held three significant administration leadership positions within the CS department. First, I continued service as Director of Graduate Recruiting (DGR) that I started pre-tenure after tenure until 2022. As Director of Graduate Studies (DGS) for the CS PhD program since 2023, I have been responsible for all aspects of the PhD program for our about 150 CS PhD students, and led CS to the largest number of CS graduates (21) in a VUSE PhD program in AY 2023/2024. These routine tasks include recruitment, admissions, orientation, helping coordinate assistantship funding, scheduling preliminary examinations (a dozen to twenty a semester), curricular matters, transfer credit approval, accreditation reporting, among many other duties. I have advocated for increased TA support (yielding 4 additional TA slots for CS), and managed the TA assignment and its roughly $2m annual budget. In this, I engage closely with staff, particularly our phenomenal Graduate Program Coordinators (GPCs).

I have spearheaded process and program improvements with coordination in many different university offices beyond CS and VUSE (such as the Graduate School, the Registrar, etc.), including but not limited to the following. We have created 5 new permanent graduate-level courses in CS since I have been DGS. We have implemented and streamlined administrative processes for handling paperwork, including coordination with the Graduate School on Kauli form improvements, as well as departmental form improvements with Redcap and Dynamic Forms. We have clarified curricular requirements, specifically outlining which of our courses count for which of our breadth areas, along with working with the Graduate School and registrar to automatically check these requirements in students official records, eliminating a needless and duplicative departmental coursework audit form. Our curriculum remains flexible so PhD students can focus on coursework most inline with their research, and this has eliminated significant administrative burden and improved record-keeping accuracy. We coordinated with VUSE, the Graduate School, and the Slate team to modify our PhD application to request additional information (resumes/curriculum vitae, faculty interest), as well as revised our process for PhD admissions to utilize Slate fully instead of a haphazard combination of Box spreadsheets and Redcap forms. We revised our PhD application deadline to December 15 from January 15, to be more inline with other graduate programs and more competitive. We re-instated an in-person PhD recruitment visit day that has been held annually since 2023. Aside from these improvements, I have also handled numerous complex professional and personal cases of students, including adviser conflicts, mental health challenges, supporting internships, etc. Based on all these contributions to the CS department and VUSE, in fall 2024 I agreed to serve as Associate Chair of CS, with a focus on graduate issues, but also with a focus on longer-term strategic planning, especially with the upcoming creation of the CCC.

3 SERVICE TO THE PROFESSION AND SCHOLARLY COMMUNITY

As detailed in my CV, I actively serve as a reviewer for prestigious research journals of the ACM, IEEE, and other publishers. I have served on the technical program committees of dozens of prestigious computer science and engineering conferences and workshops, such as CAV, HSCC, ICCPS, EMSOFT, RTSS, NFM, ADHS, and RV, among others. Since tenure, I branched out into newer areas based on my trustworthy AI focus, and served on program committees for venues such as AAAI, CVPR, ICCV, and UAI, while continuing service in the CPS and formal methods areas, such as the venues mentioned previously. In addition to this standard form of scholarly service, I have helped organize several research events, including conferences, workshops, and symposia, such as the Evaluation Chair for ARCH (2016-2023), and as Co-Chair for the VNN'20 and SNR'18 workshops. I have served on the steering committees of two workshop series (DHS and SNR), helped create the International Symposium on AI Verification (SAIV) and serve on its steering committee, and co-organized events at the ISoLA/AISoLA conference series as a track co-chair. I serve as Associate Editor for two journals (STTT and AMAI), and have served as a Guest Editor for special issues (Nonlinear Analysis: Hybrid Systems [NAHS], Control and Verification of Hybrid Systems for IET-CTA). I continue to serve the research community by reviewing proposals and serving on review panels for agencies such as NSF (over a dozen panels), and as an external reviewer for agencies such as AFOSR, the DoD NDSEG program, the NSF GRFP program, and the DoD SMART Scholarship program, as well as international programs (Mitacs and NSERC), with increasing international reputation as noted by my service as a reviewer for ANR, ISF, and other international programs since tenure. Beyond my own scholarly community, I have had the opportunity to serve as a reviewer for the curriculum tested in the NCEES licensure exams, such as the Fundamentals of Engineering (FE)

exam, required in the United States for professional engineering licensure.

A major component of my scholarly service has been on repeatability and artifact evaluations, as computational artifacts are a critical component of the modern research process within computer science and engineering. This is represented by my service as the Evaluation Chair for the ARCH workshops and the corresponding hybrid systems verification competition (ARCH-COMP). Within ARCH-COMP, I co-founded the Artificial Intelligence and Neural Network Control Systems (AINNCS) category of the ARCH-COMP and have chaired it since 2019. Given the recent interest in the community in neural network and machine learning verification, I also co-founded the International Verification of Neural Networks Competition (VNN-COMP), held with CAV over five iterations now (2020-2025), serving as co-chair annually. Overall, these efforts serve to improve confidence in the scientific processes of our community, serve as a mechanism to archive computational results, foster community collaboration to identify limitations of existing verification methods, and generally speed advances within the field. These scholarly community activities have also led to recognition within the field, such as with our NSF FMitF project that aims to improve upon these community-driven repeatability and artifact evaluation processes [CG19]. Another recognition toward this line of effort and our broader contributions in safe and trustworthy AI was my recruitment to co-lead the 2022 NSF Workshop on Safety and Trust in Artificial Intelligence (AI) Enabled Systems (SafeTAI), which I chaired along with Profs. Kate Saenko of BU and Xiaojin (Jerry) Zhu of UW-Madison. This workshop involved participation of around 80 faculty, students, researchers from industry, and NSF personnel, with keynote talks delivered by Dr. Kathleen Fisher, DARPA I2O Director, and Mozilla Foundation Fellow Deborah Raji, and culminated in the creation of NSF's about $20M Safe Learning-Enabled Systems (SLES) program launched in 2023.

4 SERVICE TO STUDENTS

The opportunity to serve our students is one of the greatest pleasures of academia. With this perspective, I have served as an academic adviser at Vanderbilt for a cohort of 35 computer science undergraduates who are now rising seniors, and previously as a Freshman Interest Group engineering mentor while at UT-Arlington. As my own undergraduate experience at Rice involved frequent engagement with faculty, facilitated in particular by Rice's Residential Colleges, I served seven times (2017-2024) as a VUceptor for Vanderbilt Visions organized through the Ingram Commons helping 18 first year students transition to college life and Vanderbilt. To help with our current enrollment surge in computer science, in fall 2017 I also volunteered to teach an extra section of ES140x Introduction to Engineering modules for first-year undergraduates, and based in part on student feedback, revised the curriculum further when I taught it again in fall 2018, polishing that curriculum introducing CS using autonomous aerial vehicles a total of seven times now (2018-2024). While at Vanderbilt, I have involved about three-dozen undergraduates in research in part through the VUSE Summer Undergraduate Research Program, and also served on around two dozen doctoral preliminary exam committees. I have also participated as a faculty mentor for the VU Women in Science and Engineering and VU Center for Integration of Research, Teaching, and Learning (VU-WiSE and VU-CIRTL) Tiered Mentorship Program (TMP). As women are underrepresented in computer science and engineering, both professionally and as students, I have begun an effort to recruit and retain women in computing, in part supported by a VIDL MacroGrant [CG10], with our approach building on a successful approach employed at Harvey Mudd that increased the percentage of women CS undergraduate majors from around 20% to over 40%. This initiative involves (1) revising introductory courses, which I have done with ES140x, (2) involving undergraduates in research early, which I have done through the VUSE Summer Undergraduate Research program, and (3) emphasizing the societal impact of computing, which I have done in part through teaching ES140x and preparing curricular materials as a part of our VIDL MacroGrant. Of course, these activities must be continually supported to continue making progress toward equity within computer science and engineering. In 2018, using discretionary funds, I sponsored two Vanderbilt undergraduates to attend the 2018 Grace Hopper Celebration of Women in Computing. In 2019, I helped Vanderbilt's ACM-W/Women-in-Computing (WiC) student organization raise funds totaling around $12.5k for Vanderbilt to sponsor and Vanderbilt CS undergraduates to attend the 2019 Grace Hopper Celebration (GHC) of Women in Computing, where around a dozen Vanderbilt students attended, as did our VUSE graduate recruiter, Gabriel Luis, and myself as the CS Director of Graduate Recruiting (DGR) to help with CS graduate recruiting, particularly of women. In 2020, I again helped arrange for Vanderbilt to sponsor the virtual edition of GHC, raising funds for the sponsorship and facilitating attendance by around a dozen and a half Vanderbilt students who were selected in conjunction with ACM-W/WiC. With the pandemic waning, we co-sponsored GHC in 2022, 2023, and 2024, and have been able to help support several dozen Vanderbilt undergrads attend in total now, illustrating my commitment to supporting our students. Previously, I have served the broader scientific and engineering community by judging app design contents sponsored by the US Congress, as well as regional science and engineering fairs. In the future, I hope to build upon these activities, such as continuing sponsorship of events such as Grace Hopper, and expanding sponsorship, outreach, and recruitment activities with other events where Vanderbilt does not yet have a presence, such as the ACM Richard Tapia Celebration of Diversity in Computing Conference.

5 SERVICE TO ORGANIZATIONS

At all the organizations with which I have been affiliated through employment or professional society means, I have had the pleasure to serve these organizations. For example, at Vanderbilt I serve on university and departmental committees, including participating in EECS ABET reviews, organizing the EECS WithIT seminars, and previously served on several committees, including faculty search and PhD admissions committees, at UT-Arlington. At Vanderbilt, I led the curriculum committee that created our new EECE2123: Digital Systems class required of all CS, CmpE, and EE majors, and eliminating previous required CS2231: Computer Organization and EECE2116: Digital Logic classes. Within professional societies, I have served on numerous program and organizational committees for scientific and technical conferences. Within governmental agencies, I have served to review grants on review panels and as an ad-hoc reviewer for both US and Canadian agencies. I served on an ABET review committee for NCEES in 2018, and became a Professional Engineer (PE) myself in 2019.

6 SERVICE TO SOCIETY

Through several activities, I have had the opportunity to serve society both through academia-related activities and more broadly through community service. This has been through aiding in college fairs for high school students, and interviewing prospective undergraduates for Rice University through the Rice Alumni Volunteers for Admission (RAVA). I have helped an MNPS teacher, Chaz Carothers, prepare curriculum for K-4 students to program a mobile phone using the Raspberry Pi. For communicating research and help to the broader computer community, I actively contribute questions and answers to help websites such as StackExchange and StackOverflow, which students and professionals alike routinely query when solving problems.