

STEPHEN F. SIEGEL

Curriculum Vitæ

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1 Employment

Professor, Department of Computer and Information Sciences and Department of Mathematical Sciences, University of Delaware, September 2026 to present

Associate Professor, Department of Computer and Information Sciences and Department of Mathematical Sciences, University of Delaware, September 2012 to August 2026

Assistant Professor, Department of Computer and Information Sciences and Department of Mathematical Sciences, University of Delaware, September 2006 to August 2012

Senior Research Scientist, Laboratory for Advanced Software Engineering Research, Department of Computer Science, University of Massachusetts Amherst, August 2001 to August 2006

Senior Software Engineer, Laboratory for Advanced Software Engineering Research, Department of Computer Science, University of Massachusetts Amherst, August 1998 to July 2001

Visiting Assistant Professor, Department of Mathematics, University of Massachusetts Amherst, September 1996 to August 1998

Visiting Assistant Professor and NSF Postdoctoral Fellow, Department of Mathematics, Northwestern University, September 1993 to June 1996

2 Education

Ph.D., Mathematics, University of Chicago, August 1993 (*Advisor*: Prof. Jonathan L. Alperin)

M.Sc., Mathematics, Oxford University, June 1989

B.A., Mathematics, University of Chicago, June 1988

3 Grants

- Principal Investigator, Department of Energy DE-SC0025953, National Science Foundation CCF-2446130, *CS²: Modular Verification of Scientific Software Using Model Checking, Symbolic Execution, and Abstraction*. June 1, 2025 – May 31, 2029. UD Award amount: \$800,000 (sole PI; \$400,000 from NSF, \$400,000 from DoE)
- Principal Investigator, Argonne National Laboratory Subcontract 4f-60043 (primary sponsor: U.S. Department of Energy), *Verifying the PETSc vector module with CIVL*. December 1, 2023 – August 31, 2025. UD Award amount: \$152,400 (sole PI)

- Principal Investigator, National Science Foundation Award CCF-1955852, *Collaborative Research: SHF: Medium: Practical and Rigorous Correctness Checking and Correctness Preservation for Irregular Parallel Programs*. August 1, 2020 – July 31, 2025. UD Award amount: \$466,450 (sole PI)
- Principal Investigator, Department of Energy Office of Science Award DE-SC0021162, *RAPIDS2: A SciDAC Institute for Computer Science, Data, and Artificial Intelligence*. September 23, 2020 – September 22, 2025. UD Award amount: \$400,000 (sole PI)
- Principal Investigator, National Science Foundation Award CCF-2319662, *Collaborative Research: DOE/NSF Workshop on Correctness in Scientific Computing*. May 1, 2023 – December 31, 2023. UD Award amount: \$15,000 (sole PI)
- Principal Investigator, National Science Foundation Award CCF-2019309, *FMitF: Track II: Usability, Robustness, and Performance Improvements for CIVL*. October 1, 2020 – March 31, 2023. UD Award amount: \$100,000 (sole PI)
- Principal Investigator, Subcontract 4000159498, Oak Ridge National Laboratory (subcontract under Department of Energy award *RAPIDS: A SciDAC Institute for Computer Science and Data*), *Extend and Improve the CIVL Software Verification Platform*. January 31, 2018 – September 30, 2021. UD Award amount: \$245,963 (sole PI)
- Principal Investigator, Department of Energy Award DE-SC0012566, *Program Verification for Extreme-Scale Applications*, September 1, 2014 – August 31, 2018. UD Award amount: \$510,000 (sole PI)
- Principal Investigator, National Science Foundation Award NSF CCF-1319571, *SHF: Small: Contracts for Message-Passing Parallel Programs*, September 1, 2013 – August 31, 2018. UD Award amount: \$449,999 (sole PI)
- Principal Investigator, National Science Foundation Award CCF-1346769, *CIVL: A Concurrency Intermediate Verification Language*, August 1, 2013 – July 31, 2016. Award amount: \$300,000 (includes subcontract to U. Nebraska. UD amount: \$182,000)
- Principal Investigator, National Science Foundation Award CCF-0953210 Supplement 001, *Extension of TASS to Chapel*, June 1, 2011 – March 31, 2016. UD Award amount: \$99,333 (sole PI)
- Principal Investigator, National Science Foundation Award CNS-0958512, Computing Research Infrastructure program, *II-New: System Acquisition for the Development of Scalable Parallel Algorithms for Scientific Computing*, May 1, 2010 – April 30, 2013. Co-PIs: Peter B. Monk, Douglas M. Swamy, and Krzysztof Szalewicz. UD Award amount: \$749,769. *Equipment award used to purchase the UD Chimera cluster*.
- Principal Investigator, National Science Foundation Award CCF-0953210, *CAREER: Ensuring the Accuracy of Scientific Software: A Formal Approach*, April 1, 2010 – June 31, 2016. UD Award amount: \$411,689 (sole PI)
- Principal Investigator, National Science Foundation Award CCF-0541035/CCF-0733035, *Finite-State Verification for High Performance Computing*, April 15, 2006 – March 31, 2010. Co-PI: George S. Avrunin, University of Massachusetts. Lead institution: University of Massachusetts, transferred to University of Delaware. Collaborating Institutions: University of Nebraska (PI Matthew Dwyer), University of Chicago (PI Andrew Siegel). Award amount: \$960,000 (total), \$546,000 (lead institution)
- Principal Investigator, University of Delaware Research Foundation Grant, *Verifying the Order of Accuracy of Numerical Software*, June 1, 2009 – May 31, 2011. Award amount: \$35,000. Awarded Research Experience for Undergraduate supplement for summer 2010: \$3,500.
- Targeted Grant for Capstone Experience (with Keith Decker), University of Delaware, summer 2008, \$8,658, to develop capstone experience for CISC 475

4 Publications

Name = student or post-doc supervised by S.F. Siegel

4.1 Refereed Conference Publications

1. Venkata Dhavala, Jan Hückelheim, Paul D. Hovland, and Stephen F. Siegel. Verifying PETSc vector components using CIVL. In Ruzica Piskac and Zvonimir Rakamarić, editors, *Computer Aided Verification (CAV 2025)*, volume 15931 of *Lecture Notes in Computer Science*, pages 148–161, Cham, 2025. Springer. Acceptance rate: 25.9%. doi:10.1007/978-3-031-98668-0_7.
2. Ziqing Luo and Stephen F. Siegel. Collective contracts for message-passing parallel programs. In Arie Gurfinkel and Vijay Ganesh, editors, *Computer Aided Verification (CAV 2024)*, volume 14682 of *Lecture Notes in Computer Science*, pages 44–68, Cham, 2024. Springer. CAV Artifact Evaluation Badges: Available, Functional, Reusable. Acceptance rate: 26%. doi:10.1007/978-3-031-65630-9_3.
3. Xavier Denis and Stephen F. Siegel. VerifyThis 2023: an international program verification competition. In Dirk Beyer, Arnd Hartmanns, and Fabrice Kordon, editors, *TOOLympics Challenge 2023*, volume 14550 of *Lecture Notes in Computer Science*, pages 147–159, Cham, 2024. Springer. doi:10.1007/978-3-031-67695-6_5.
4. Wenhao Wu, Jan Hückelheim, Paul D. Hovland, Ziqing Luo, and Stephen F. Siegel. Model checking race-freedom when “sequential consistency for data-race-free programs” is guaranteed. In Constantin Enea and Akash Lal, editors, *Computer Aided Verification (CAV 2023)*, volume 13965 of *Lecture Notes in Computer Science*, pages 265–287, Cham, 2023. Springer. CAV Artifact Evaluation Badges: Available, Functional, Reusable. Acceptance rate: 26%. doi:10.1007/978-3-031-37703-7_13.
5. Wenhao Wu, Jan Hückelheim, Paul D. Hovland, and Stephen F. Siegel. Verifying Fortran Programs with CIVL. In D. Fisman and G. Rosu, editors, *Tools and Algorithms for the Construction and Analysis of Systems (TACAS 2022)*, volume 13243 of *Lecture Notes in Computer Science*, pages 106–124. Springer, 2022. EAPLS Artifact Badges: Artifacts Available v1.1, Artifacts Evaluated: Reusable v1.1. Acceptance rate: 29.46% (research papers). doi:10.1007/978-3-030-99524-9_6.
6. Stephen F. Siegel and Yihao Yan. Action-based model checking: Logic, automata, and reduction. In Shuvendu K. Lahiri and Chao Wang, editors, *Computer Aided Verification (CAV 2020)*, volume 12225 of *Lecture Notes in Computer Science*, pages 77–100. Springer, 2020. CAV Artifact Evaluated Badge. Acceptance rate: 27%. doi:10.1007/978-3-030-53291-8_6.
7. Stephen F. Siegel. What’s wrong with on-the-fly partial order reduction. In Isil Dillig and Serdar Tasiran, editors, *Computer Aided Verification (CAV 2019)*, volume 11562 of *Lecture Notes in Computer Science*, pages 478–495. Springer, 2019. CAV Artifact Evaluated Badge. Acceptance rate: 26%. doi:10.1007/978-3-030-25543-5_27.
8. Markus Schordan, Dirk Beyer, and Stephen F. Siegel. Evaluating tools for software verification (track introduction). In Tiziana Margaria and Bernhard Steffen, editors, *Leveraging Applications of Formal Methods, Verification and Validation. Verification. ISoLA 2018*, volume 11245 of *Lecture Notes in Computer Science*, pages 139–143. Springer, 2018. doi:10.1007/978-3-030-03421-4_10.
9. Ziqing Luo and Stephen F. Siegel. Symbolic execution and deductive verification approaches to VerifyThis 2017 challenges. In Tiziana Margaria and Bernhard Steffen, editors, *Leveraging Applications of Formal Methods, Verification and Validation (ISoLA 2018), Proceedings, Part II: Verification*, volume 11245 of *Lecture Notes in Computer Science*, pages 160–178. Springer, 2018. doi:10.1007/978-3-030-03421-4_12.
10. Jan Hückelheim, Ziqing Luo, Sri Hari Krishna Narayanan, Stephen Siegel, and Paul D. Hovland. Verifying properties of differentiable programs. In Andreas Podelski, editor, *Static Analysis: 25th*

- International Symposium, SAS 2018, Proceedings*, volume 11002 of *Lecture Notes in Computer Science*. Springer, 2018. SAS Artifact Evaluated badge: Consistent, Complete, Easy to Reuse, Well Documented. Acceptance rate: $18/37 = 49\%$. doi:10.1007/978-3-319-99725-4_14.
11. Ziqing Luo, Manchun Zheng, and Stephen F. Siegel. Verification of MPI programs using CIVL. In *Proceedings of the 24th European MPI Users' Group Meeting*, EuroMPI '17, pages 6:1–6:11, New York, NY, USA, 2017. ACM. Paper acceptance rate: $17/37 = 46\%$. doi:10.1145/3127024.3127032.
 12. Manchun Zheng, John G. Edenhofner, Ziqing Luo, Mitchell J. Gerrard, Michael S. Rogers, Matthew B. Dwyer, and Stephen F. Siegel. CIVL: Applying a general concurrency verification framework to C/Pthreads programs (competition contribution). In *Tools and Algorithms for the Construction and Analysis of Systems – 22nd International Conference, TACAS 2016, Held as Part of the European Joint Conferences on Theory and Practice of Software, ETAPS 2016, Eindhoven, The Netherlands, April 2–8, 2016. Proceedings*, volume 9636 of *Lecture Notes in Computer Science*, pages 908–911. Springer, 2016. doi:10.1007/978-3-662-49674-9_57.
 13. Manchun Zheng, Michael S. Rogers, Ziqing Luo, Matthew B. Dwyer, and Stephen F. Siegel. CIVL: Formal verification of parallel programs. In *Proceedings of the 30th ACM/IEEE International Conference on Automated Software Engineering (ASE'15)*, New York, NY, USA, 2015. ACM. Pages 830–835. Overall acceptance rate: 27%; for tool papers: unknown. doi:10.1109/ASE.2015.99.
 14. Stephen F. Siegel, Manchun Zheng, Ziqing Luo, Timothy K. Zirkel, Andre V. Marianiello, John G. Edenhofner, Matthew B. Dwyer, and Michael S. Rogers. CIVL: The Concurrency Intermediate Verification Language. In *SC15: Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis*, New York, NY, USA, Nov 2015. ACM. Article no. 61, pages 1–12. Acceptance rate: 22%. doi:10.1145/2807591.2807635.
 15. Adam Hammouda, Andrew Siegel, and Stephen Siegel. Overcoming asynchrony: An analysis of the effects of asynchronous noise on nearest neighbor synchronizations. In Stefano Markidis and Erwin Laure, editors, *Solving Software Challenges for Exascale*, volume 8759 of *Lecture Notes in Computer Science*, pages 100–109. Springer, 2015. Acceptance rate: $12/17 = 71\%$. doi:10.1007/978-3-319-15976-8_7.
 16. Timothy K. Zirkel, Stephen F. Siegel, and Timothy McClory. Automated verification of Chapel programs using model checking and symbolic execution. In Guillaume Brat, Neha Rungta, and Arnaud Venet, editors, *NASA Formal Methods*, volume 7871 of *Lecture Notes in Computer Science*, pages 198–212. Springer Berlin Heidelberg, 2013. Acceptance rate: 37%. doi:10.1007/978-3-642-38088-4_14.
 17. Stephen F. Siegel and Timothy K. Zirkel. Loop invariant symbolic execution for parallel programs. In Viktor Kuncak and Andrey Rybalchenko, editors, *Verification, Model Checking, and Abstract Interpretation: 13th International Conference, VMCAI 2012*, volume 7148 of *Lecture Notes in Computer Science*, pages 412–427. Springer, January 2012. Acceptance rate: 37%. doi:10.1007/978-3-642-27940-9_27.
 18. Stephen F. Siegel and Timothy K. Zirkel. Automatic formal verification of MPI-based parallel programs. In Calin Cascaval and Pen-Chung Yew, editors, *Proceedings of the 16th ACM SIGPLAN Annual Symposium on Principles and Practices of Parallel Programming (PPoPP '11), short paper and poster*, pages 309–310. ACM, January 2011. doi:10.1145/2038037.1941603.
 19. Stephen F. Siegel and Timothy K. Zirkel. Collective assertions. In Ranjit Jhala and David Schmidt, editors, *Verification, Model Checking, and Abstract Interpretation: 12th International Conference, VMCAI 2011, Austin, TX, January 23–25, 2011, Proceedings*, volume 6538 of *Lecture Notes in Computer Science*, pages 387–402, 2011. doi:10.1007/978-3-642-18275-4_27.
 20. Stephen F. Siegel and Andrew R. Siegel. A memory-efficient data redistribution algorithm. (Video). In Matti Ropo, Jan Westerholm, and Jack Dongarra, editors, *Recent Advances in Parallel Virtual Machine and Message Passing Interface, 16th European PVM/MPI User's Group Meeting, Proceedings*, volume 5759 of *Lecture Notes in Computer Science*, pages 219–229. Springer, 2009. doi:10.1007/978-3-642-03770-2_28.

21. Stephen F. Siegel and Andrew R. Siegel. MADRE: The Memory-Aware Data Redistribution Engine. In Alexey Lastovetsky, Tahar Kechadi, and Jack Dongarra, editors, *Recent Advances in Parallel Virtual Machine and Message Passing Interface, 15th European PVM/MPI User's Group Meeting, Proceedings*, volume 5205 of *Lecture Notes in Computer Science*, pages 218–226. Springer, 2008. doi:10.1007/978-3-642-03770-2_28.
22. Stephen F. Siegel and Louis F. Rossi. Analyzing BlobFlow: A case study using model checking to verify parallel scientific software. In Alexey Lastovetsky, Tahar Kechadi, and Jack Dongarra, editors, *Recent Advances in Parallel Virtual Machine and Message Passing Interface, 15th European PVM/MPI User's Group Meeting, Proceedings*, volume 5205 of *Lecture Notes in Computer Science*, pages 274–282. Springer, 2008. doi:10.1007/978-3-540-87475-1_37.
23. Stephen F. Siegel and George S. Avrunin. Verification of halting properties for MPI programs using nonblocking operations. In Franck Cappello, Thomas Hérault, and Jack Dongarra, editors, *Recent Advances in Parallel Virtual Machine and Message Passing Interface, 14th European PVM/MPI User's Group Meeting, Paris, France, September 30 - October 3, 2007, Proceedings*, volume 4757 of *Lecture Notes in Computer Science*, pages 326–334. Springer, 2007. doi:10.1007/978-3-540-75416-9_44.
24. Stephen F. Siegel. Model checking nonblocking MPI programs. In Byron Cook and Andreas Podelski, editors, *Verification, Model Checking, and Abstract Interpretation: 8th International Conference, VMCAI 2007, Nice, France, January 14–16, 2007, Proceedings*, volume 4349 of *Lecture Notes in Computer Science*, pages 44–58, 2007. doi:10.1007/978-3-540-69738-1_3.
25. Stephen F. Siegel, Anastasia Mironova, George S. Avrunin, and Lori A. Clarke. Using model checking with symbolic execution to verify parallel numerical programs. In Lori L. Pollock and Mauro Pezzé, editors, *Proceedings of the ACM SIGSOFT International Symposium on Software Testing and Analysis, ISSTA 2006, Portland, Maine, USA, July 17–20, 2006*, pages 157–168. ACM, 2006. doi:10.1145/1146238.1146256.
26. Stephen F. Siegel and George S. Avrunin. Modeling wildcard-free MPI programs for verification. In *Proceedings of the ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming*, pages 95–106, Chicago, IL, June 2005. doi:10.1145/1065944.1065957.
27. Stephen F. Siegel. Efficient verification of halting properties for MPI programs with wildcard receives. In Radhia Cousot, editor, *Verification, Model Checking, and Abstract Interpretation: 6th International Conference, VMCAI 2005, Paris, January 17–19, 2005, Proceedings*, volume 3385 of *Lecture Notes in Computer Science*, pages 413–429, 2005. doi:10.1007/978-3-540-30579-8_27.
28. Stephen F. Siegel and George S. Avrunin. Improving the precision of INCA by preventing spurious cycles. In Mary Jean Harrold, editor, *Proceedings of the ACM SIGSOFT 2000 International Symposium on Software Testing and Analysis, Portland, OR, USA, August 21–24, 2000*, pages 191–200. ACM Press, 2000. doi:10.1145/347636.349130.

4.2 Refereed Journal Publications

29. Adam Hammouda, Andrew R. Siegel, and Stephen F. Siegel. Noise-tolerant explicit stencil computations for nonuniform process execution rates. *ACM Transactions on Parallel Computing*, 2(1):7:1–7:33, April 2015. doi:10.1145/2742351.
30. Kyle G. Felker, Andrew R. Siegel, and Stephen F. Siegel. Optimizing memory constrained environments in Monte Carlo nuclear reactor simulations. *International Journal of High Performance Computing Applications*, 27(2):210–216, May 2013. doi:10.1177/1094342012445627.
31. Stephen F. Siegel. Transparent partial order reduction. *Formal Methods in System Design*, 40(1):1–19, February 2012. doi:10.1007/s10703-011-0126-0.
32. Ganesh Gopalakrishnan, Robert M. Kirby, Stephen Siegel, Rajeev Thakur, William Gropp, Ewing Lusk, Bronis R. De Supinski, Martin Schulz, and Greg Bronevetsky. Formal analysis of MPI-based

- parallel programs. *Communications of the ACM*, 54(12):82–91, December 2011. doi:10.1145/2043174.2043194.
33. Stephen F. Siegel and Timothy K. Zirkel. TASS: The Toolkit for Accurate Scientific Software. *Mathematics in Computer Science*, 5(4):395–426, 2011. doi:10.1007/s11786-011-0100-7.
 34. Stephen F. Siegel and Timothy K. Zirkel. FEVS: A Functional Equivalence Verification Suite for high performance scientific computing. *Mathematics in Computer Science*, 5(4):427–435, 2011. doi:10.1007/s11786-011-0101-6.
 35. Stephen F. Siegel and Andrew R. Siegel. MADRE: The Memory-Aware Data Redistribution Engine. *International Journal of High Performance Computing Applications*, 24(1):93–104, February 2010. doi:10.1007/978-3-642-03770-2_28.
 36. Stephen F. Siegel, Anastasia Mironova, George S. Avrunin, and Lori A. Clarke. Combining symbolic execution with model checking to verify parallel numerical programs. *ACM Transactions on Software Engineering and Methodology*, 17(2):Article 10, 1–34, 2008. doi:10.1145/1348250.1348256.
 37. Stephen F. Siegel. Hochschild cohomology and elementary abelian subgroups. *Trans. Amer. Math. Soc.*, 358(7):2911–2915, July 2006. Appendix to Jonathan Pakianathan and Sarah Witherspoon, Quillen stratification for Hochschild cohomology of blocks. doi:10.1090/S0002-9947-05-04012-2.
 38. Stephen F. Siegel and George S. Avrunin. Improving the precision of INCA by eliminating solutions with spurious cycles. *IEEE Transactions on Software Engineering*, 28(2):115–128, 2002. doi:10.1109/32.988494.
 39. Stephen F. Siegel and Sarah J. Witherspoon. The Hochschild cohomology ring of a cyclic block. *Proc. Amer. Math. Soc.*, 128(5):1263–1268, 2000. doi:10.1090/S0002-9939-00-05466-6.
 40. Stephen F. Siegel. The cohomology of split extensions of elementary abelian 2-groups and Totaro’s example. *J. Pure Appl. Algebra*, 145(2):183–198, 2000. doi:10.1016/S0022-4049(98)00052-8.
 41. Stephen F. Siegel and Sarah J. Witherspoon. The Hochschild cohomology ring of a group algebra. *Proc. London Math. Soc.*, 79(1):131–157, 1999. doi:10.1112/S0024611599011958.
 42. Stephen F. Siegel, Vassily Gorbounov, and Peter Symonds. The cohomology of the Morava stabilizer group $\mathbb{S}_2$ at the prime 3. *Proc. Amer. Math. Soc.*, 126(3):933–941, 1998.
 43. Stephen F. Siegel. On the cohomology of split extensions of finite groups. *Trans. Amer. Math. Soc.*, 349(4):1587–1609, 1997.
 44. Stephen F. Siegel. The spectral sequence of a split extension and the cohomology of an extraspecial group of order p^3 and exponent p . *J. Pure Appl. Algebra*, 106(2):185–198, 1996.
 45. Leonard Evens and Stephen F. Siegel. Generalized Benson-Carlson duality. *J. Algebra*, 179(3):775–792, 1996.
 46. Stephen F. Siegel. Projective modules for A_9 in characteristic three. *Communications in Algebra*, 19(11):3099–3117, 1991.

4.3 Volumes Edited

47. Stephen F. Siegel and Ganesh Gopalakrishnan, editors, *Proceedings International Workshop on Verification of Scientific Software*, Electronic Proceedings of Theoretical Computer Science **432**, doi:10.4204/EPTCS.432, 15 Oct. 2025.

4.4 Refereed Workshop Publications

48. Alper Altuntas, Allison H. Baker, Ganesh Gopalakrishnan, John Baugh, and Stephen F. Siegel. Specification and verification for climate modeling: Formalization leading to impactful tooling. In *International Workshop on Verification of Scientific Software*, Electronic Proceedings in Theoretical Computer Science **432**, 2025. doi:10.4204/EPTCS.432.8.

49. Ziqing Luo and Stephen F. Siegel. Towards deductive verification of message-passing parallel programs. In Ignacio Laguna and Cindy Rubio-González, editors, *2018 IEEE/ACM 2nd International Workshop on Software Correctness for HPC Applications (Correctness)*. IEEE, 2018. doi:10.1109/Correctness.2018.00012.
50. Jan Hückelheim, Ziqing Luo, Fabio Luporini, Navjot Kukreja, Michael Lange, Gerard Gorman, Stephen Siegel, Matthew Dwyer, and Paul Hovland. Towards self-verification in finite difference code generation. In *Proceedings of the First International Workshop on Software Correctness for HPC Applications*, Correctness’17, pages 42–49, New York, NY, USA, 2017. ACM. Acceptance rate: 7/13 = 54%. doi:10.1145/3145344.3145488.
51. George S. Avrunin, Stephen F. Siegel, and Andrew R. Siegel. Finite-state verification for high performance computing. In Philip M. Johnson, editor, *Proceedings of the Second International Workshop On Software Engineering For High Performance Computing System Applications, St. Louis, Missouri, USA, May 15, 2005*, pages 68–72, 2005. doi:10.1145/1145319.1145340.
52. Stephen F. Siegel and George S. Avrunin. Verification of MPI-based software for scientific computation. In Susanne Graf and Laurent Mounier, editors, *Model Checking Software: 11th International SPIN Workshop, Barcelona, Spain, April 1–3, 2004, Proceedings*, volume 2989 of *Lecture Notes in Computer Science*, pages 286–303. Springer-Verlag, 2004. doi:10.1007/978-3-540-24732-6_20.

4.5 Papers & Extended Abstracts for Invited Talks/Tutorials Published in Peer-Reviewed Conference Proceedings

53. Marc Jasper, Maximilian Fecke, Bernhard Steffen, Markus Schordan, Jeroen Meijer, Jaco van de Pol, Falk Howar, and Stephen F. Siegel. The RERS 2017 challenge and workshop (invited paper). In *Proceedings of the 24th ACM SIGSOFT International SPIN Symposium on Model Checking of Software*, SPIN 2017, pages 11–20, New York, NY, USA, 2017. ACM. doi:10.1145/3092282.3098206.
54. Stephen F. Siegel and Ganesh Gopalakrishnan. Formal analysis of message passing (Invited Talk). In Ranjit Jhala and David Schmidt, editors, *Verification, Model Checking, and Abstract Interpretation: 12th International Conference, VMCAI 2011, Austin, TX, January 23–25, 2011, Proceedings*, volume 6538 of *Lecture Notes in Computer Science*, pages 2–18, January 2011. doi:10.1007/978-3-642-18275-4_2.
55. Stephen F. Siegel. Formal verification for scientific computing: Trends and progress. In Matti Ropo, Jan Westerholm, and Jack Dongarra, editors, *Recent Advances in Parallel Virtual Machine and Message Passing Interface*, volume 5759 of *Lecture Notes in Computer Science*, page 7. Springer Berlin / Heidelberg, 2009. doi:10.1007/978-3-642-03770-2_6.
56. Stephen F. Siegel. Verifying parallel programs with MPI-Spin. In Franck Cappello, Thomas Héroult, and Jack Dongarra, editors, *Recent Advances in Parallel Virtual Machine and Message Passing Interface, 14th European PVM/MPI User’s Group Meeting, Paris, France, September 30 - October 3, 2007, Proceedings*, volume 4757 of *Lecture Notes in Computer Science*, pages 13–14. Tutorial. Springer, 2007. doi:10.1007/978-3-540-75416-9_8.

4.6 Other Published Invited Papers

57. Stephen F. Siegel. CIVL solutions to VerifyThis 2016 challenges. *ACM SIGLOG News*, 4(2):55–75, May 2017. doi:10.1145/3090064.3090070.
58. Stephen F. Siegel. Verification of MPI-based computations. In Henri E. Bal, Lubos Brim, and Martin Leucker, editors, *Distributed Verification and Grid Computing*, number 08332 in Dagstuhl Seminar Proceedings, Dagstuhl, Germany, 1–3, 2008. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, Germany. URL: <http://drops.dagstuhl.de/opus/volltexte/2008/1631>.

4.7 Refereed Posters with Extended Abstracts

59. Wenhao Wu. A22: Verifying Functional Equivalence Between C and Fortran Programs. (Advisor: Stephen Siegel) ACM Student Research Competition, *Archive, SC17: International Conference for High Performance Computing, Networking, Storage and Analysis*, Nov. 2017. URL: http://sc17.supercomputing.org/SC17%20Archive/src_poster/src_poster_pages/spost157.html Acceptance rate: $28/59 = 47\%$.
60. Ziqing Luo and Stephen F. Siegel. P83: Contracts for Message-Passing Programs. Research Poster, *Archive, SC17: International Conference for High Performance Computing, Networking, Storage and Analysis*, Nov. 2017. Acceptance rate: $99/169 = 59\%$. URL: http://sc17.supercomputing.org/SC17%20Archive/tech_poster/tech_poster_pages/post210.html

4.8 Significant Reports

61. Maya Gokhale, Ganesh Gopalakrishnan, Jackson Mayo, Santosh Nagarakatte, Cindy Rubio-González, and Stephen F. Siegel. *Report of the DOE/NSF Workshop on Correctness in Scientific Computing, June 2023, Orlando, FL, 2023*. doi:10.48550/arXiv.2312.15640
62. Ganesh Gopalakrishnan, Paul D. Hovland, Costin Iancu, Sriram Krishnamoorthy, Ignacio Laguna, Richard A. Lethin, Koushik Sen, Stephen F. Siegel, and Armando Solar-Lezama. *Report of the HPC Correctness Summit*. Department of Energy, 2017. doi:10.2172/1470989.
63. Stephen F. Siegel, Andrew R. Siegel, and Cristian Rabiti. UNIC Code: Algorithmic specification of the Method of Long Characteristics. Technical Memo ANL/MCS-TM-301, Mathematics and Computer Science Division, Argonne National Laboratory, June, 2008.
64. Stephen F. Siegel and George S. Avrunin. Modeling MPI programs for verification. Technical Report UM-CS-2004-75, Department of Computer Science, University of Massachusetts Amherst, 2004.
65. Stephen F. Siegel. The INCA Query Language. Technical Report UM-CS-2002-18, Department of Computer Science, University of Massachusetts Amherst, 2002.
66. George S. Avrunin, James C. Corbett, Matthew B. Dwyer, Corina S. Păsăreanu, and Stephen F. Siegel. Comparing finite-state verification techniques for concurrent software. Technical Report UM-CS-1999-69, Department of Computer Science, University of Massachusetts Amherst, 1999.

5 Software Systems Developed

- The Concurrency Intermediate Verification Language (CIVL), <http://civl.dev>
 - model checking and symbolic execution platform for sequential and parallel C programs, with focus on scientific computing; supporting MPI, OpenMP, and CUDA
 - under development from 2014 to present
 - approximately 42 downloads from 14 unique IPs per week
 - the main paper on CIVL [13] has been cited 106 times (Google Scholar)
- MCRERS, <svn://vsl.cis.udel.edu/mcrers>
 - model checker for parallel compositions of labeled transitions systems
 - See <https://rers-challenge.org> for background and file formats.
 - See https://doi.org/10.1007/978-3-030-53291-8_6 for description of the algorithms implemented.

- Functional Equivalence Verification Suite (FEVS), <http://vsl.cis.udel.edu/fevs>
 - FEVS is a suite of 37 programs (all in C, many using MPI) to test the precision of verification tools that target numerical/scientific software. The programs are arranged in 11 groups, each containing one simple version believed to be correct, the *specification*. Each group also contains several implementations which can be considerably more complex, some of which contain known errors. The suite was published in 2011 and has been used as a benchmark in projects from other groups; the main paper has 33 citations (Google Scholar).
- Toolkit for Accurate Scientific Software (TASS), <http://vsl.cis.udel.edu/tass>
 - TASS is a symbolic execution and model checking platform for numerically-intensive C/MPI programs. It is the predecessor to CIVL.
- MPI-SPIN, <http://vsl.cis.udel.edu/mpi-spin>
 - MPI-Spin is a significant extension to the model checker Spin. It adds support for a large subset of MPI, and was the main platform used for the research reported in many of our publications. It is still maintained and used by other groups for teaching or research.
- Memory Aware Data Redistribution Engine (MADRE), <http://vsl.cis.udel.edu/madre>
 - MADRE is a C/MPI library for re-distributing blocks of data in a memory-constrained distributed environment. This problem arises frequently in many kinds of scientific applications, such as particle-based algorithms. A number of different heuristics and algorithms have been proposed (by ourselves and other researchers) to solve this problem, and MADRE has been used to investigate and compare these.

6 Invited Talks

- *Challenge Problems in Verification of MPI Programs*, The 11th Workshop on Formal Reasoning in Distributed Algorithms, (CAV 2024 workshop), Montreal, Canada. July 23, 2024
- *Verification of Scientific Software with the CIVL Model Checker: Project overview with applications to CUDA and PETSc*, Computer Science Seminar Series, Argonne National Laboratory, June 25, 2024, with students Venkata Dhavala, Alex Wilton, and Devin Cummings
- *CIVL Verification of PETSc Vector Module*, FastMath Institute Annual Meeting. November 2, 2023
- *A CIVLized Platform for Verification of Scientific Software*, The Workshop on Democratizing Software Verification, at CAV 2019. July 14, 2019
- *CIVL Tutorial*, University of Twente, Netherlands. March 12, 2019
- *Specification & Verification of Message-Passing Parallel Programs*, Colloquium, University of Twente. March 14, 2019
- *Specification & Verification of Message-Passing Parallel Programs*, CEA List, Saclay, France. March 19, 2019
- *A Verification Language for High Performance Computing*, Keynote address, Correctness 2017: First International Workshop on Software Correctness for HPC Applications, at SC17, Denver, Colorado, November 12, 2017
- *Data race detection with CIVL*, Invited talk, RERS Workshop: 7th International Challenge on the Rigorous Examination of Reactive Systems, University of California Santa Barbara, July 12, 2017
- *Scopes & Processes: a general concurrency model for parallel program analysis and model checking*, Colloquium, School of Computing, University of Utah, September 7, 2012

- *Formal Specification and Verification of MPI Programs Using TASS*, Argonne National Laboratory, Mathematics and Computer Science Division, April 31, 2011
- *Formal Specification and Verification of MPI Programs Using TASS*, Massachusetts Institute of Technology, Computer Science and Artificial Intelligence Laboratory, April 15, 2011
- *Formal Verification for Scientific Computing: Trends and Progress*, EuroPVM/MPI 2009 (Video). September 10, 2009
- *Towards Verifiable Scientific Computing*, University of Nebraska Lincoln colloquium, July 10, 2008
- *Towards Verifiable Scientific Computing*, University of Utah colloquium, Salt Lake City, UT, November 16, 2007
- *Finite-state verification for scientific computing*, in the series *Computing the future: lectures in computational science, engineering, and mathematics*, Center for Computation and Technology, Louisiana State University, Baton Rouge, LA, April 18, 2005
- *Recent progress in the finite-state verification of MPI programs*, Argonne National Laboratory, November 18, 2004
- *Applying finite-state verification to scientific software using MPI*, Smith College, December 3, 2003
- *Applying finite-state verification to scientific software using MPI*, Argonne National Laboratory, January 13, 2003

7 Service

7.1 Editorial

- Associate Editor, *IEEE Transactions on Software Engineering*, 2015–2019

7.2 Organization

- Publications Chair, International Conference on Computer Aided Verification (CAV 2025)
- Co-organizer, International Workshop on Verification of Scientific Software (VSS 2025), an ETAPS 2025 Workshop
- Organizing Committee, CoDaC: A CAV 2024 Workshop on Correct Data Compression
- Co-chair, DOE/NSF Workshop on Correctness in Scientific Computing, a PLDI 2023 workshop
- Co-chair, VerifyThis Program Verification Competition, 2023
- Co-organizer, *Evaluating Tools for Software Verification*, a track at the International Symposium on Leveraging Applications of Formal Methods, Verification and Validation (ISoLA 2018)
- Workshops Chair, CGO 2018: International Symposium on Code Generation and Optimization
- Organizing committee, *Exploiting Concurrency Efficiently and Correctly ((EC)²)*, CAV Workshop, 2008, 2009, 2010, 2011 (chair), 2012.
- Publicity Chair, International Symposium on Software Testing and Analysis, Boston, Massachusetts, July 11–14, 2004
- Co-chair (with John Maginnis), Special Session on Cohomology of Finite Groups, 1998 Spring Central Sectional Meeting (#932) of the American Mathematical Society, March 27–28, 1998

7.3 Program Committees

- VMCAI 2026: International Conference on Verification, Model Checking, and Abstract Interpretation
- CAV 2025: International Conference on Computer Aided Verification
- SPIN 2024: 30th International SPIN Symposium on Model Checking of Software
- SPIN 2021: 27th International SPIN Symposium on Model Checking of Software
- Correctness 2020: IEEE/ACM 4th International Workshop on Software Correctness for HPC Applications
- Correctness 2018: IEEE/ACM 2nd International Workshop on Software Correctness for HPC Applications
- TACAS 2018: 24th International Conference on Tools and Algorithms for the Construction and Analysis of Systems
- Correctness 2017: First International Workshop on Software Correctness for HPC Applications
- SV-COMP 2016, 2017: Software Verification Competition, held at TACAS 2016, 2017
- SC16: International Conference for High Performance Computing, Networking, Storage and Analysis, Technical track, Programming Systems, 2016
- NFM 2013: International Symposium on NASA Formal Methods
- NSV 2011: International Workshop on Numerical Software Verification
- EuroPVM/MPI 2009, 2010, 2012
- SC10: International Conference for High Performance Computing, Networking, Storage and Analysis, Technical track, Systems, 2010
- SC09: International Conference for High Performance Computing, Networking, Storage and Analysis, Tutorials, 2009

7.4 Proposal Reviewing

- U.S. National Science Foundation proposal review panels, 2025, 2024, 2014, 2011, 2009, 2006
- Ad-hoc proposal reviewer, National Science Foundation, 2026, 2024, 2022, 2015
- Ad-hoc proposal reviewer, U.S. Department of Energy, 2022
- Proposal review panel, Department of Energy SciDAC program, 2017
- Panelist, Department of Energy, Advanced Scientific Computing Research Exascale Tools Workshop, Panel on Correctness and Debugging, October 13–14, 2011

7.5 Other reviewing

- ESOP 2026: European Symposium on Programming, external reviewer, 2025
- *International Journal on Software Tools for Technology Transfer*, 2025
- *Formal Methods in System Design* (journal), 2018, 2022
- *IEEE Transactions on Software Engineering*, 2008, 2021
- *Automated Software Verification* (book), Springer, 2020

- *Parallel Computing* (journal), 2018
- POPL: Symposium on Principles of Programming Languages, external reviewer, 2017
- *IEEE Transactions on Reliability*, 2014, 2015
- International Symposium on Software Reliability Engineering, 2014
- PLDI: ACM SIGPLAN Conference on Programming Language Design and Implementation, External Review Committee, 2014
- PPOPP: ACM SIGPLAN Symposium on Principles and Practices of Parallel Programming, External Review Committee, 2014
- *Automated Software Engineering* (journal), 2012
- ISSTA: International Symposium on Software Testing and Analysis, 2011
- SC09: International Conference for High Performance Computing, Networking, Storage and Analysis, 2009
- PPOPP: ACM SIGPLAN Symposium on Principles and Practice of Parallel Computing, ad hoc reviewer, 2008
- CAV: 17th International Conference on Computer Aided Verification, 2008
- *Concurrency and Computation: Practice and Experience* (journal), 2007
- *Parallel Computing* (journal), 2007
- *ACM Transactions on Software Engineering and Methodology* (TOSEM), 2007
- EuroPVM/MPI: 13th European PVM/MPI Users' Group Meetings, 2006
- *Communications in Algebra* (journal), 2006

7.6 Participation

- Participant and Presenter, Dagstuhl Seminar 18151: Program Equivalence, *Program equivalence problems in computational science*, April 8–13, 2018, <http://www.dagstuhl.de/18151>
- Participant and Presenter, VerifyThis program verification competition, April 14–15, 2018
- Participant, Emerging Technologies Principal Investigators Meeting, Department of Energy, August 22, 2018
- Participant, NSF Software Infrastructure for Sustained Innovation (SI2) workshop, Feb. 16–17, 2016

7.7 University of Delaware Service

- College of Engineering Faculty Representative, Student & Faculty Honors Committee of the Faculty Senate, Aug. 26, 2025 to present
- CIS Executive Committee member, summer 2023; Jan. 1, 2025 to present
- CIS Marketing Committee, 2022–2023; Fall 2023–present (chair)
- CIS Space Committee, 2022–present
- Department Representative, American Association of University Professors, University of Delaware Chapter, 2013–present

- UD ACM Student Chapter, talk, *Utilizing CUnit and LCOV for Robust Unit Testing and Code Coverage in C Programming*, with Devin Cummings, October 24, 2024
- CIS Party with the Profs, participant, November 11, 2024
- CIS 60th Anniversary Committee, 2024
- Chair, CIS Undergraduate Curriculum and Program Committee, 2021–2022
- CIS representative to College of Engineering Educational Activities Committee, 2021–2022
- CIS SPICE Committee, 2020–2021
- CIS Undergraduate Advising Committee, 2020–2021
- Chair, CIS Undergraduate Curriculum and Program Committee, 2016–2019
- CIS representative to College of Engineering Educational Activities Committee, January 2016–2019
- assisted with the UD booth presence at SC07, SC09, SC15, and SC17 (the International Conference for High Performance Computing, Networking, Storage and Analysis, also known as “Supercomputing”) with funding, posters, students, post-doc, and demos
- SIG-SYS organizer, Fall 2016
- CIS Undergraduate Committee member, 2007–2009, 2015–2016
- M.S. Software Engineering Committee chair, 2013–2017
- Dean’s Diversity Committee member, 2015
- ECE/CIS Lab System Administrator Search Committee, 2014
- Dean’s Junior Faculty Advisory Council, 2013–2014
- UD Engineering Outreach Advisory Committee, 2013–2015
- Computing Infrastructure Hiring Committee, 2011–2012
- Graduate Program Committee, 2010–2012
- HPC Programming Team coach, 2010
- Search Committee member, tenure-track position in software engineering, 2009–2010
- CISC 475 assessment team member, 2007, 2008, 2009
- Graduate Recruitment Committee member, 2006–2007
- Master of Science in Software Engineering committee member: helped develop curriculum of new program and prepare documents for university approval
- organized and coached two UD teams which competed in the HPC Programming Contest at SC09. One team tied for first place, the other came in third.
- co-organized the Computer and Information Sciences Distinguished Lecture Series, 2007–2008

8 Mentoring

- Post-doctoral researchers sponsored
 - Dr. Manchun Zheng, November 2013–2016
- Graduate student advisees
 - Venkata Dhavala, M.S. student and Research Assistant, 2024–2025, status: received M.S. in 2025
 - Alex Wilton; Ph.D. student and Research Assistant, 2020–present, status: passed Ph.D. Qualifying Exam, January 2026
 - Wenhao Wu, Ph.D. student and Research Assistant, 2015–2021, 2025, status: passed Ph.D. Qualifying Exam in 2020, dropped out
 - Ziqing Luo, Ph.D. student and Research Assistant, 2014–2020, status: received Ph.D. in 2020, thesis: *Contracts for Message-Passing Programs*
 - Yihao Yan; M.S. student and Research Assistant, 2016–2018, status: received M.S. in 2018
 - Si Li, Ph.D. student and Research Assistant, 2015–2016, status: withdrew
 - Timothy Zirkel, Ph.D. student and Research Assistant, 2008–2014, status: received Ph.D. in 2014, thesis: *Formally Verifying the Accuracy of Numerical Approximations in Scientific Software*
 - Timothy McClory, M.S. student and Research Assistant, 2011–2013, status: received M.S. in 2013
 - Yi Wei: M.S. student and Research Assistant, 2007–2010, status: received M.S. in 2010
 - Jiaqiang Xu, M.S. student and Research Assistant, 2007–2009, status: received M.S. in 2009
 - Pujan Kafle, M.S. student and Research Assistant, 2006–2008, status: received M.S. in 2008
- Other Graduate Research Assistants
 - Michael Karpeles, Research Assistant, 2011
 - Benjamin Perry, Research Assistant, 2010
 - Samuel Moelius, Research Assistant, 2007–2008
- Ph.D. Dissertation Committees
 - Ph.D. Dissertation Committee member for Fabian Cordero, University of Delaware, defended 2024
 - Ph.D. Dissertation Committee member for Marc Jasper, Technische Universität Dortmund, defended 2021
 - Ph.D. Dissertation Committee member for Matthew Lambert, University of Delaware, defended 2020
 - Ph.D. Dissertation Committee member for Tristan Vanderbruggen, University of Delaware, defended 2018
 - Ph.D. Dissertation Committee member for Chen Huo, defended 2017
 - Ph.D. Dissertation Committee member for E.J. Park, defended 2014
 - Ph.D. Dissertation Committee member for Trilce Estrada, defended 2012
 - Ph.D. Dissertation Committee member for Sarvani Vakkalanka, University of Utah (advisor: Ganesh Gopalakrishnan), defended 2010
- Undergraduate students supervised in research projects
 - Devin Cummings, NSF REU, *A high-performance model checker kernel*, 2024
 - Sydney Hester, Independent Study, *Testing the Correctness of Transport Layer Message Passing Protocols Via Socket Programming In CIVL*, 2023
 - Zane Greenholt, NSF REU, *A new CUDA front-end for CIVL*, 2022

- Alex You, Independent Study, *Symbolic execution and model checking*, 2022
- Joshua Davis, *Model Checking Concurrent Collections*, 2018
- Sarah Elizabeth Strobel, NSF REU, *A web-based interface for CIVL*, 2018
- Matthew Zelinksy, NSF REU, *Formal specification of machine learning classification algorithms*, 2018
- Andre Marianiello, NSF REU, *Translation of CUDA to CIVL intermediate form for verification*, 2014
- Jacob Trieu, NSF REU, *Translation of OpenCL to CIVL intermediate form for verification*, 2014
- John Edenhofner, NSF REU, *Translation of POSIX Threads programs to CIVL intermediate form for verification*, 2014
- Benjamin Handanyan, NSF REU, *Graphical User Interface for concurrent trace display*, 2014
- Steven Noyes, REU, *Graphical User Interface for the CIVL framework*, 2014
- Alex Stachnik, Independent Study, *Construction of compiler-based front-end for TASS*, 2011
- Andrew Chester, Independent Study, *Development of new ECE/CIS Account System*, 2011
- Daniel Fix, University of Delaware Research Foundation summer internship, *Counterexample trace display for TASS*, 2010
- Robert Deaton, Independent Study, *An XML representation for TASS models*, 2009
- John Hankins, Independent Study, *A concurrent elevator control system in Java*, 2008
- Brandon Maas, Independent Study, *nfoShare (Vgoo) and Bus Bookie Startup Projects*, 2008

9 Classes Taught

- 2026 Fall (UD)
 - CISC 303: *Auutomata Theory*
- 2026 Spring (UD)
 - CISC 867.012: *Automated Reasoning*
 - CISC 404/604: *Elements of the Theory of Computation*
- 2025 Fall (UD)
 - CISC 404/604: *Logic in Computer Science*
- 2025 Spring (UD)
 - CISC 475/675: *Software Engineering Principles & Practices*
 - CISC 414/614: *Formal Methods in Software Engineering*
- 2024 Spring (UD)
 - CISC 475/675: *Software Engineering Principles & Practices*
- 2023 Fall (UD)
 - CISC 404/604: *Logic in Computer Science*
- 2023 Spring (UD)
 - CISC 401/601: *Elements of the Theory of Computation*
- 2022 Fall (UD)

- CISC 372.010: *Parallel Computing*
- 2022 Spring (UD)
 - CISC 372.010: *Parallel Computing*
- 2021 Fall (UD)
 - CISC 404/604: *Logic in Computer Science*
- 2021 Spring (UD)
 - CISC 849.012: *Advanced Topics in Computer Applications: Model Checking*
- 2020 Fall (UD)
 - CISC 372.010: *Parallel Computing*
- 2018 Fall (UD)
 - CISC 372.010: *Parallel Computing*
 - CISC 675.010: *Software Engineering: Principles & Practices*
- 2018 Spring (UD)
 - CISC 449.010/649.010: *Topics in Computer Applications: Rigorous Program Development*
 - CISC 467.013: *VIP: High-Performance Computing*
- 2017 Fall (UD)
 - CISC 372.010: *Parallel Computing*
 - CISC 675.010: *Software Engineering: Principles & Practices*
 - CISC 467.013: *VIP: High-Performance Computing*
- 2017 Spring (UD)
 - CISC 879.010: *Reproducibility in Software Systems Research*
 - CISC 467.013: *VIP: High-Performance Computing*
- 2016 Fall (UD)
 - CISC 108.010: *Introduction to Computer Science 1*
 - CISC 372: *Parallel Computing*
- 2016 Spring (UD)
 - CISC 879.010: *Concurrency & Verification*
- 2015 Fall (UD)
 - CISC 108: *Introduction to Computer Science 1*
 - CISC 414/614: *Formal Methods in Software Engineering*
- 2015 Spring (UD)
 - CISC 108: *Introduction to Computer Science 1*
- 2014 Fall (UD)
 - CISC 475/675: *Advanced Software Engineering*
 - CISC 414/614: *Formal Methods in Software Engineering*

- 2014 Spring (UD)
 - CISC 879.011: *Formal Methods for High Performance Computing*
- 2013 Fall (UD)
 - CISC 414/614: *Formal Methods in Software Engineering*
 - CISC 475/675: *Advanced Software Engineering*
- 2013 Spring (University of Utah)
 - CS 5965/6965: *Formal Methods for High Performance Computing*
- 2012 Spring (UD)
 - CISC 475/675: *Advanced Software Engineering*
- 2011 Fall (UD)
 - CISC 108: *Introduction to Computer Science 1*
 - CISC 414/614: *Formal Methods in Software Engineering*
- 2011 Spring (UD)
 - CISC 475/675: *Advanced Software Engineering*
 - CISC 879.011: *Advanced Topics in Software Verification*
- 2010 Fall (UD)
 - CISC 414/614: *Software Verification*
- 2010 Spring (UD)
 - CISC 475/675: *Advanced Software Engineering*
 - CISC 372: *Parallel Programming* (co-taught with Martin Swamy)
- 2009 Fall (UD)
 - CISC 403/603: *Software Verification*
 - CISC 879.010: *Advanced Parallel Computing* (co-taught with Martin Swamy)
- 2009 Spring (UD)
 - CISC 475/675: *Object-Oriented Software Engineering*
 - CISC 372: *Parallel Programming*
- 2008 Fall (UD)
 - CISC 879.011: *Abstract Interpretation*, Fall 2008
- 2008 Spring (UD)
 - CISC 475: *Object-Oriented Software Engineering*
 - CISC 675: *Object-Oriented Software Engineering* (graduate)
- 2007 Fall (UD)
 - CISC403/603: *Program Validation*
- 2007 Spring (UD)
 - CISC 475: *Object-Oriented Software Engineering*

- 2006 Fall (UD)
 - CISC 879.011: *Finite-State Verification*
- 2003 Fall (Amherst College)
 - CS31: *Concurrency*
- 1998 Spring (University of Massachusetts Amherst)
 - Math 132: *Calculus II with Graphing Calculator*
- 1997 Fall (University of Massachusetts Amherst)
 - Math 132: *Calculus II with Graphing Calculator*
- 1997 Spring (University of Massachusetts Amherst)
 - Math 411: *Introduction to Abstract Algebra I*
 - Math 132: *Calculus II with Graphing Calculator*
- 1996 Fall (University of Massachusetts Amherst)
 - Math 190: *Basic Math Skills for the Modern World*
 - Math 131: *Calculus I with Graphing Calculator*
- 1995 Spring (Northwestern University)
 - Math D-78: *Group representation theory*
- Winter 1994–5 (Northwestern University)
 - Math B15-0: *Multiple integration and vector calculus*
- Winter 1993–4 (Northwestern University)
 - Math E-11: *Group cohomology*
- Fall 1993 (Northwestern University)
 - Math B14-1: *Calculus I*

10 Recognitions

- VerifyThis 2025 software verification competition, *Innovative Tool Feature: Model checking based on symbolic execution* (with student Alex Wilton)
- VerifyThis 2022 software verification competition, *Second Place*
- CIS Department Service Award (for work on the undergraduate program), 2019
- VerifyThis 2017 software verification competition, *Best Tool Feature: CIVL: Functional Equivalence*, April 2017
- Yihao Yan, Verified Software Laboratory, Rigorous Examination of Reactive Systems (RERS) Challenge 2017, Gold Medal in category *Parallel LTL* model checking
- Nominated for Excellence in Undergraduate Academic Advising Award, May 2009
- National Science Foundation Postdoctoral Fellowship, September 1993 – June 1996
- Sloan Foundation Dissertation Fellowship, October 1992 – August 1993
- Office of Naval Research Graduate Fellowship, University of Chicago, June 1989 – May 1992

- Senior Mathematics Award for M.Sc. dissertation, Oxford University, June 1989
- Fulbright Graduate Fellowship, Oxford University, September 1988 – June 1989
- Paul R. Cohen Mathematics Prize, University of Chicago, June 1988
- National Science Foundation Graduate Fellowship (declined), April 1988
- Admitted to Phi Beta Kappa, University of Chicago, June 1987