

Curriculum Vitae

Tevfik Bultan

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Department of Computer Science
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Current Research Interests

automated testing, analysis, verification, and repair of software, string analysis, constraint solvers, model counting, side-channel analysis, quantitative information flow, access control, design for verification, symbolic execution, model checking, formal methods, computer security, software engineering

Degrees

Ph.D., August 1998, Department of Computer Science, University of Maryland, College Park
Dissertation: *Automated Symbolic Analysis of Reactive Systems*
Advisor: Richard Gerber

M.S., January 1992, Department of Computer Engineering and Information Science, Bilkent University, Ankara, Turkey
Thesis: *Parallel Circuit Partitioning and Mapping Heuristics Based on Mean Field Annealing*
Advisor: Cevdet Aykanat

B.S., June 1989, Department of Electrical and Electronics Engineering, Middle East Technical University, Ankara, Turkey

Work Experience

Chair, Department of Computer Science, University of California, Santa Barbara, July 2019–present

Professor, Department of Computer Science, University of California, Santa Barbara, July 2009–present

Visiting Professor, Koc University, Istanbul, Turkey, March 2015–August 2015

Vice Chair, Department of Computer Science, University of California, Santa Barbara, November 2005–June 2009

Associate Professor, Department of Computer Science, University of California, Santa Barbara, July 2004–June 2009

Visiting Associate Professor, Department of Computer Science, University of Maryland, College Park, October 2004–September 2005

Visiting Scientist, Fraunhofer Center for Experimental Software Engineering, Maryland, October 2004–September 2005

Visiting Scientist, Naval Research Laboratory, Center for High Assurance Computer Systems, September 2004–September 2005

Assistant Professor, Department of Computer Science, University of California, Santa Barbara, September 1998–June 2004

Research/Teaching Assistant, Department of Computer Science, University of Maryland, College Park, January 1994–August 1998

Research/Teaching Assistant, Department of Computer Engineering and Information Science, Bilkent University, Ankara, Turkey, September 1989–August 1993

Honors and Awards

ACM Recognition of Service Award, 2019

ACM SIGSOFT and IEEE Computer Society TCSE, Recognition of Outstanding Contributions to Software Engineering Community, 2019

UCSB Academic Senate Outstanding Graduate Mentor Award, 2016

ACM Distinguished Scientist, 2016

Advisee Muath Alkhalaf received the ACM SIGSOFT Outstanding Doctoral Dissertation Award, 2015

Scientific and Technical Research Council of Turkey (TUBITAK) Visiting Scientist Fellowship, 2015

ACM SIGSOFT distinguished paper award, 29th IEEE/ACM International Conference on Automated Software Engineering (ASE 2014)

ACM Recognition of Service Award, 2012

Advisee Fang Yu received the UCSB Computer Science Outstanding Dissertation Award, 2010

Best paper award, 20th IEEE/ACM International Conference on Automated Software Engineering (ASE 2005)

ACM SIGSOFT distinguished paper award, 20th IEEE/ACM International Conference on Automated Software Engineering (ASE 2005)

National Science Foundation Faculty Early Career Development (CAREER) Award, 2000

Regents' Junior Faculty Fellowship, University of California, Santa Barbara, 1999

NATO Science Fellowship, 1993

Conference papers C13, C22, C33, C43, C44, C45, C46, C54, C56, C59, C63, C65, C71, and workshop paper W9 were invited for submission to special journal issues dedicated to top papers from the conferences and workshop they appeared in, and extended versions of these papers were published as journal papers, J1, J3, J7, J11, J12, J13, J14, J20, J21, J18, J23, J22, J27, and J10, respectively.

Grants

DARPA Hardening Development Toolchains Against Emergent Execution Engines (HARDEN) Program
Project Title: *EMERGENCY: A Unified Framework for Discovering, Modeling, Analyzing & Mitigating Adversarial Emergent Computations*
Grant: N66001-22-2-4037 Amount: \$2,211,000 Period: 2022-2026 (PI; joint with Giovanni Vigna, Christopher Kruegel, Yu Feng, UCSB; Aravind Machiry, Milind Kulkarni, Purdue)

Navy SBIR-STTR Phase 2
Project Title: *Self-Healing Ship Systems*
Recommended for funding, Amount: \$1,000,000 Period: 2022-2024 (PI; joint with David Siu, Oceanit)

National Science Foundation
Project Title: *FMitF: Track I: Scalable and Quantitative Verification for Neural Network Analysis and Design*
Grant: CCF 2124039 Amount: \$750,000 Period: 2021-2025 (PI; joint with Yufei Ding)

National Science Foundation
Project Title: *Automated Quantitative Assessment of Testing Difficulty*
Grant: CCF 2008660 Amount: \$500,000 Period: 2020-2023 (PI; joint with Lucas Bang, Harvey Mudd College)

National Science Foundation
Project Title: *THINGULARITY-Taming the Heterogeneity of IoT Across the System Stack*
Grant: CCF 2008660 Amount: \$250,000 Period: 2020-2021 (Co-PI; joint with Chandra Krintz, Yufei Ding, Ben Hardekopf, Divyakant Agrawal)

Navy SBIR-STTR Phase 1
Project Title: *Self-Healing Ship Systems*
Grant: N68335-21-C-0439 Amount: \$160,000 Period: 2020-2022 (PI; joint with David Siu, Oceanit)

Army SBIR-STTR Phase 1
Project Title: *Validating Vehicle Communications between Trusted and Untrusted Vehicle Control Systems*
Grant: W56HZV-21-C-0052 Amount: \$100,000 Period: 2020 (PI; joint with David Siu, Oceanit)

National Science Foundation
Project Title: *HUGS: Human-Guided Software Testing and Analysis for Scalable Bug Detection and Repair*
Grant: CCF 1901098 Amount: \$1,200,000 Period: 2019-2023 (PI; joint with Corina Pasareanu, CMU; Koushik Sen UC Berkeley)

National Science Foundation
Project Title: *Differential Policy Verification and Repair for Access Control in the Cloud*
Grant: CCF 1817242 Amount: \$500,000 Period: 2018-2021 (sole PI)

Amazon
Project Title: *Automatically Detecting Bugs in Identity and Access Management Policies*
Amount: \$100,000 Period: 2018 (sole PI)

Committee on Research, University of California, Santa Barbara
Project Title: *Quantifying Information Leakage in Mobile Applications*
Amount: \$7,000 Period: 2017 (sole PI)

National Science Foundation

Project Title: *NSF Travel and Attendance Grant Proposal for ISSTA/SPIN 2017*
Grant: CCF 1741648 Amount: \$9,000 Period: 2017 (sole PI)

DARPA Space/Time Analysis for Cybersecurity (STAC) Program

Project Title: *Integrated Symbolic execution for Space-Time Analysis of Code (ISSTAC)*
Grant: FA8750-15-2-0087 Amount: \$6,000,000 Period: 2015-2019 (PI; joint with Gabor Karsai, Vanderbilt; Corina Pasareanu, CMU)

National Science Foundation

Project Title: *Leveraging Graph Databases for Incremental and Scalable Symbolic Analysis and Verification of Web Applications*
Grant: CCF 1548848 Amount: \$200,000 Period: 2015-2017 (PI; joint with Xifeng Yan; Alex Orso, Georgia Tech; Corina Pasareanu, CMU)

National Science Foundation

Project Title: *Data Model Verification for Web Applications*
Grant: CCF 1423623 Amount: \$500,000 Period: 2014-2017 (sole PI)

National Science Foundation

Project Title: *IGERT: Interdisciplinary Graduate Education Research and Training in Network Science*
Grant: CIF21-IGERT 1258507 Amount: \$2,800,000 Period: 2013-2018 (Faculty Participant; joint with Ambuj Singh, Divyakant Agrawal, Subhash Suri, John Mohr, Stephen Proulx)

National Science Foundation

Project Title: *Viewpoints: Discovering Client- and Server-side Input Validation Inconsistencies to Improve Web Application Security*
Grant: CNS 1116967 Amount: \$500,000 Period: 2011-2013 (PI; joint with Christopher Kruegel; Alex Orso, Georgia Tech)

National Science Foundation

Project Title: *Formal Analysis of Distributed Interactions*
Grant: CNS 1117708 Amount: \$494,000 Period: 2011-2014 (PI; joint with Oscar Ibarra; Samik Basu, Iowa State)

Committee on Research, University of California, Santa Barbara

Project Title: *Automated Verification of Web Application Data Model*
Amount: \$5,600 Period: 2012-2013 (sole PI)

Google Android Education Grant

Project Title: *Developing Android Applications in a Capstone Class*
Amount: \$8,700 Period: 2010 (sole PI)

Google Research Award

Project Title: *Automated Verification of the Native Client*
Amount: \$50,000 Period: 2010-2011 (PI; joint with Christopher Kruegel)

National Science Foundation

Project Title: *Automata Based String Analysis for Detecting Vulnerabilities in Web Applications*
Grant: CCF-0614002 Amount: \$350,000 Period: 2009-2012 (PI; joint with Christopher Kruegel)

Instructional Development, University of California, Santa Barbara

Project Title: *Software Support for Web-based Interaction in Computer Science Capstone Projects*
Amount: \$11,500 Period: 2008-2009 (sole PI)

National Science Foundation

Project Title: *Modeling and Analyzing Trust in Service-Oriented Architectures*
Grant: CNS-0716095 Amount: \$850,000 Period: 2007-2010 (Co-PI; joint with Giovanni Vigna and Richard Kemmerer)

National Science Foundation

Project Title: *Design for Verification*
Grant: CCF-0614002 Amount: \$200,000 Period: 2006-2008 (sole PI)

Committee on Research, University of California, Santa Barbara

Project Title: *Design for Verification: A New Approach for Developing Highly Dependable Software*
Amount: \$7,000 Period: 2006-2007 (sole PI)

National Science Foundation

Project Title: *REU: Reliable Concurrent Software Development via Reliable Concurrency Controllers*
Grant: CCF-0530377 Amount: \$6,000 Period: 2005-2006 (sole PI)

National Science Foundation

Project Title: *Reliable Concurrent Software Development via Reliable Concurrency Controllers*
Grant: CCF-0341365 Amount: \$336,000 Period: 2003-2007 (sole PI)

Committee on Research, University of California, Santa Barbara

Project Title: *Developing Reliable Concurrency Controllers*
Amount: \$8,900 Period: 2003-2004 (sole PI)

National Science Foundation Faculty Early Career Development (CAREER) Award

Project Title: *CAREER: Verifiable Specifications: Tools for Reliable Reactive Software Development*
Grant: CCF-9970976 Amount: \$200,000 Period: 2000-2004 (sole PI)

National Science Foundation

Project Title: *A Composite Model Checking Toolset for Analyzing Software Systems*
Grant: CCF-9984822 Amount: \$300,000 Period: 1999-2003 (sole PI)

Committee on Research, University of California, Santa Barbara

Project Title: *Tools and Techniques for Workflow Specifications*
Amount: \$6,000 Period: 1999-2000 (Joint with Jianwen Su)

Publications

Books

B1. String Analysis for Software Verification and Security. Tevfik Bultan, Fang Yu, Muath Alkhalaf, and Abdulbaki Aydin. Springer 2017, ISBN 978-3-319-68668-4.

Edited Books

E1. Proceedings of the 41st International Conference on Software Engineering, ICSE 2019, Joanne M. Atlee, Tevfik Bultan, Jon Whittle, editors, Montreal, QC, Canada, May 25-31, 2019, IEEE Press.

- E2. Proceedings of the 41st International Conference on Software Engineering: Companion Proceedings, ICSE 2019, Joanne M. Atlee, Tevfik Bultan, Jon Whittle, editors, Montreal, QC, Canada, May 25-31, 2019, IEEE Press.
- E3. Proceedings of the 26th ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA 2017), Tevfik Bultan and Koushik Sen, editors. ACM 2017, ISBN 978-1-4503-5076-1
- E4. Proceedings of the 28th IEEE/ACM International Conference on Automated Software Engineering (ASE 2013), Ewen Denney, Tevfik Bultan and Andreas Zeller, editors. IEEE 2013, ISBN: 978-1-4799-0215-6.
- E5. Proceedings of the ACM SIGSOFT 20th International Symposium on the Foundations of Software Engineering (FSE 2012), Will Tracz, Martin Robillard and Tevfik Bultan, editors. ACM 2012, ISBN 978-1-4503-1614-9.
- E6. Proceedings of the 9th International Symposium on Automated Technology for Verification and Analysis (ATVA 2011), Tevfik Bultan and Pao-Ann Hsiung, editors. Springer 2011, ISBN 978-3-642-24371-4.
- E7. Proceedings of the 7th International Workshop on Web Services and Formal Methods (WS-FM 2010), Tevfik Bultan and Mario Bravetti, editors. Springer 2011, ISBN 978-3-642-19588-4.
- E8. Proceedings of the Workshop on Testing, Analysis and Verification of Web Software (TAV-WEB 2008), Tevfik Bultan and Tao Xie, editors, ACM 2008, ISBN: 978-1-60558-052-4.
- E9. Proceedings of the Workshop on Testing, Analysis and Verification of Web Services and Applications (TAV-WEB 2006), Tevfik Bultan, editor, ACM 2006, ISBN: 1-59593-458-8.

Refereed Journal Papers

- J1. Ivan Bocić, Tevfik Bultan, Nicolás Rosner. “Inductive Verification of Data Model Invariants in Web Applications Using First-Order Logic.” *Automated Software Engineering, special issue on top papers from the 30th IEEE/ACM International Conference on Automated Software Engineering (ASE 2015)*, December 2018.
- J2. Samik Basu, Tevfik Bultan. “On Deciding Synchronizability for Asynchronously Communicating Systems.” *Theoretical Computer Science (TCS)*, vol. 656, pp. 60–75, 2016.
- J3. Jaideep Nijjar, Ivan Bocić and Tevfik Bultan. “Data Model Property Inference, Verification and Repair for Web Applications.” *ACM Transactions on Software Engineering and Methodology (TOSEM), special issue on top papers from the 2013 International Symposium on Software Testing and Analysis (ISSTA 2013)*, vol. 24, issue 4, no. 25, August 2015.
- J4. Fang Yu, Muath Alkhalaf, Tevfik Bultan, and Oscar H. Ibarra. “Automata-Based Symbolic String Analysis for Vulnerability Detection.” *Formal Methods in System Design*, vol. 44, no. 1, pp. 44–70, 2014.
- J5. Aysu Betin Can, Sylvain Hallé, and Tevfik Bultan. “Modular Verification of Asynchronous Service Interactions Using Behavioral Interfaces.” *IEEE Transactions on Services Computing*, vol. 6, no. 2, pp. 262–275, 2013.
- J6. Gwen Salaun, Tevfik Bultan, and Nima Roohi. “Realizability of Choreographies Using Process Algebra Encodings.” *IEEE Transactions on Services Computing*, vol. 5, no. 3, pp. 290–304, 2012.
- J7. Fang Yu, Tevfik Bultan, and Oscar Ibarra. “Relational String Verification Using Multi-Track Automata.” *International Journal of Foundations of Computer Science (IJFCS), special issue on top*

- papers from the 15th International Conference on Implementation and Application of Automata (CIAA 2010)*, vol. 22, no. 8, pages 1909–1924, 2011.
- J8. Sylvain Hallé, Tevfik Bultan, Graham Hughes, Muath Alkhalaf, and Roger Villemaire. “Runtime Verification of Web Service Interface Contracts.” *IEEE Computer*, vol. 43, no. 3, pp. 59–66, March 2010.
- J9. Tuba Yavuz Kahveci and Tevfik Bultan. “Action Language Verifier: An Infinite State Model Checker for Reactive Software Specifications.” *Formal Methods in System Design*, vol. 35, no. 3, pp. 325–367, 2009.
- J10. Graham Hughes and Tevfik Bultan. “Automated Verification of Access Control Policies Using a SAT Solver.” *International Journal on Software Tools for Technology Transfer (STTT), special issue on top papers from the Workshop on Web Quality, Verification and Validation (WQVV 2007)*, vol. 10, no. 6, pp. 473–534, December 2008.
- J11. Graham Hughes and Tevfik Bultan. “Interface Grammars for Modular Software Model Checking.” *IEEE Transactions on Software Engineering (TSE), special issue on top papers from the 2007 ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA 2007)*, vol. 34, no. 5, pp. 614–632, 2008.
- J12. Tevfik Bultan and Xiang Fu. “Specification of Realizable Service Conversations Using Collaboration Diagrams.” *Service Oriented Computing and Applications (SOCA), special issue on top papers from the IEEE International Conference on Service Oriented Computing and Applications (SOCA 2007)*, vol. 2, no. 1, pp. 27–39, April 2008.
- J13. Tevfik Bultan and Constance Heitmeyer. “Applying Infinite State Model Checking and Other Analysis Techniques to Tabular Requirements Specifications of Safety-Critical Systems.” *Design Automation for Embedded Systems (DAEM), special issue on top papers from the Fourth ACM-IEEE International Conference on Formal Methods and Models for Codesign (MEMOCODE 2006)*, vol. 12, no. 1-2, pp. 97–137, June 2008.
- J14. Aysu Betin-Can, Tevfik Bultan, Mikael Lindvall, Benjamin Lux, and Stefan Topp. “Eliminating Synchronization Faults in Air Traffic Control Software via Design for Verification with Concurrency Controllers.” *Automated Software Engineering (ASE), special issue on top papers from the 20th International Conference on Automated Software Engineering (ASE 2005)*, vol. 14, no. 2, pp. 129–178, June 2007.
- J15. Mikael Lindvall, Ioana Rus, Paolo Donzelli, Atif Memon, Marvin Zelkowitz, Aysu Betin-Can, Tevfik Bultan, Chris Ackermann, Bettina Anders, Sima Asgari, Victor Basili, Jorg Fellmann, Daniel Hirschbach, Lorin Hochstein, Forrest Shull, Roseanne Tvedt and Daniel Pech. “Experimenting with Software Testbeds for Evaluating New Technologies.” *Empirical Software Engineering (ESE)*, vol. 12, no. 4, pp. 417–444, August 2007.
- J16. Aysu Betin-Can and Tevfik Bultan. “Highly Dependable Concurrent Programming Using Design for Verification.” *Formal Aspects of Computing (FACS), special issue on Verified Software: Theories, Tools, Experiments (VSTTE 2005) Conference*, vol. 19, no. 2, pp. 243–268, June 2007.
- J17. Tevfik Bultan, Xiang Fu, Jianwen Su. “Analyzing Conversations of Web Services.” *IEEE Internet Computing*, vol. 10, no. 1, pp. 18–25, January/February 2006.
- J18. Constantinos Bartzis and Tevfik Bultan. “Efficient BDDs for Bounded Arithmetic Constraints.” *International Journal on Software Tools for Technology Transfer (STTT), special issue on top papers*

- from the 9th International Conference on Tools and Algorithms for the Construction and Analysis of Software Systems (TACAS 2003), vol. 8, no. 1, pp. 26–36, February 2006.
- J19. Xiang Fu, Tevfik Bultan, Jianwen Su. “Synchronizability of Conversations among Web Services.” *IEEE Transactions on Software Engineering (TSE)*, special issue on Interaction and State-Based Modeling, vol. 31, no. 12, pp. 1042–1055, December 2005.
- J20. Xiang Fu, Tevfik Bultan, and Jianwen Su. “Realizability of Conversation Protocols With Message Contents.” *International Journal of Web Services Research (JWSR)*, special issue on top papers from the 2004 IEEE International Conference on Web Services (ICWS 2004), vol. 2, no. 4, pp. 68–93, October 2005.
- J21. Xiang Fu, Tevfik Bultan and Jianwen Su. “Conversation Protocols: A Formalism for Specification and Verification of Reactive Electronic Services.” *Theoretical Computer Science (TCS)*, special issue on top papers from the 8th International Conference on Implementation and Application of Automata (CIAA 2003), vol. 328, no. 1–2, pp. 19–37, November 2004.
- J22. Zhe Dang, Tevfik Bultan, Oscar H. Ibarra and Richard A. Kemmerer. “Past Pushdown Timed Automata and Safety Verification.” *Theoretical Computer Science (TCS)*, special issue on top papers from the 6th International Conference on Implementation and Application of Automata (CIAA 2001), vol. 313, no. 1, pp. 57–71, February 2004.
- J23. Tuba Yavuz-Kahveci and Tevfik Bultan. “A Symbolic Manipulator for Automated Verification of Reactive Systems with Heterogeneous Data Types.” *International Journal on Software Tools for Technology Transfer (STTT)*, special issue on top papers from the 7th International Conference on Tools and Algorithms for the Construction and Analysis of Software Systems (TACAS 2001), vol. 5, no. 1, pp. 15–33, November 2003.
- J24. Constantinos Bartzis and Tevfik Bultan. “Efficient Symbolic Representations for Arithmetic Constraints in Verification.” *International Journal of Foundations of Computer Science (IJFCS)*, special issue on Verification and Analysis of Infinite State Systems, vol. 14, no. 4, pp. 605–624, August 2003.
- J25. Oscar H. Ibarra, Jianwen Su, Zhe Dang, Tevfik Bultan and Richard A. Kemmerer. “Counter Machines and Verification Problems.” *Theoretical Computer Science (TCS)*, vol. 289, no. 1, pp. 165–189, October 2002.
- J26. Oscar H. Ibarra, Tevfik Bultan and Jianwen Su. “On Reachability and Safety in Infinite-State Systems.” *International Journal of Foundations of Computer Science (IJFCS)*, vol. 12, no. 6, pp. 821–836, December 2001.
- J27. Tevfik Bultan, Richard Gerber and Christopher League. “Composite Model Checking: Verification with Type-Specific Symbolic Representations.” *ACM Transactions on Software Engineering and Methodology (TOSEM)*, special issue on top papers from the 1998 ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA 1998), vol. 9, no. 1, pp. 3–50, January 2000.
- J28. Tevfik Bultan, Richard Gerber and William Pugh. “Model Checking Concurrent Systems with Unbounded Integer Variables: Symbolic Representations, Approximations and Experimental Results.” *ACM Transactions on Programming Languages and Systems (TOPLAS)*, vol. 21, no. 4, pp. 747–789, July 1999.
- J29. Cevdet Aykanat, Tevfik Bultan and İsmail Haritaoğlu. “A Fast Neural Network Algorithm for VLSI Cell Placement.” *Neural Networks*, vol. 11, no. 9, pp. 1671–1684, December 1998.

- J30. Tevfik Bultan and Cevdet Aykanat. “Circuit Partitioning Using Mean Field Annealing.” *Neurocomputing*, vol. 8, pp. 171–194, 1995.
- J31. Tevfik Bultan and Cevdet Aykanat. “A New Mapping Heuristic Based on Mean Field Annealing.” *Journal of Parallel and Distributed Computing (JPDC)*, vol. 16, pp. 292–305, December 1992.

Refereed Conference Papers

- C1. Ismet Burak Kadron, Chaofan Shou, Emily O’Mahony, Yilmaz Vural, Tevfik Bultan. “Targeted Black-Box Side-Channel Mitigation for IoT.” Accepted for publication in the *Proceedings of the 12th International Conference on the Internet of Things (IoT 2022)*.
- C2. Seemanta Saha, Mara Downing, Tegan Brennan, Tevfik Bultan. “PREACH: A Heuristic for Probabilistic Reachability to Identify Hard to Reach Statements.” *Proceedings of the 44th International Conference on Software Engineering (ICSE 2022)*, pp. 1706–1717, May 25-27, 2022.
- C3. William Eiers, Ganesh Sankaran, Albert Li, Emily O’Mahony, Benjamin Prince, Tevfik Bultan. “Quantifying Permissiveness of Access Control Policies.” *Proceedings of the 44th International Conference on Software Engineering (ICSE 2022)*, pp. 1805–1817, May 25-27, 2022.
- C4. Chaofan Shou, Ismet Burak Kadron, Qi Su, Tevfik Bultan. “CorbFuzz: Checking Browser Security Policies with Fuzzing.” *Proceedings of the 36th IEEE/ACM International Conference on Automated Software Engineering (ASE 2021)*, pp. 215–226, Melbourne, Australia, November 15-19, 2021.
- C5. Ismet Burak Kadron, Nicolás Rosner, Tevfik Bultan, “Feedback-driven side-channel analysis for networked applications.” *Proceedings of the 29th ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA 2020)*, pp. 260–271, July 18-22, 2020.
- C6. Tegan Brennan, Seemanta Saha, Tevfik Bultan, “JVM Fuzzing for JIT-Induced Side-Channel Detection.” *Proceedings of the 42nd International Conference on Software Engineering (ICSE 2020)*, pp. 1011–1023, June 27-July 19, 2020.
- C7. Tegan Brennan, Nicolás, Rosner, and Tevfik Bultan. “JIT Leaks: Inducing Timing Side Channels through Just-In-Time Compilation.” *Proceedings of the IEEE Symposium on Security and Privacy (S&P 2020)*, pp. 1207–1222, May 18-21, 2020.
- C8. William Eiers, Seemanta Saha, Tegan Brennan, and Tevfik Bultan. “Subformula Caching for Model Counting and Quantitative Program Analysis.” *Proceedings of the 34th IEEE/ACM International Conference on Automated Software Engineering (ASE 2019)*, pp. 453–464, San Diego, CA, USA, November 11-15, 2019.
- C9. Nicolás, Rosner, Burak Kadron, Lucas Bang, and Tevfik Bultan. “Profit: Detecting and Quantifying Side Channels in Networked Applications.” *Proceedings of the 26th Network and Distributed System Security Symposium (NDSS 2019)*, San Diego, California, USA, February 24-27, 2019.
- C10. Abdulbaki Aydin, William Eiers, Lucas Bang, Tegan Brennan, Miroslav Gavrilov, Tevfik Bultan, and Fang Yu. “Parameterized Model Counting for String and Numeric Constraints,” *Proceedings of the ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 2018)*, pp. 400–410, Lake Buena Vista, Florida, November 4-9, 2018.
- C11. Nestan Tsiskaridze, Lucas Bang, Joseph McMahan, Tevfik Bultan, and Timothy Sherwood. “Information Leakage in Arbiter Protocols,” *Proceedings of the 16th International Symposium on Automated Technology for Verification and Analysis (ATVA 2018)*, pp. 404–421, October 7-10, 2018, Los Angeles, CA.

- C12. Tegan Brennan, Seemanta Saha, Tevfik Bultan, and Corina S. Pasareanu. “Symbolic path cost analysis for side-channel detection,” *Proceedings of the 27th ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA 2018)*, pp. 27–37, Amsterdam, The Netherlands, July 16-21, 2018.
- C13. Lucas Bang, Nicolás Rosner, and Tevfik Bultan. “Online Synthesis of Adaptive Side-Channel Attacks Based On Noisy Observations,” *Proceedings of the 2018 IEEE European Symposium on Security and Privacy (EuroS&P 2018)*, pp. 307–322, London, United Kingdom, April 24-26, 2018.
- C14. Tegan Brennan, Nestan Tsiskaridze, Nicolás Rosner, Abdalbaki Aydin and Tevfik Bultan. “Constraint Normalization and Parameterized Caching for Quantitative Program Analysis.” *Proceedings of the 11th Joint Meeting of the European Software Engineering Conference and the ACM SIGSOFT Symposium on the Foundations of Software Engineering (ESEC/FSE 2017)*, pp. 535–546, Paderborn, Germany, September 4-8, 2017.
- C15. Quoc-Sang Phan, Lucas Bang, Corina S. Pasareanu, Pasquale Malacaria, and Tevfik Bultan. “Synthesis of Adaptive Side-Channel Attacks.” *Proceedings of the 2017 IEEE Computer Security Foundations Symposium (CSF 2017)*, pp. 328–342, Santa Barbara, CA, USA, August 21-25, 2017.
- C16. Ivan Bocić and Tevfik Bultan. “Symbolic Model Extraction for Web Application Verification.” *Proceedings of the 39th International Conference on Software Engineering (ICSE 2017)*, pp. 724–734, Buenos Aires, Argentina, May 20–28, 2017.
- C17. Lucas Bang, Abdalbaki Aydin, Quoc-Sang Phan, Corina S. Pasareanu, and Tevfik Bultan. “String Analysis for Side Channels with Segmented Oracles.” *Proceedings of the 24th ACM SIGSOFT International Symposium on the Foundations of Software Engineering (FSE 2016)*, pp. 193–204, Seattle, WA, USA, November 13-18, 2016.
- C18. Ivan Bocić and Tevfik Bultan. “Finding Access Control Bugs in Web Applications with CanCheck.” *Proceedings of the 31st IEEE/ACM International Conference on Automated Software Engineering (ASE 2016)*, pp. 155–166, Singapore, September 3–7, 2016.
- C19. Fang Yu, Ching-Yuan Shueh, Chun-Han Lin, Yu-Fang Chen, Bow-Yaw Wang and Tevfik Bultan. “Optimal Sanitization Synthesis for Web Application Vulnerability Repair.” *Proceedings of the 2016 International Symposium on Software Testing and Analysis (ISSTA 2016)*, pp. 189–200, Saarbrücken, Germany, July 18-20, 2016.
- C20. Samik Basu and Tevfik Bultan. “Automated Choreography Repair.” *Proceedings of the, 19th International Conference on Fundamental Approaches to Software Engineering (FASE 2016)*, pp. 13–30, Eindhoven, The Netherlands, April 2–8, 2016.
- C21. Ivan Bocić and Tevfik Bultan. “Efficient Data Model Verification with Many-Sorted Logic.” *Proceedings of the 30th IEEE/ACM International Conference on Automated Software Engineering (ASE 2015)*, pp. 42–52, November 9–13, 2015, Lincoln, Nebraska, USA.
- C22. Lucas Bang, Abdalbaki Aydin, and Tevfik Bultan. “Automatically Computing Path Complexity of Programs.” *Proceedings of the 10th Joint Meeting of the European Software Engineering Conference and the ACM SIGSOFT Symposium on the Foundations of Software Engineering (ESEC/FSE 2015)*, pp. 61–72, Bergamo, Italy, August 30–September 4, 2015.
- C23. Abdalbaki Aydin, Lucas Bang, and Tevfik Bultan. “Automata-based model counting for string constraints.” *Proceedings of the 27th International Conference on Computer Aided Verification (CAV 2015)*, pp. 255–272, San Francisco, CA, USA, July 18–24, 2015.

- C24. Ivan Bocić and Tevfik Bultan. “Coexecutability for Efficient Verification of Data Model Updates.” *Proceedings of the 37th International Conference on Software Engineering (ICSE 2015)*, pp. 744–754, Florence, Italy, May 16–24, 2015.
- C25. Samik Basu and Tevfik Bultan. “Automatic Verification of Interactions in Asynchronous Systems with Unbounded Buffers.” *ACM SIGSOFT Distinguished Paper Award. Proceedings of the 29th IEEE/ACM International Conference on Automated Software Engineering (ASE 2014)*, pp. 743–754, Vasteras, Sweden, September 15-19, 2014.
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- C56. Tuba Yavuz-Kahveci and Tevfik Bultan. “Verification of Parameterized Hierarchical State Machines Using Action Language Verifier.” *Proceedings of the Third ACM-IEEE International Conference on Formal Methods and Models for Codesign (MEMOCODE 2005)*, pp. 79–87, Verona, Italy, July 2005.
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- C63. Xiang Fu, Tevfik Bultan, and Jianwen Su. “Analysis of Interacting BPEL Web Services.” *Proceedings of the 13th International World Wide Web Conference (WWW 2004)*, pp. 621–630, New York, New York, May 2004.
- C64. Xiang Fu, Tevfik Bultan and Jianwen Su. “Conversation Protocols: A Formalism for Specification and Verification of Reactive Electronic Services.” *Proceedings of the 8th International Conference on Implementation and Application of Automata (CIAA 2003)*, O. Ibarra and Z. Dang, eds., *Lecture Notes in Computer Science*, vol. 2759, pp. 188–200, Santa Barbara, California, July 2003.
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- C77. Zhe Dang, Oscar H. Ibarra, Tevfik Bultan, Richard A. Kemmerer, and Jianwen Su. “Binary Reachability Analysis of Discrete Pushdown Timed Automata.” *Proceedings of the 12th International Conference on Computer Aided Verification (CAV 2000)*, E. Allen Emerson and A. Prasad Sistla, eds., *Lecture Notes in Computer Science* vol. 1855, pp. 69–84, Chicago, Illinois, July 2000.
- C78. Oscar H. Ibarra, Jianwen Su, Zhe Dang, Tevfik Bultan, and Richard A. Kemmerer. “Counter Machines: Decidable Properties and Applications to Verification Problems.” *Proceedings of the 25th International Symposium on Mathematical Foundations of Computer Science (MFCS 2000)*, M. Nielsen and B. Rovan, eds., *Lecture Notes in Computer Science*, vol. 1893, pp. 426–435, Bratislava, Slovak Republic, August 2000.
- C79. Tevfik Bultan, Richard Gerber and Christopher League. “Verifying Systems with Integer Constraints and Boolean Predicates: A Composite Approach.” *Proceedings of the 1998 ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA 1998)*, pp. 113–123, Clearwater Beach, Florida, March 1998.
- C80. Tevfik Bultan, Richard Gerber and William Pugh. “Symbolic Model Checking of Infinite State Systems Using Presburger Arithmetic.” *Proceedings of the 9th International Conference on Computer Aided Verification (CAV 1997)*, Orna Grumberg, ed., *Lecture Notes in Computer Science* vol. 1254, pp. 400–411, Haifa, Israel, June 1997.
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- C82. Tevfik Bultan and Cevdet Aykanat. “Circuit Partitioning Using Parallel Mean Field Annealing Algorithms.” *Proceedings of the 3rd IEEE Symposium on Parallel and Distributed Processing (SPDP 1991)*, Dallas, Texas, pp. 534–541, December 1991.
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Refereed Short Conference Papers

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- S2. William Eiers, Ganesh Sankaran, Albert Li, Emily O’Mahony, Benjamin Prince, Tevfik Bultan. “Quacky: Quantitative Access Control Permissiveness Analyzer.” Tool Paper. *Proceedings of the 37th IEEE/ACM International Conference on Automated Software Engineering (ASE 2022)*, to appear.
- S3. Chun-Han Lin, Fang Yu, Jie-Hong Roland Jiang, and Tevfik Bultan. “Static detection of API call vulnerabilities in iOS executables.” Poster paper. *Proceedings of the 40th International Conference on Software Engineering: Companion Proceedings (ICSE 2018)*, pp. 394-395, Gothenburg, Sweden, May 27 - June 03, 2018.
- S4. Tegan Brennan, Seemanta Saha, and Tevfik Bultan. “Symbolic path cost analysis for side-channel detection.” Poster paper. *Proceedings of the 40th International Conference on Software Engineering: Companion Proceedings (ICSE 2018)*, pp. 424-425, Gothenburg, Sweden, May 27 - June 03, 2018.
- S5. Ivan Bocić and Tevfik Bultan. “Data Model Bugs.” Short paper. *Proceedings of the 7th NASA Formal Methods Symposium (NFM 2015)*, pp. 393–399, Pasadena, California, April 27-29, 2015.
- S6. Fang Yu, Muath Alkhalaf and Tevfik Bultan. “Stranger: An Automata-based String Analysis Tool for PHP.” Tool paper. *Proceedings of the 16th International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS 2010)*, Javier Esparza and Rupak Majumdar, eds., *Lecture Notes on Computer Science* vol. 6015, pp. 154–157, Paphos, Cyprus, March 2010.
- S7. Fang Yu, Muath Alkhalaf and Tevfik Bultan. “Generating Vulnerability Signatures for String Manipulating Programs Using Automata-based Forward and Backward Symbolic Analyses.” *Proceedings of the 24th IEEE/ACM International Conference on Automated Software Engineering (ASE 2009)*, pp. 605–609, Auckland, New Zealand, November 2009.
- S8. Tuba Yavuz-Kahveci, Constantinos Bartzis, and Tevfik Bultan. “Action Language Verifier, Extended.” Tool paper. *Proceedings of the 17th International Conference on Computer Aided Verification (CAV 2005)*, pp. 413–417, Edinburgh, Scotland, UK, July 2005.
- S9. Xiang Fu, Tevfik Bultan, and Jianwen Su. “WSAT: A Tool for Formal Analysis of Web Services.” Tool paper. *Proceedings of the 16th International Conference on Computer Aided Verification (CAV 2004)*, Rajeev Alur and Doron Peled, eds., *Lecture Notes in Computer Science*, vol. 3114, pp. 510–514, Boston, Massachusetts, July 2004.
- S10. Constantinos Bartzis and Tevfik Bultan. “Automata-Based Representations for Arithmetic Constraints in Automated Verification.” Poster paper. *Proceedings of the 7th International Conference on Implementation and Application of Automata (CIAA 2002)*, Jean-Marc Champarnaud and Denis Maurel, eds., *Lecture Notes in Computer Science*, vol. 2608, pp. 282–288, University of Tours, Tours, France, July 2002.
- S11. Tevfik Bultan and Tuba Yavuz-Kahveci. “Action Language Verifier.” *Proceedings of the 16th IEEE International Conference on Automated Software Engineering (ASE 2001)*, pp. 382–386, Coronado Island, California, November 2001.

Refereed Workshop Papers

- W1. Seemanta Saha, Ismet Burak Kadron, William Eiers, Lucas Bang, and Tevfik Bultan. “Incremental Attack Synthesis.” Java PathFinder Workshop (JPF 2019), *ACM SIGSOFT Software Engineering Notes*, vol. 44, no. 4.
- W2. Seemanta Saha, Ismet Burak Kadron, William Eiers, Lucas Bang, and Tevfik Bultan. “Attack Synthesis for Strings using Meta-Heuristics.” Java PathFinder Workshop (JPF 2018), *ACM SIGSOFT Software Engineering Notes*, vol. 43, no. 4.
- W3. Chandra Krintz, Hiranya Jayathilaka, Stratos Dimopoulos, Alexander Pucher, Rich Wolski and Tevfik Bultan. “Cloud Platform Support for API Governance.” *Proceedings of the IEEE International Workshop on the Future of PaaS 2014*, Boston, Massachusetts, USA, March 11th, 2014.
- W4. Jaideep Nijjar, Ivan Bocić and Tevfik Bultan. “An Integrated Data Model Verifier with Property Templates.” *Proceedings of the ICSE 2013 Workshop on Formal Methods in Software Engineering (FormaliSE 2013)*, pp. 29–35, San Francisco, USA, May 25, 2013.
- W5. Fang Yu, Tevfik Bultan and Ben Hardekopf. “String Abstractions for String Verification.” *Proceedings of the 18th International SPIN Workshop on Model Checking of Software (SPIN 2011)*, LNCS 6823, pp. 20–37, Snowbird, Utah, USA, July 14-15, 2011.
- W6. Ben Rubinger and Tevfik Bultan. “Contracting the Facebook API.” *Proceedings of the 4th International Workshop on Testing, Analysis and Verification of Web Software (TAV-WEB 2010)*, Antwerp, Belgium, September 2010.
- W7. Fang Yu, Tevfik Bultan, Marco Cova, and Oscar H. Ibarra. “Symbolic String Verification: An Automata-based Approach.” *Proceedings of the 15th International SPIN Workshop on Model Checking of Software (SPIN 2008)*, pp. 306–324, Los Angeles, CA, August 2008.
- W8. Graham Hughes, Tevfik Bultan and Muath Alkhalaf. “Client and Server Verification for Web Services Using Interface Grammars.” *Proceedings of the Workshop on Testing, Analysis and Verification of Web Software (TAV-WEB 2008)*, pp. 40–46, Seattle, Washington, July 2008.
- W9. Graham Hughes and Tevfik Bultan. “Extended Interface Grammars for Automated Stub Generation.” *Proceedings of the Automated Formal Methods Workshop (AFM 2007)*, pp. 41–54, Atlanta, Georgia, November 2007.
- W10. Graham Hughes and Tevfik Bultan. “Automated Verification of XACML Policies Using a SAT Solver.” *Workshop Proceedings of the 7th International Conference on Web Engineering, Workshop on Web Quality, Verification and Validation (WQVV 2007)*, pp. 378–392, Como, Italy, July 2007.
- W11. Xiang Fu, Tevfik Bultan, and Jianwen Su. “A Top-Down Approach to Modeling Global Behaviors of Web Services.” *Proceedings of the Requirements Engineering for Open Systems Workshop (REOS 2003)*, Monterey, California, September 2003.
- W12. Aysu Betin-Can and Tevfik Bultan “Interface-Based Specification and Verification of Concurrency Controllers.” *Proceedings of the Workshop on Software Model Checking (SoftMC 2003)*. *Electronic Notes in Theoretical Computer Science (ENTCS)*, vol. 89, no. 3, Boulder, Colorado, July 2003.
- W13. Xiang Fu, Tevfik Bultan and Jianwen Su. “Formal Verification of E-Services and Workflows.” *Proceedings of the Workshop on Web Services, e-Business, and the Semantic Web: Foundations, Models, Architecture, Engineering and Applications (WES 2002)*, C. Bussler, R. Hull, S. McIlraith, M.E. Or-lowska, B. Pernici and J. Yang, eds., *Lecture Notes in Computer Science*, vol. 2512, pp. 88–202, Toronto, Canada, May 2002.

- W14. Tuba Yavuz-Kahveci and Tevfik Bultan. “Heuristics for Efficient Manipulation of Composite Constraints.” *Proceedings of the 4th International Workshop on Frontiers of Combining Systems (FroCoS 2002)*, Alessandro Armando, ed., *Lecture Notes in Artificial Intelligence*, vol. 2309, pp. 57–71, Santa Margherita Ligure, Italy, April 2002.

Refereed Book Chapters

- H1. Tevfik Bultan, Xiang Fu, and Jianwen Su. “Analyzing Conversations: Realizability, Synchronizability, and Verification.” *Test and Analysis of Web Services*, Luciano Baresi and Elisabetta Di Nitto (eds.), pp. 57–86, Springer, 2007.

Invited Papers

- I1. Tevfik Bultan. “Quantifying Information Leakage Using Model Counting Constraint Solvers.” *Proceedings of the 11th International Conference on Verified Software: Theories, Tools, and Experiments (VSTTE 2019)*, pp. 30–35, New York City, NY, USA, July 13–14, 2019.
- I2. Tevfik Bultan. “Side-Channel Analysis via Symbolic Execution and Model Counting,” Java PathFinder Workshop (JPF 2018), ACM SIGSOFT Software Engineering Notes, vol. 43, no. 4.
- I3. Tevfik Bultan. “String Analysis for Vulnerability Detection and Repair.” *Proceedings of the 22nd International Symposium on Model Checking Software (SPIN 2015)*, pp. 3–9, Stellenbosch, South Africa, August 24–26, 2015.
- I4. Jian Lü, David S. Rosenblum, Tevfik Bultan, Valerie Issarny, Schahram Dustdar, Margaret-Anne Storey, Dongmei Zhang. “Roundtable: The Future of Software Engineering for Internet Computing.” *IEEE Software*, vol. 32, issue 1, pp. 91–97, Jan-Feb. 2015.
- I5. Tevfik Bultan. “Analyzing Interactions of Asynchronously Communicating Software Components.” *Proceedings of the Joint IFIP WG 6.1 International Conference on Formal Techniques for Distributed Systems (FORTE/FMOODS 2013)*, LNCS 7892, pp. 1–4, Florence, Italy, June 3–5, 2013.
- I6. Tevfik Bultan and Xiang Fu. “Choreography Modeling and Analysis with Collaboration Diagrams.” *IEEE Data Engineering Bulletin*, vol. 31, no. 3, pp. 27–30.
- I7. Tevfik Bultan. “Service Choreography and Orchestration with Conversations.” *Proceedings of the 19th International Conference on Concurrency Theory*, Franck van Breugel and Marsha Chechik, eds., *Lecture Notes in Computer Science*, vol. 5201, pp. 2–3, Toronto, Canada, August 2008.
- I8. Jianwen Su, Tevfik Bultan, Xiang Fu, and Xiangpeng Zhao. “Towards a Theory of Web Service Choreographies.” *Proceedings of the 4th International Workshop on Web Services and Formal Methods (WS-FM 2007)*, Marlon Dumas and Reiko Heckel, eds., *Lecture Notes in Computer Science*, vol. 4937, pp. 1–16, Brisbane, Australia, September 2007.
- I9. Xiang Fu, Tevfik Bultan, and Jianwen Su. “Realizability Analysis of Top-down Web Service Composition Specifications.” *Web Services Research and Practices, Volume 2 of the Advances in Web Services Research (WSR) Series*, Liang-Jie Zhang (ed.), 2007.
- I10. Tevfik Bultan. “Modeling Interactions of Web Software.” *Proceedings of the Second International Workshop on Automated Specification and Verification of Web Systems (WWV 2006)*, pp. 525–529, November 2006.

- I11. Jianwen Su, Tevfik Bultan and Xiang Fu. “Web Service Interactions: Analysis and Design.” *Proceedings of the Second International Workshop on Semantic and Dynamic Web Processes (SDWP 2005)*, pp. 14–19, Orlando, Florida, USA, July 2005.
- I12. Tevfik Bultan, Xiang Fu and Jianwen Su. “Tools for Automated Verification of Web Services.” *Proceedings of the Second International Symposium on Automated Technology on Verification and Analysis (ATVA 2004)*, Farn Wang, ed., *Lecture Notes in Computer Science*, vol. 3299, pp. 8–10, Taipei, Taiwan, November 2004.

Other Publications

- O1. Tevfik Bultan, Andreas Zeller. “Emerging areas in automated software engineering research.” *Automated Software Engineering*, vol. 24, no. 4, pp. 863–864.
- O2. Jian Lu, David S. Rosenblum, Tevfik Bultan, Valerie Issarny, Schahram Dustdar, Margaret-Anne D. Storey, Dongmei Zhang. “Roundtable: The Future of Software Engineering for Internet Computing.” *IEEE Software*, vol. 32, no. 1, pp. 91–97, 2015.
- O3. Tevfik Bultan. “Software for Everyone by Everyone.” Position paper. *Proceedings of the 2010 FSE/SDP Workshop on the Future of Software Engineering Research*, pp. 69–74, Santa Fe, New Mexico, November 2010.
- O4. Tevfik Bultan and Tao Xie: “Workshop summary for the workshop on testing, analysis and verification of web software (TAV-WEB 2008).” *Proceedings of the 2008 International Testing and Analysis (ISSTA 2008)*, pp. 311–312, 2008.
- O5. Tevfik Bultan. “Developing Verifiable Concurrent Software.” Position paper. *Proceedings of the CAV 2008 Workshop on Exploiting Concurrency Efficiently and Correctly*.
- O6. Tevfik Bultan and Xiang Fu. “Realizability of Interactions in Collaboration Diagrams.” Technical report 2006-11, Department of Computer Science, University of California, Santa Barbara, September 2006.
- O7. Tevfik Bultan, Constance Heitmeyer and John O’Leary. “Panel on Design for Verification.” Panel position paper. *Proceedings of the Third ACM/IEEE International Conference on Formal Methods and Models for Co-Design (MEMOCODE 2005)*, pp. 233–235, Verona, Italy, July 2005.
- O8. Shriram Krishnamurthi and Tevfik Bultan. “Characteristics of Web Services and Their Impact on Testing, Analysis and Verification.” Discussion summary. *Workshop on Testing, Analysis and Verification of Web Services (TAV-WEB 2004)*. *ACM SIGSOFT Software Engineering Notes (SEN)*, vol. 30, no. 1, January 2005.
- O9. Graham Hughes and Tevfik Bultan “Automated Verification of Access Control Policies.” Technical report 2004-22, Department of Computer Science, University of California, Santa Barbara, September 2004.
- O10. Sandeep Shukla, Tevfik Bultan and Constance Heitmeyer. “Given that Hardware Verification has been such an Uphill Battle, What is the Future of Software Verification?” Panel position paper. *Proceedings of the Second ACM/IEEE International Conference on Formal Methods and Models for Co-Design (MEMOCODE 2004)*, pp. 157–158, San Diego, California, June 2004.
- O11. Tevfik Bultan. “Software Design From a Verification Perspective.” Position paper. *National Science Foundation Workshop, Science of Design: Software and Software-Intensive Systems*, Airlie Center, Herndon, Virginia, November 2003.

- O12. Tevfik Bultan. “A Composite Model Checking Toolset for Analyzing Software Systems.” Project summary, *ACM SIGSOFT Software Engineering Notes (SEN)*, vol. 25, no. 1, pp. 37–38, January 2000.
- O13. Tevfik Bultan and Cevdet Aykanat. “A Mean Field Annealing Algorithm for the Mapping Problem.” *Proceedings of the Intel Technology Focus Conference*, Timberline, Oregon, pp. 271–308, April 1992.

Software Tools

AUTOMATA BASED MODEL COUNTER (ABC) is a constraint solver for string and numeric constraints that also performs model counting. ABC characterizes the set of solutions to string and numeric constraints in the form of a deterministic finite automaton. Additionally, ABC produces symbolic representation of the number of solutions within a given bound that satisfy a set of constraints. ABC can also output the number of satisfying solutions for a specific bound. ABC has been integrated with the Symbolic Path Finder (SPF) for side channel analysis.

ABSTRACT DATA STORE LIBRARY (ADSL) Modern web applications are frequently built using two software patterns: Model/View/Controller (MVC) and REpresentational State Transfer (REST). Based on these patterns, the business logic of the application is organized in actions that can be arbitrarily invoked by the user, and the actions are implemented in the model, isolated from the issues such as user navigation and response synthesis. It is paramount to ensure that the model schema and model state updates are correct as errors may lead to unrecoverable corruption or loss of data. Our tool addresses this problem by extracting an ADSL specification from a given Ruby on Rails application, which is an abstraction of both the data model schema and the updates that can be done to the data model state, and verifying it using a first order logic theorem prover. Invariants on the data store can be specified using our own Rails extension. ADSL also supports analysis of access control policies and detection of access control bugs.

PATH COMPLEXITY ANALYZER (PAC) is a tool for computing path complexity of programs. Path complexity is a complexity measure that provides an upper bound for the number of paths in a program, and hence, can be used for assessing the difficulty of achieving path coverage for a given method. Path complexity is defined as a function that takes a depth bound as input and returns the number of paths in the control flow graph that are within that bound. PAC computes the path complexity function in closed form, and the asymptotic path complexity which identifies the dominant term in the path complexity function. Experiments on PAC demonstrate that path complexity can be computed efficiently, and it is a better complexity measure for path coverage compared to cyclomatic complexity and NPATH complexity.

SEMREP is an automated semantic differential repair tool that analyzes and repairs validation and sanitization functions against each other. SEMREP takes dependency graphs of two functions as input and looks for differences in validation and sanitization operations for string variables. If a difference is found, the tool generates three patch functions that together fix the difference. One application of this tool is fixing the differences between a sanitizer function on the client-side and the corresponding one on the server-side in web applications. SEMREP is language agnostic and can be used with Java, PHP or ASP.NET web applications.

IDAVER (AN INTEGRATED DATA MODEL VERIFIER): Most modern web applications are built using development frameworks based on the Model-View-Controller (MVC) pattern. In MVC-based web applications the data model specifies the types of objects used by the application and the relations among them. Since the data model forms the foundation of such applications, its correctness is crucial. IDAVER is a tool for automated verification of data models written in Ruby on Rails MVC framework.

After automatically extracting formal data model specifications from Rails code, IDAVER implements two types of verification 1) SAT-based bounded verification via translation to Alloy, 2) unbounded verification via translation to the quantified theory of uninterpreted functions and an SMT Solver. iDaVer provides property templates that facilitate manual property specification. It also implements heuristics for automated property inference and automated repair for the properties that fail.

LIBSTRANGER is an Automata-Based Symbolic String Analysis Library. One can use LIBSTRANGER to solve string constraints and/or compute pre and post-images of string manipulation operations such as concatenation and replacement. It can handle complex regular-expression based replace operations such as PHP's `preg_replace` and approximate these operations in the presence of unbounded loops with high precision. Additionally, LIBSTRANGER provides fast and precise modeling for common string functions such as `trim`, `substring`, `toUpperCase` and `toLowerCase` and complex sanitization functions such as PHP's `addslashes` and `htmlspecialchars`.

STRANGER (STRING AUTOMATON GENERATOR) is a string analysis tool for PHP web applications that detects vulnerabilities such as XSS and SQL injection. STRANGER uses Pixy as a front end and MONA automata package for automata manipulation. STRANGER takes a PHP program as input and automatically analyzes it and outputs the possible XSS and SQL injection vulnerabilities in the program. Additionally, for each input that leads to a vulnerability, it outputs an automaton in a dot format that characterizes all possible string values for this input which may exploit the vulnerability, i.e., it outputs the vulnerability signature.

TUNE: Singularity is an experimental operating system developed by Microsoft Research. In order to improve the dependability of software systems, Singularity operating system uses process isolation. Singularity processes are not allowed to share memory to avoid situations where a buggy process crashes the whole system. Instead, all inter-process communication occurs via message passing over bidirectional conduits, called channels. Singularity processes are required to specify a channel contract that identifies the sequences of messages that can be sent through a given channel. TUNE is a tool that analyzes Singularity channel contracts and verifies their properties. Singularity processes can deadlock even when they faithfully implement a channel contract. By analyzing the channel contracts, TUNE can prevent such deadlocks and ensure that when processes faithfully implement a channel contract, the properties of the contract are preserved by the implementation.

NETSTUB is a tool for analyzing distributed programs by decoupling the behavior of the programs from the behavior of the network. It consists of a set of stub classes that replace the native methods used in network communication and enables both unit and integration verification for distributed Java applications.

WSAT (WEB SERVICE ANALYSIS TOOL) is a tool for analyzing interactions among web services. It consists of: 1) An intermediate representation for web services that supports XML data manipulation; 2) Synchronizability analysis, which determines if the asynchronous communication among web services can be synchronized without changing their interaction behavior; 3) Realizability analysis, which determines if an interaction specification can be realized by asynchronously communicating web services; 4) Translators from a subset of BPEL to the WSAT intermediate representation and from the WSAT intermediate representation to Promela, input language of the SPIN model checker.

COMPOSITE SYMBOLIC LIBRARY: A symbolic manipulator for automated verification that combines different symbolic representations using an object oriented design. COMPOSITE SYMBOLIC LIBRARY supports BDDs for representing boolean logic formulas, and polyhedral and automata representations for linear arithmetic formulas. An extension to Composite Symbolic Library implements shape analysis for checking properties of linked lists.

ALV (ACTION LANGUAGE VERIFIER): Action Language is a specification language for reactive software systems that supports both synchronous and asynchronous compositions and hierarchical specifications. ALV consists of 1) a compiler that converts Action Language specifications to composite symbolic representations, and 2) an infinite state model checker that verifies CTL properties of Action Language specifications.

Keynote and Distinguished Talks

- “Quantitative Symbolic Analysis for Software Security and Dependability.” Keynote, The 28th Asia-Pacific Software Engineering Conference (APSEC) 2021, December 8, 2021.
- “Side Channel Analysis Using a Model Counting Constraint Solver and Symbolic Execution.” Keynote, 11th Working Conference on Verified Software: Theories, Tools, and Experiments, New York City, USA, July 14, 2019.
- “Software, Logic, and Automata: Automating Dependability of Software.” Distinguished Speaker, Institute for Software Research (ISR), University of California, Irvine, January 18, 2019.
- “Side-Channel Analysis via Symbolic Execution and Model Counting.” Keynote, Java PathFinder Workshop (JPF 2018), Lake Buena Vista, Florida, November 5, 2018.
- “Side Channel Analysis Using a Model Counting Constraint Solver and Symbolic Execution.” Keynote, 36th IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2016), Chennai Mathematical Institute, Chennai, India. December 13, 2016.
- “Side Channel Analysis Using a Model Counting Constraint Solver and Symbolic Execution.” Keynote, 14th International Symposium on Automated Technology for Verification and Analysis (ATVA 2016), October 18, 2016, Chiba, Japan.
- “String Analysis for Vulnerability Detection and Repair.” Distinguished Lecture, University of Luxembourg, Interdisciplinary Center for Security, Reliability and Trust (SnT), July 21, 2016.
- “String Analysis for Vulnerability Detection and Repair.” Keynote, 22nd International Symposium on Model Checking Software (SPIN 2015), Stellenbosch, South Africa, August 24, 2015.
- “Analyzing Interactions of Asynchronously Communicating Software Components.” Keynote, 2nd International Workshop on Quality Assurance for Service-based Applications (QASBA 2013), Lugano, Switzerland, July 15, 2013.
- “Analyzing Interactions of Asynchronously Communicating Software Components.” Keynote, 2013 IFIP Joint International Conference on Formal Techniques for Distributed Systems (33rd FORTE / 15th FMOODS), Florence, Italy, June 3, 2013.
- “Analyzing Interactions of Asynchronously Communicating Software Components.” Keynote, 9th International Symposium on Formal Aspects of Component Software (FACS 2012), Mountain View, USA, September 12, 2012.
- “String Analysis for Dependable Input Validation.” Distinguished Lecture, The Center for Embedded Systems for Critical Applications (CESCA), Virginia Tech, April 6, 2012.
- “String Analysis for Dependable Input Validation.” Keynote, 13th International Workshop on Verification of Infinite-State Systems (Infinity 2011), Taipei, Taiwan, October 10, 2011.

“Web Yazılımlarındaki Hataları Otomatik Doğrulama Yöntemleri ile Düzeltmek.”

Keynote, 5th National Software Engineering Symposium (UYMS 2011), September 26, 2011.

“Eliminating Web Software Vulnerabilities Using Automated Verification.” Keynote, Workshop on Formal Methods, Koc University, Istanbul, Turkey, May 31, 2010.

“Modularity, Interfaces, and Verification.” Keynote, 8th ACM SIGPLAN-SIGSOFT Workshop on Program Analysis for Software Tools and Engineering (PASTE 2008), November 9, 2008.

“Service Choreography and Orchestration with Conversations.” Keynote, 19th International Conference on Concurrency Theory (CONCUR 2008), August 21, 2008.

“Infinite State Model Checking with Presburger Arithmetic.” Keynote, 6th ACM-IEEE International Conference on Formal Methods and Models for Codesign (MEMOCODE 2008), Anaheim, CA, June 6, 2008.

Invited Talks

“Software, Logic and Security,” Invited talk, IEEE California Central Coast Section, October 20, 2021.

“Quantifying Information Leakage Using Model Counting and Symbolic Execution.” Invited talk, Department of Computer Science and Engineering, University of Nebraska-Lincoln, October 22, 2020.

“Side Channel Analysis Using a Model Counting Constraint Solver and Symbolic Execution.”

- Southern California Software Engineering Symposium (SuCSES), University of California, Irvine, June 7, 2019.

“Automating Software Engineering Tasks with Automated Logic Solvers.”

- Huawei Vision Forum, Santa Clara, California, October 10, 2018.

“Side Channel Analysis Using a Model Counting Constraint Solver and Symbolic Execution.”

- 6th International Symposium on High Confidence Software (ISHCS 2016), December 17, 2016, Institute of Software and Key Laboratory of High Confidence Software Technologies, Ministry of Education, Peking University, Beijing, China.
- 5th ACM SIGPLAN International Workshop on the State Of the Art in Program Analysis (SOAP 2016), Santa Barbara, California, June 14, 2016.

“Detecting and Repairing Security Vulnerabilities in Web Applications.”

- Middle East Technical University, Ankara, Turkey, May 14, 2015.
- Bilkent University, Ankara, Turkey, May 14, 2015.
- Bogazici University, Istanbul, Turkey, May 4, 2015.
- Sabanci University, Istanbul, Turkey, April 29, 2015.
- Koc University, Istanbul, Turkey, March 30, 2015.

“Differential String Analysis.”

- Microsoft Research, Redmond, Washington, January 5, 2015.
- Academia Sinica, Taipei, Taiwan, November 14, 2014.

“Data Model Analysis and Verification.”

- NTU, Taipei, Taiwan, November 15, 2014.

“String Analysis for Dependable Input Validation”

- IFIP Working Group 2.3 Programming Methodology Meeting, Istanbul, Turkey, March 27, 2015.
- NASA Ames Research Center, August 18, 2014.
- Fujitsu Laboratories of America, August 18, 2014.
- Aarhus University, Denmark, April 24, 2013.

“Analyzing Interactions of Asynchronously Communicating Software Components.”

- Institut de Recherche en Informatique de Toulouse (IRIT), Toulouse, France, July 10, 2013.
- Computer Engineering Department, TOBB Economics and Technology University, Ankara, Turkey, September 27, 2011.
- IFIP Working Group 2.3 Programming Methodology Meeting, Santa Barbara, CA, January 20, 2011.

“Eliminating Web Software Vulnerabilities Using Automated Verification”

- Georgia Tech, Atlanta, September 8, 2010.
- CalPoly, San Luis Obispo, California, November 5, 2010.

“Service Choreography and Orchestration with Conversations”

- Bilkent University, Ankara, Turkey, January 2, 2009.
- Middle East Technical University, Ankara, Turkey, December 24, 2008.

“Infinite State Model Checking with Presburger Arithmetic”

- First International Workshop on Numerical Abstractions for Software Verification, Princeton, NJ, July 8, 2008.

“Structuring Software for Verifiability”

- University of California, Riverside, December 13, 2007.
- NEC Labs, Princeton, NJ, November 5, 2007.

“Modeling Interactions of Web Software”

- Second International Workshop on Automated Specification and Verification of Web Systems (WWV 2006), Paphos, Cyprus, November 19, 2006.

“Analyzing Conversations of Web Services”

- State University of New York at Stony Brook, December 2, 2005.

“Tools for Automated Verification of Web Services”

- Naval Research Laboratory, Center for High Assurance Computer Systems, Washington, D.C., November 24, 2004.
- Second International Symposium on Automated Technology on Verification and Analysis (ATVA 2004), Taipei, Taiwan, November 1, 2004.
- Software Chat, Computer Science Department, University of Maryland, College Park, Maryland, September 27, 2004.
- Computer Science Department, Brown University, Providence, Rhode Island, July 9, 2004.
- Nokia Research Center, Boston, Massachusetts, July 12, 2004.
- Bell Laboratories, Lucent Technologies, Murray Hill, New Jersey, May 18, 2004.

“Automated Verification of Concurrent Software and Web Services”

- Fraunhofer Center, College Park, Maryland, October 5, 2004.

“Tools for Automated Verification of Concurrent Software”

- Naval Research Laboratory, Center for High Assurance Computer Systems, Washington, D.C., September 29, 2004.

- Department of Computer Science and Engineering, Michigan State University, East Lansing, Michigan, September 26, 2003.
- Department of Computer Science and Engineering, University of California, San Diego, California, August 18, 2003.

“Integrating Arithmetic Constraint Based Verification and Shape Analysis”

- Dagstuhl Seminar on Deduction and Infinite-state Model Checking, Schloss Dagstuhl, Wadern, Germany, April 23, 2003.

“Tools for Specification, Verification, and Synthesis of Reactive Systems”

- Computer Science Department, University of Massachusetts, Amherst, Massachusetts, March 25, 2002.
- Computer Science Department, State University of New York at Stony Brook, Stony Brook, New York, March 22, 2002.

“A Specification Language and a Verification Engine for Reliable Reactive Software Development”

- School of Computer Science, Carnegie Mellon University, Pittsburgh, Pennsylvania, November 19, 2001.

“Automated Symbolic Analysis of Reactive Systems”

- Computer Engineering and Information Science Department, Bilkent University, Ankara, Turkey, December, 1998.

“Symbolic Model Checking Systems with Unbounded Integer Variables.”

- Logic and Computation Seminar, University of Pennsylvania, Philadelphia, Pennsylvania, November 17, 1997.

“Model Checking Infinite State Systems: Recent Results and New Challenges.”

- Naval Research Laboratory, Center for High Assurance Computer Systems, Washington, D.C., September 29, 1997.

Invited Panels

CRA Snowbird Conference Panel on Hispanic Serving Institutions and Research 1 Universities, Snowbird, Utah, July 21, 2022.

ISSTA 30th Panel on the Past and Future of Software Testing and Analysis, July 14, 2021.

Served on two National Science Foundation CAREER award review panels

Served on seven National Science Foundation proposal review panels

Proof Tools Panel at the IFIP Working Conference on Verified Software: Theories, Tools, Experiments, ETH Zurich, Switzerland (2005)

Invited Tutorials

“Quantifying Information Leakage Using Model Counting.” 32nd International Conference on Computer Aided Verification (CAV 2020), July 20, 2020.

“String Analysis for Vulnerability Detection and Repair.” Invited tutorial, 14th International Symposium on Automated Technology for Verification and Analysis (ATVA 2016), October 17-20, 2016, Chiba, Japan.

“A Tutorial on Automated Verification.” 5th National Software Engineering Symposium (UYMS 2011), September 27, 2011.

“Modeling Interactions of Web Software,” 2nd Int’l Workshop on Automated Specification and Verification of Web Systems (WWV 2006), Paphos, Cyprus, November 19, 2006.

Tutorials

“Automata-based String Analysis.” 37th annual ACM SIGPLAN conference on Programming Language Design and Implementation (PLDI 2016), Santa Barbara, California, June 13, 2016.

“String Analysis.” 22nd ACM SIGSOFT International Symposium on Foundations of Software Engineering, November 17, 2014.

Professional Activities

Steering Committee

Steering Committee Member, IEEE/ACM International Conference on Automated Software Engineering (ASE) (2013–present)

Steering Committee Member, ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA) (2015–present)

Steering Committee Member, International Conference on Software Engineering (ICSE) (2016–2022)

Steering Committee Chair, ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA) (2017–2018)

Journal Editor

Associate Editor, ACM Transactions on Software Engineering and Methodology (TOSEM) (2018–present)

Associate Editor, IEEE Transactions of Software Engineering (TSE) (2014–2018)

Editorial Board Member, Service Oriented Computing and Applications Journal (2006–2013)

Technical Program Committee Chair, Co-Chair

Program Committee Co-Chair, 41st International Conference on Software Engineering (ICSE 2019)

Program Committee Co-Chair, 28th IEEE/ACM International Conference on Automated Software Engineering (ASE 2013)

Program Committee Co-Chair, 20th ACM SIGSOFT International Symposium on Foundations of Software Engineering (FSE 2012)

Program Committee Co-Chair, 9th International Symposium on Automated Technology for Verification and Analysis (ATVA 2011)

Program Committee Co-Chair, 7th International Workshop on Web Services and Formal Methods (WS-FM 2010)

Program Committee Co-Chair, Workshop on Testing, Analysis and Verification of Web Software (TAV-WEB 2008)

Program Committee Chair, Workshop on Testing, Analysis and Verification of Web Services and Applications (TAV-WEB 2006)

Program Committee Co-Chair, Workshop on Testing, Analysis and Verification of Web Services (TAV-WEB 2004)

Technical Program Committee Area Chair

International Conference on Software Engineering (ICSE 2022)

Technical Program Board Member

International Conference on Software Engineering (ICSE 2017, 2018)

Technical Program Committee Member

International Conference on Software Engineering (ICSE 2021) Doctoral Symposium

International Conference on Software Engineering (ICSE 2005, 2015, 2016, 2019, 2020)

International Conference on Computer Aided Verification (CAV 2015, 2020, 2021)

ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA 2002, 2007, 2009, 2016, 2018, 2020)

ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 2011, 2014, 2018, 2019)

IEEE/ACM International Conference on Automated Software Engineering (ASE 2005, 2006, 2007, 2008, 2010, 2011, 2014, 2015, 2018)

International Symposium on Automated Technology for Verification and Analysis (ATVA 2003, 2004, 2015, 2016, 2018)

International Conference on Coordination Models and Languages (COORDINATION 2016)

ACM SIGSOFT International Symposium on Foundations of Software Engineering (FSE 2016) Visions and Reflections Track

International Conference on Software Engineering and Formal Methods (SEFM 2014, 2015)

Haifa Verification Conference (HVC 2014)

International Conference on Software Testing, Verification and Validation (ICST 2013, 2014)

International Symposium on Formal Aspects of Component Software (FACS 2013)

2013 IFIP Joint International Conference on Formal Techniques for Distributed Systems (33rd FORTE/15th FMOODS)

International Workshop on Foundations of Interface Technologies (FIT 2012)

International Conference on Software Engineering (ICSE 2012) Doctoral Symposium

International Workshop on Searching and Integrating New Web Data (VLDS 2011)
International Workshop on Principles of Engineering Service-Oriented Systems (PESOS 2009, 2010)
IEEE International Conference on Web Services (ICWS 2005, 2010, 2011)
International Symposium on Stabilization, Safety, and Security of Distributed Systems (SSS 2010)
Workshop on Testing, Analysis and Verification of Web Software (TAV-WEB 2010)
International Conference on Service Oriented Computing (ICSOC 2005, 2006, 2007, 2008)
International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS 2008)
International Workshop on Formal Aspects of Component Software (FACS 2008)
International Workshop on Software Quality Assurance (SOQUA 2007)
IEEE International Conference on Service-Oriented Computing and Applications (SOCA 2007)
Automated Formal Methods Workshop (AFM 2007)
International Workshop on Automated Specification and Verification of Web Systems (WWV 2007)
International Workshop on Service Oriented Software Engineering (IW-SOSWE 2007)
International Workshop on Web Service Composition and Adaptation (WSCA 2007)
International Workshop on Software Verification and Validation (SVV 2004, 2005, 2006)
International Workshop on Service Oriented Software Engineering (IW-SOSE 2006)
International Conference on Software Engineering, Emerging Results Track (ICSE 2006)
Dependability in Large-scale Service-oriented Systems (DILSOS 2006)
Workshop on Software Model Checking (SoftMC 2005)
International Workshop on Automated Verification of Infinite-State Systems (AVIS 2005)
Poster Committee Member, International World Wide Web Conference (WWW 2004)
International Conference on Implementation and Application of Automata (CIAA 2003)

Award Committees

ACM SIGSOFT Impact Paper Award Committee Member (2022)
ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 2021) Test of Time Award Committee Member
ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA 2017) Impact Paper Award Committee Chair

Organizing Committees

General Chair, ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA 2017)

Doctoral Symposium Co-Chair, 27th IEEE/ASE International Conference on Automated Software Engineering (ASE 2012)

Workshop Co-chair, 25th IEEE/ACM International Conference on Automated Software Engineering (ASE 2010)

Co-organizer, 7th Workshop on Formal Methods and Web Services (WS-FM 2010)

Co-organizer, Workshop on Testing, Analysis and Verification of Web Software (TAV-WEB 2008)

Organizing Committee Member, Workshop on Web quality, Verification and Validation (WQVV 2007)

Organizing Committee Member, Workshop on Testing, Analysis and Verification of Web Services and Applications (TAV-WEB 2006)

Panel Chair, Third ACM-IEEE International Conference on Formal Methods and Models for Codesign (MEMOCODE 2005)

Co-organizer, Workshop on Testing, Analysis and Verification of Web Services (TAV-WEB 2004)

Organizing Committee Chair, 8th International Conference on Implementation and Application of Automata (CIAA 2003)

Professional Organizations

Member of IEEE, Computer Society

Distinguished member of ACM, SIGSOFT, SIGPLAN

Teaching, Advising, Research Supervision and Collaboration

Undergraduate Courses

Software Engineering/Capstone Project: Winter 2000, Winter 2002, Winter 2003, Winter 2004, Winter 2006, Winter 2007, Winter 2008, Winter 2009, Winter 2010, Winter 2019, Winter 2021.

Translation of Programming Languages: Winter 1999, Fall 1999, Fall 2000, Fall 2001, Winter 2004, Fall 2010, Winter 2011, Fall, 2011, Winter 2012, Winter 2013, Fall 2013, Fall 2015, Spring 2017, Fall 2017.

Problem Solving with Computers I: Spring 2014, Spring 2016.

Graduate Courses

Software Engineering: Spring 2003, Spring 2007, Fall 2008, Fall 2012, Fall 2018.

Quantitative Information Flow and Side Channels: Spring 2019, Fall 2021.

String Analysis: Winter 2016, Winter 2018.

Automated Verification: Spring 1999, Spring 2000, Winter 2001, Fall 2002, Spring 2006, Spring 2008, Fall 2009, Spring 2010, Spring 2011, Spring 2012, Winter 2014, Winter 2017.

Formal Models for Web Software: Spring 2010, Spring 2013.

Static Analysis: Spring 2002, Spring 2004.

Concurrent Program Design and Verification: Spring 2000.

Graduate Seminars

Neural Network Verification: Spring 2022.
Quantitative Verification: Spring 2021.
Testing and Verification Techniques for Machine Learning: Spring 2019.
Side Channel Analysis via Model Counting Constraint Solvers: Fall 2016.
Automated Worst Case and Side Channel Analysis for Software: Fall 2015.
Automated Decision Procedures: Winter 2013.
Analysis and Verification Techniques for Improving Dependability of Web Software: Fall 2011.
Domain Specific Languages and Analyses for Web Applications: Spring 2010.
Dependable Web Applications via String Analysis: Spring 2009.
Static String Analysis: Spring 2008.
Architectural Support for Dynamic Software Analysis: Spring 2007.
Environment Generation and Model Based Testing: Spring 2006.
Web Services and Security: Winter 2006.
Web Services: Spring 2003, Fall 2003.
Interfaces, Web Services and Verification: Winter 2003.
Topics in Automated Verification: Fall 2000, Spring 2002, Spring 2004.
Automated Verification of Infinite State Systems: Spring 1999, Fall 1999.
Workflow Specification Languages: Winter 1999.

Undergraduate Seminars

What is Computing?: Spring 2012, Spring 2013, Spring 2014.

Visitors

Daniele Fani, Ph.D. Candidate, University of Camerino, Italy
February 2014–September 2014

Joanne M. Atlee, Professor, University of Waterloo, Canada
February 2014–August 2014

Meriem Ouderni, Associate Professor, IRIT/INP Toulouse, France
December 2010–March 2011

Samik Basu, Associate Professor, Iowa State University
August 2010–December 2010

Gwen Salaun, Associate Professor, ENSIMAG, Grenoble INP, France
June 2008–July 2008

Postdoctoral Advisees

Nicolás Rosner, Postdoctoral researcher, 2016–2019

Research topic: Side-channel analysis, model counting constraint solvers.

Nestan Tsiskaridze, Postdoctoral researcher, 2016–2018 Research Topic: Side-channel analysis, model counting constraint solvers.

Sylvain Hallé, Postdoctoral researcher, 2008–2010

Research topic: Formal Modeling and Analysis of Web Applications and Web Services

Current position: Assistant Professor, Université du Québec á Chicoutimi, Canada

Ph.D. Advisees

MD Shafiuzzaman, Ph.D. student

Laboni Sarker, Ph.D. student

Mara Downing, Ph.D. candidate

William Eiers, Ph.D. candidate

Seemanta Saha, Ph.D. candidate

Burak Kadron, Ph.D. candidate

Tegan Brennan, Ph.D. 2020

Outstanding Dissertation Award 2020, Computer Science Department, UCSB

2019 Rising Stars Workshop Participant

Outstanding Graduate Student Award 2019, Computer Science Department, UCSB

2018 NCWIT Collegiate Award, honorable mention

IGERT Fellow, UCSB

Dissertation: “Static and Dynamic Software Side Channels.”

Current position: Assistant Professor, Computer Science Department, Stevens Institute of Technology.

Lucas Bang, Ph.D. 2018

Outstanding Graduate Student Award 2017, Computer Science Department, UCSB

Best Presentation Award 2016, Computer Science Department Graduate Student Workshop, UCSB

Lead Teaching Assistant 2014-2015, Computer Science Department, UCSB

Outstanding Teaching Assistant 2014, Computer Science Department, UCSB

Doctoral Scholar Fellow, UCSB

Lopker Fellow, Computer Science Department, UCSB

Dissertation: “Software Side-Channel Analysis.”

Current position: Assistant Professor, Computer Science Department, Harvey Mudd College.

Abdulbaki Aydin, Ph.D. 2017

Best paper award, Computer Science Department Graduate Student Workshop (GSW 2014)

Outstanding Teaching Assistant 2012, Computer Science Department, UCSB

Dissertation: “Automata-based Model Counting String Constraint Solver for Vulnerability Analysis.”

Current position: Software Engineer, Facebook.

Ivan Bocić, Ph.D. 2016

Outstanding Publication Award 2014, Computer Science Department, UCSB

Best paper award runner-up, Computer Science Department Graduate Student Workshop (GSW 2014)

Outstanding Teaching Assistant 2011, Computer Science Department, UCSB

Dissertation: "Data Model Verification via Theorem Proving."

Current position: Software Engineer, Google.

Muath Alkhalaf, Ph.D. 2014

2015 ACM SIGSOFT Outstanding Doctoral Dissertation Award

Dissertation: Automatic Detection and Repair of Input Validation and Sanitization Bugs

Current position: Assistant Professor, Computer Science Department, King Saud University.

Jaideep Nijjar, Ph.D. 2014

Best Poster Award, Graduate Student Workshop 2010, Computer Science Department, UCSB

Clare Boothe Luce Fellowship, UCSB

Dissertation: Analysis and Verification of Web Application Data Models

Fang Yu, Ph.D. 2010

Outstanding Dissertation Award 2010, Computer Science Department, UCSB

Best Paper Award, Graduate Student Workshop 2008, Computer Science Department, UCSB

UCSB Dean's Fellowship 2008

Dissertation: Automatic Verification of String Manipulating Programs

Current position: Associate Professor, Department of Management Information Systems, National Chengchi University, Taiwan

Graham Hughes, Ph.D. 2009

Dissertation: Interface Grammars for Modular Software Verification

Position after graduation: Research scientist, Acelot, Inc.

Aysu Betin-Can, Ph.D. 2005

IEEE/ACM International Conference on Automated Software Engineering (ASE) Best Paper Award, 2005

ACM SIGSOFT Distinguished Paper Award, 2005

Dissertation: Design for Verification for Concurrent and Distributed Systems

Current Position: Associate Professor, Informatics Institute, Middle East Technical University, Ankara, Turkey

Constantinos Bartzis, Ph.D. 2004

Dissertation: Symbolic Representations for Integer Sets in Automated Verification

Position after graduation: Post Doctoral Fellow, Computer Science Department, Carnegie Mellon University

Xiang Fu, Ph.D. 2004 (co-advised with Jianwen Su)

Dissertation: Formal Specification and Verification of Asynchronously Communicating Web Services

Current position: Associate Professor, Department of Computer Science, Hofstra University

Tuba Yavuz-Kahveci, Ph.D. 2004

Dissertation: Specification and Automated Verification of Concurrent Software Systems

Current position: Assistant Professor, Electrical and Computer Engineering Department, University of Florida, Gainesville

Zhe Dang, Ph.D. 2000 (co-advised with Richard A. Kemmerer)

Dissertation: Verification and Debugging of Infinite State Real-time Systems

Current position: Associate Professor, School of Electrical Engineering and Computer Science, Washington State University, Pullman

M.S. Advisees

Ganesh Sankaran, M.S. 2022

Project: An Open-Source Tool for Quantitatively Analyzing Access Control Policies for the Cloud

Albert Li, M.S. 2022

Project: State Machine Inference for Electronic Control Units in Cars Using Communication Traces

Nicholas Chen, M.S. 2019

Project Title: Pattern-Based Alignment for Network Traces

Plane Janthong, M.S. 2017

Project: Safety Checking for Domain Relational Calculus Queries Using Alloy Analyzer

Zachary Stengel, M.S. 2010

Project: Analyzing Singularity Channel Contracts

Current Position: Software Engineer, Microsoft

Ben Rubinger, M.S. 2010

Project: A Code Contracts Case Study for a Facebook Application

Current Position: Software Engineer, IBM

Muath Alkhalaf, M.S. 2008

Project: Automated Web Service Testing Using Interface Grammars

Current position: Ph.D. candidate, UCSB

Chris Ferguson, M.S. 2008

Project: Collaboration Diagram Analysis Toolkit

Current position: Student Information Systems and Technology, UCSB

Elliot Barlas, M.S. 2007

Project: A Framework for Verification of Distributed Java Programs Using Java PathFinder

Current position: Software Engineer, Citrix Online

Jennifer Choe, M.S. 2006

Project: An Extended Finite State Machine Approach for Automated GUI Testing

Current position: Software Engineer, Veeco Systems

Undergraduate Projects Supervised

Supervised 39 Capstone team projects as the Capstone Course instructor.

Erin DeLong, 2021-2022

Early Research Scholars project: Evaluating the Robustness of Quantized Neural Networks to Adversarial Attacks

Anushka Lodha 2021-2022

Early Research Scholars project: Evaluating the Robustness of Quantized Neural Networks to Adversarial Attacks

Brian Ozawa Burns 2021-2022

Early Research Scholars project: Evaluating the Robustness of Quantized Neural Networks to Adversarial Attacks

Olivia Gillam, 2020-2021

Early Research Scholars project: Quantitative Program Analysis with KLEE

Surendra Ghentiyala, 2020-2021

Early Research Scholars project: Quantitative Program Analysis with KLEE

Victoria Reed, 2020-2021

Early Research Scholars project: Quantitative Program Analysis with KLEE

Kunal Handa, 2020-2021

Early Research Scholars project: Quantitative Program Analysis with KLEE

Chaofan Shou, 2019–2021

Project: Network side channel analysis for IoT

Shihua Lu, 2019–2020

Distinction in Major Project: Quantitative program analysis using KLEE and ABC

Ganesh Sankaran, 2019–2020

Early Research Scholars and NSF REU project: Quantitative analysis of access control policies for the cloud

Albert L , 2019–2020

Early Research Scholars and NSF REU project: Quantitative analysis of access control policies for the cloud

Emily O’Mahony, 2019–2020

Early Research Scholars and NSF REU project: Quantitative analysis of access control policies for the cloud

Benjamin Prince, 2019–2020

Early Research Scholars and NSF REU project: Quantitative analysis of access control policies for the cloud

Claudia Zeng, 2019

Project: Experiments on Side Channel Leakage in Runtime Systems

Myles Adams, 2018–2019

Distinction in Major Project: Model Counting Constraint Solver as an Online Service

William Eiers, 2016–2017

Distinction in Major Project: Automata-based String Constraint Solving

Elliot Barlas, Spring, Summer 2006

Project: Modular Verification of Distributed Programs

Thomas Wilson, Spring 2002

Project: Use of Assertions in Object Oriented Programming Languages

Christophe G. Joubert, Spring 2001

Project: Shape Analysis

Ph.D. Committee Membership

Mohammad Javad Amiri, Ph.D. 2020

Dissertation: Large-Scale Data Management using Permissioned Blockchains

- Lawton Nichols, Ph.D. Ph.D. 2020
Dissertation: Program Similarity Techniques and Applications
- Fish Wang, Ph.D. 2018
Dissertation: Decloaking Binary Programs for Fun and Profit
- Antonio Bianchi, Ph.D. 2018
Dissertation: Identifying and Mitigating Trust Violations in the Mobile Ecosystem
- Faisal Nawab, Ph.D. 2017
Dissertation: Global-Scale Data Management with Strong Consistency Guarantees
- Kyle Dewey, Ph.D. 2017
Dissertation: Automated Black Box Generation of Structured Inputs for Use in Software Testing
- Stratos Dimopoulos, Ph.D. 2017
Dissertation: Resource Allocation in Multi-Analytics, Resource-Constrained Environments
- Christopher Hall, Ph.D. 2017
Dissertation: A New Human-Readability Infrastructure: Structured Data as a Visual Programming Language
- Hiranya Jayathilaka, Ph.D. 2016
Dissertation: Governance of Cloud-hosted Web Applications
- Yutian Sun, Ph.D. 2015
Dissertation: Management of Data and Collaboration for Business Processes
- Merritt Miller, Ph.D. 2015
Dissertation: Realization and Formal Analysis of Asynchronous Pulse Communication Circuits
- Kunal Arya, Ph.D. 2014
Dissertation: Hierarchical Transactions for Hardware/Software Cosynthesis
- Nagy Mostafa, Ph.D. 2012
Dissertation: Towards Enabling Better Understanding and Performance for Managed Languages
- Mohit Tiwari, Ph.D. 2011
Dissertation: Design and Verification of Information Flow Secure Systems
- Marco Cova, Ph.D. 2010
Dissertation: Taming the Malicious Web: Avoiding and Detecting Web-based Attacks
- Vika Felmetsger, Ph.D. 2010
Dissertation: Toward Automated Detection of Logic Vulnerabilities in Web Applications
- Sunil Soman, Ph.D. 2008
Dissertation: Memory Management in Multi-Application Managed Runtime Environments
- Cagdas Gerede, Ph.D. 2007
Dissertation: Modeling, Analysis and Composition of Business Processes
- Ganapathy Parthasarathy, Ph. D. (Electrical and Computer Engineering) 2005
Dissertation: Hybrid Methods for Satisfiability Checking in Register-Transfer Level Circuits
- Madhu K. Iyer, Ph.D. (Electrical and Computer Engineering) 2005
Dissertation: Techniques for efficient satisfiability checking

Mirek Riedewald, Ph.D. 2002

Dissertation: Efficient aggregation for data warehouses and digital libraries

Jeff Bogda, Ph.D. 2001

Dissertation: Program Analysis Alleviates Java Synchronization

Steve Haynal, Ph.D. (Electrical and Computer Engineering) 1999

Dissertation: Symbolic Automata-Based Scheduling

Paul Kolano, Ph.D. 1999

Dissertation: Tools and Techniques for the Design and Systematic Analysis of Real-Time Systems

External Ph.D. Committee Membership

Devika Sondhi, Ph.D. 2021, Indraprastha Institute of Information Technology Delhi (IIIT-D), India
Dissertation: Leveraging the External Resources and Meta-data to Highlight the Gap between a Program's Implementation and its Documentation

Daniele Fani, Ph.D. 2015, Universita degli Studi di Camerino, Italy

Dissertation: Dynamic Verification of Service-Based Systems

Simon Holm Jensen, Ph.D. 2013, Aarhus University, Denmark

Dissertation: Static Analysis of JavaScript

Mathias Romme Schwarz, Ph.D. 2013, Aarhus University, Denmark

Dissertation: Design and Analysis of Web Application Frameworks

Domenico Bianculli, Ph.D. 2012, University of Lugano, Italy

Dissertation: Open-World Software: Specification, Verification, and Beyond

Naghmeh Ghafari, Ph.D. 2009, University of Waterloo, Canada

Dissertation: Algorithmic Analysis of Infinite-State Systems

Ming-Ying Chung, Ph.D. 2007, University of California at Riverside

Dissertation: Distributed Symbolic Reachability Analysis

Beata Sarna-Starosta, Ph.D. 2005, SUNY, Stony Brook

Dissertation: Constraint-based Analysis of Security Properties

M.S. Committee Membership

Aleksandra Potapova, M.S. 2010

Project: On Nondeterministic Workflow Executions

Yiming Li, M.S. 2010

Project: Efficient Front-End Support for Cloud Platforms

Puneet Lakhina, M.S. 2010

Project: Analysis and Evaluation of a Hypervisor Hosted Java Virtual Machine

Alon Levi, M.S. 2007

Project: Building a Semantic Web Service Registry

Anders Smestad, M.S. 2006

Project: Increasing Sharing in a Multitasking Java Virtual Machine

Ariane Gravel, M.S. 2006
Project: A Monitoring Tool for BPEL Services

John Yoder, M.S. 2006
Project: Using a Binary Tree of Conditionals (BTC) for Dynamic Dispatch in ISE Eiffel

Milly Strelzoff, M.S. 2001
Project: Hidden Markov Models in TetraGene

University Service

University of California, Santa Barbara

2019–present, Chair, Computer Science Department
 2000–present, Director, Verification Laboratory
 2020–2021, Member, College of Engineering Building Cluster Committee
 2020, Member, Packard Fellowship Nomination Committee
 2018–2019, Chair, Faculty Recruitment Committee, Computer Science Department
 2018–2019, Faculty Member, Vision and Strategic Planning Committee, Computer Science Department
 2015–2018, Faculty Member, Program Review Panel, UCSB
 2016–2017, Faculty Member, Faculty Recruitment Committee, Computer Science Department
 2017, Faculty Member, Committee on Outstanding Graduate Mentor Awards, UCSB Academic Senate
 2016, Faculty Member, Committee on Instructional Improvement Program Grants, UCSB
 2015–2017, Faculty Member, Vision Committee, Computer Science Department
 2015–2016, Chair, Faculty Recruitment Committee, Computer Science Department
 2005–2009, Vice Chair, Computer Science Department
 2014, Chair, Task Force on Undergraduate Program Growth, Computer Science Department
 2013–2014, 2010–2011, Chair, Graduate Admissions Committee, Computer Science Department
 2011–2012, Chair, Committee on Graduate Funding and Fellowships, Graduate Council, UCSB Academic Senate
 2009–2012, Faculty Member, Graduate Council, UCSB Academic Senate
 2006, Chair, UCSB Committee on International Graduate Student Issue
 2005–2009, Vice Chair, Computer Science Department
 2005–2009, Graduate Advisor, Computer Science Department
 2011–present, Faculty Member, Center for Cybersecurity
 2012–2013, 1999–2004, Faculty Member, Graduate Admissions Committee, Computer Science Department

2013, Member, MSO Search Committee, Department of Computer Science

2011–2013, Faculty Member, Executive Committee, College of Engineering

2011–2012, Faculty Member, Committee on Self-Supporting and Professional Graduate Programs, Graduate Council, UCSB Academic Senate

2010–2011, Faculty Member, Committee on Program Review, Graduate Council, UCSB Academic Senate

2009–2010, Faculty Member, Committee on Graduate Student Affairs, Graduate Council, UCSB Academic Senate

2012–2013, Faculty Member, Graduate Division Central Continuing Fellowship Committee

2011–2012, Faculty Member, Graduate Division Central Recruitment Fellowship Committee

2011–2012, 2017-2018, Faculty Member, Graduate Advising and Affairs Committee, Computer Science Department

2009–2011, Faculty Member, Undergraduate Affairs Committee, Computer Science Department

2005–2009, Co-Chair, Graduate Affairs Committee, Computer Science Department

2005–2009, Co-Chair, Graduate Admissions Committee, Computer Science Department

2005–2009, Teaching Coordinator, Computer Science Department

2008–2011, Coordinator, Distinction in the Major Program, Computer Science Department

2006–2010, Faculty Member, Strategic Planning Committee, Computer Science Department

2006–2007, Faculty Member, Acceleration Committee, Computer Science Department

2002–2004, Faculty Member, Recruitment Committee, Computer Science Department

2000–2003, Faculty Member, Curriculum Committee, Computer Science Department

2001–2002, Faculty Member, Accreditation Committee, Computer Science Department

2000–2001, Academic Senate Representative, Computer Science Department

1998–2001, ACM Liaison, Computer Science Department

1998–1999, Library Liaison, Computer Science Department

1999–2000, Colloquium and Distinguished Lecture Series Coordinator, Computer Science Department

2006, Faculty Member, Packard Fellowship Nomination Review Committee, College of Engineering

2006, Faculty Member, NSF PIRE Grant Review Committee, College of Engineering

1999–present, Faculty Member, Computer Engineering Program

2013–2014, 1999–2000, Faculty Member, Recruitment Committee, Computer Engineering Program

2009–2013, 2002–2004, Faculty Member, Long Range Planning Committee, Computer Engineering Program

2006–2009, Teaching Coordinator, Computer Engineering Program

2006–2007, Faculty Member, Graduate Curriculum and Affairs Committee, Computer Engineering Program

2005–2006, Faculty Member, Seminar Series Committee, Computer Engineering Program

2005–2006, Faculty Member, Student Awards Committee, Computer Engineering Program

1999–2004, Seminar Coordinator, Computer Engineering Program