Emery Berger

emery.berger@gmail.com
https://github.com/emeryberger

Amazon Web Services +
Manning College of Information and Computer Sciences
University of Massachusetts Amherst
Amherst, MA 01003

Research Interests

Design and implementation of programming languages and systems, with a focus on automatically improving reliability, security, and performance.

Education

Ph.D., Computer Science, University of Texas at Austin, August 2002
Thesis: **Memory Management for High-Performance Applications**
Advisor: Kathryn S. McKinley
M.S., Computer Science, University of Texas at Austin, December 1991
B.S., Computer Science, University of Miami, May 1988

Academic Experience

Professor, University of Massachusetts Amherst, 2014–present
Visiting Researcher, University of Washington, 2018–9
Visiting Researcher, Microsoft Research, 2005, 2006, 2011, 2013, 2015, 2016, 2018–9
Associate Professor, University of Massachusetts Amherst, 2008–2014
Associate Researcher, Barcelona Supercomputing Center, 2010–2013
Visiting Professor, Universitat Politècnica de Catalunya, 2008–2009
Assistant Professor, University of Massachusetts Amherst, 2002–2008
Research Intern, Microsoft Research, Summer 2000 & 2001
Graduate Research Assistant, University of Texas at Austin, 1997–2002

Professional Experience

Amazon Scholar, Amazon Corporation, 2023–present
Consultant, Bloomberg Corporation, 2020–2023
Consultant, Microsoft Research, 2019–2023
Systems Analyst, University of Texas at Austin, 1995–2000
Teacher, Benjamin Franklin International School, Barcelona, Spain, 1992–1994
Systems Analyst, Applied Research Laboratories: UT-Austin, 1990–1992
Instructor, The Princeton Review, Austin, Texas, 1989–1990
Teaching Assistant, University of Texas at Austin, 1989–1990
Programmer, FOCAL Informatique, Grenoble, France, Summer 1990
Programmer, Texas Instruments, Austin, Texas, 1989 – 1990
Programmer, ComPro Associates, Orlando, Florida, 1988
Programmer, Stromberg-Carlson, Inc. (now Siemens), Lake Mary, Florida, 1986
Programmer, AT&T Information Systems, Maitland, Florida, 1985
Programmer, Fetco Inc., Sanford, Florida, 1984

HONORS & AWARDS

Professional Organization:

- **ACM SIGPLAN Distinguished Service Award**, 2024
- **ACM Fellow**, 2019
- **ACM Distinguished Member**, 2018
- **ACM Senior Member**, 2011

Most Influential Paper Awards:

- **ASPLOS 2019 Influential Paper Award** (≥10 year test of time award)
  for *Hoard: A Scalable Allocator for Multithreaded Applications, ASPLOS 2000*
- **PLDI 2016 Most Influential Paper Award** (10 year test of time award)
  for *DieHard: Probabilistic Memory Safety for Unsafe Languages, PLDI 2006*
- **OOPSLA 2012 Most Influential Paper Award** (10 year test of time award)
  for *Reconsidering Custom Memory Allocation, OOPSLA 2002*

Communications of the ACM and SIGPLAN Research Highlights:

- **CACM Research Highlights**:
  - *PlanAlyzer: Assessing Threats to the Validity of Online Experiments,* September 2021
  - *BLeak: Automatically Debugging Memory Leaks in Web Applications,* November 2020
  - *Coz: Finding Code that Counts with Causal Profiling,* June 2018
  - *AutoMan: Integrating Digital and Human Computation,* June 2016
  - *Exterminator: Automatically Correcting Errors with High Probability*, December 2008
- **SIGPLAN Research Highlights:**
  - *PlanAlyzer: Assessing Threats to the Validity of Online Experiments*, 2020
  - *BLeak: Automatically Debugging Memory Leaks in Web Applications*, 2019
  - *Doppio: Breaking the Browser Language Barrier*, 2014
  - *AutoMan: Integrating Human and Digital Computation*, 2013

Best Paper Awards:

- **OSDI Jay Lepreau Best Paper Award**, *Triangulating Python Performance Issues with Scalene* (OSDI 2023)
- **SOSP Best Paper Award**, *Coz: Finding Code that Counts with Causal Profiling* (SOSP 2015)
- **OOPSLA Best Paper Award**, *SurveyMan: Programming and Debugging Surveys* (OOPSLA 2014)
- **FAST Best Paper Award**, *TFS: A Transparent File System for Contributory Storage* (FAST 2007)

Other Significant Awards:

- **National Science Foundation (NSF) CAREER Award**, 2004–2007

- **Facebook Faculty Research Award**, 2017
- **University of Massachusetts Exceptional Merit Award**, 2014
- **PLDI Distinguished Artifact Award**, 2014
- **Microsoft Software Engineering Foundation (SEIF) Award**, 2013
- **Google Research Award**, 2011
- **Lilly Teaching Fellowship**, University of Massachusetts Amherst, 2006
- **Microsoft Research Graduate Fellowship**, 2001 – 2002
- **Novell Corporation Fellowship**, 1997 – 1998
- **Florida Honors Scholarship**, 1984 – 1988

PUBLICATIONS: CONFERENCE PAPERS

Note: In Computer Science, unlike many other fields, conference papers are rigorously reviewed, with top conferences having low acceptance rates; publications in these conferences are considered archival and superior to top journal papers.
Citation counts from Google Scholar, October 2024; total: 6,942. HTTPS://GOO.GL/B54C1B

[OSDI 2023] **Triangulating Python Performance Issues with Scalene**, E. Berger, S. Stern, J. A. Pizzorno. In *Proceedings of the 17th USENIX Symposium on Operating Systems Design and Implementation*, July 2023. Acceptance rate: 20% (50/255). ***Jay Lepreau Best Paper Award*** https://github.com/plasma-umass/scalene [39 citations], 1.5 million downloads

[ISSTA 2023] **SlipCover: Near Zero-Overhead Code Coverage for Python**, J. A. Pizzorno, E. Berger. In *Proceedings of the 32nd ACM SIGSOFT International Symposium on Software Testing and Analysis*, July 2023. Acceptance rate: 31% (117/372). https://github.com/plasma-umass/slipcover, [4 citations], 30,000 downloads

[OOPSLA 2020] **Mossad: Defeating Software Plagiarism Detection**, B. Devore-McDonald, E. Berger. In *Proceedings of the 2020 ACM Object-Oriented Programming Languages, Systems, and Applications*, October 2020. Acceptance rate: 36% (109/302). [37 citations]

[OOPSLA 2019] **PlanAlyzer: Assessing Threats to the Validity of Online Experiments**, E. Tosch, E. Bakshy, E. Berger, D. Jensen, J. E. B. Moss. In *Proceedings of the 2019 ACM Object-Oriented Programming Languages, Systems, and Applications*, October 2019, pp. 1–30. Acceptance rate: 36% (73/201). ***SIGPLAN Research Highlight, CACM Research Highlight*** [8 citations]

[UIST 2019] **Tea: A High-Level Language and Runtime System for Automating Statistical Analysis**, E. Jun, M. Daum, J. Roesch, S. Chasins, E. Berger, R. Just, K. Reinecke. In *Proceedings of the 2019 ACM User Interface Software and Technology Symposium*, October 2019. Acceptance rage: 24% (93/381). *http://tea-lang.org* [43 citations]

[USENIX 2019] **Not So Fast: Analyzing the Performance of WebAssembly vs. Native Code**, A. Jangda, B. Powers, E. Berger, A. Guha. In *Proceedings of the 2019 USENIX Annual Technical Conference*, July 2019. Acceptance rate: 20% (71/356). [188 citations]

[PLDI 2019] **Mesh: Compacting Memory Management for C/C++ Applications**, B. Powers, D. Tench, E. Berger, A. McGregor. In *Proceedings of the 2019 ACM SIGPLAN Conference on Programming Language Design and Implementation*, June 2019. Acceptance rate: 27% (76/281). http://libmesh.org [32 citations]

[Middleware 18] **CRIMES: Using Evidence to Secure the Cloud**, S. Rajasekaran, H. Chawla, Z. Ni, N. Shah, E. Berger, T. Wood. In *Proceedings of the 19th Annual Middleware Conference*, December 2018. Acceptance rate: 23% (22/95). [2 citations]

[OOPSLA 2018] **ExceLint: Automatically Finding Spreadsheet Formula Errors**, D. Barowy, E. Berger, B. Zorn. In *Proceedings of the 2018 ACM SIGPLAN Conference on Object-Oriented Programming Languages, Systems, and Applications*, November 2018. Acceptance rate: 28% (60/216). http://excelint.org [51 citations]

[PLDI 2018] **BLeak: Automatically Debugging Memory Leaks in Web Applications**, J. Vilk, E. Berger. In *Proceedings of the 39th ACM SIGPLAN Conference on Programming Language Design and Implementation*, June 2018. Acceptance rate: 21% (55/258) ***SIGPLAN Research Highlight, CACM Research Highlight, incorporated into Google Android SDK.*** http://bleak-detector.org/ [19 citations]

[CHI 2017] **VoxPL: Programming with the Wisdom of the Crowd**, D. Barowy, D. Goldstein, S. Suri, E. Berger. In *Proceedings of the 35th Annual CHI Conference on Human Factors in Computing Systems*, May 2017. Acceptance rate: 25% (600/2400). [9 citations]

[ASPLOS 2017] **Browsix: Bridging the Gap Between Unix and the Browser**, B. Powers, J. Vilk, E. Berger. In *Proceedings of the Twenty-Third International Conference on Architectural Support for Programming Languages and Operating Systems*, April 2017. Acceptance rate: 17% (56/321). https://browsix.org [25 citations]

[OOPSLA 2016] **Prioritized Garbage Collection: Explicit GC Support for Software Caches**, D. Nunez, S. Guyer, E. Berger. In *Proceedings of the 2016 ACM SIGPLAN Conference on Object-Oriented Programming Languages, Systems, and Applications*, November 2016. Acceptance rate: 26% (52/203). [9 citations]

[ICSE 2016] **DOUBLETAKE: Fast and Precise Error Detection via Evidence-Based Dynamic Analysis**, T. Liu, C. Curtsinger, E. Berger. In *Proceedings of the 38th International Conference on Software Engineering*, May 2016. Acceptance rate: 19% (101/530). [54 citations]

[SOSP 2015] **COZ: Finding Code that Counts with Causal Profiling**, C. Curtsinger, E. Berger. In *Proceedings of the 25th ACM 2015 Symposium on Systems Principles*. ***Best Paper Award, CACM Research Highlight.*** *http://coz-profiler.org* [141 citations] Over 300,000 downloads (Rust version alone)

[OOPSLA 2014] **CHECKCELL: Data Debugging for Spreadsheets**, D. Barowy, D. Gochev, E. Berger. In *Proceedings of the 2014 ACM SIGPLAN Conference on Object-Oriented Programming Languages, Systems, and Applications,* October 2014. Acceptance rate: 28% (53/185)***.*** *http://checkcell.org* [58 citations]

[OOPSLA 2014] **SURVEYMAN: Programming and Automatically Debugging Surveys**, E. Tosch, E. Berger. In *Proceedings of the 2014 ACM SIGPLAN Conference on Object-Oriented Programming Languages, Systems, and Applications,* October 2014. Acceptance rate: 28% (53/185). ***Best Paper Award.*** *http://surveyman.org* [9 citations]

[PLDI 2014] **DOPPIO: Breaking the Browser Language Barrier**, J. Vilk, E. Berger. In *Proceedings of the 35th ACM SIGPLAN Conference on Programming Language Design and Implementation,* pp. 508-518, June 2014. Acceptance rate: 18% (52/287). ***Winner of PLDI 2014 Distinguished Artifact Award; SIGPLAN Research Highlight, incorporated into Archive.org's software emulators (over 1.2M downloads).*** *http://doppiojvm.org* [21 citations]

[PPoPP 2014] **PREDATOR: Predictive False Sharing Detection**, T. Liu, C. Tian, Z. Hu, E. Berger. In *Proceedings of the 19th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming,* pp. 3-14, February 2014. Acceptance rate: 16% (28/179). [53 citations]

[ASPLOS 2013] **STABILIZER: Statistically Sound Performance Evaluation**, C. Curtsinger, E. Berger. In *Proceedings of the Eighteenth International Conference on Architectural Support for Programming Languages and Operating Systems,* pp. 219-228, March 2013. Acceptance rate: 23% (44/191). http://stabilizer-tool.org [150 citations]

[DATE 2013] **Probabilistic Timing Analysis on Conventional Cache Designs**, L. Kosmidis, C. Curtsinger, E. Quiñones, J. Abella, E. Berger, F. Cazorla. In *Proceedings of the Conference on Design, Automation and Test in Europe,* pp. 603-606, March 2013. [64 citations]

[OOPSLA 2012] **AUTOMAN: Integrating Digital and Human Computation**, D. Barowy, C. Curtsinger, E. Berger, A. McGregor. In *Proceedings of the 2012 ACM Conference on Object-Oriented Programming Languages, Systems, and Applications*, pp. 639-654, October 2012. Acceptance rate: 25% (57/228). ***SIGPLAN Research Highlight, CACM Research Highlight.*** *http://automan-lang.org* [175 citations]

[SOSP 2011] **DTHREADS: Efficient Deterministic Multithreading**, T. Liu, C. Curtsinger, E. Berger. In *Proceedings of the Twenty-Third ACM Symposium on Operating Systems Principles*, pp. 327-336, October 2011. Acceptance rate: 18% (28/153). [341 citations] *http://dthreads.org*

[OOSPLA 2011] **SHERIFF: Precise Detection and Automatic Mitigation of False Sharing**, T. Liu, E. Berger. In *Proceedings of the 2011 ACM Conference on Object-Oriented Programming Languages, Systems, and Applications*, pp. 3-18, October 2011. Acceptance rate: 37% (61/166). [108 citations]

[WOOT 2011] **DieHarder: Securing the Heap**, G. Novark, E. Berger. In *Proceedings of the 5th USENIX Workshop on Offensive Technologies,* August 2011 (invited paper).

[CCS 2010] **DieHarder: Securing the Heap**, G. Novark, E. Berger. In *Proceedings of the 2010 ACM Conference on Computer and Communications Security,* pp. 573-584, October 2010. Acceptance rate: 17% (55/325). [272 citations]
Inspiration for security-hardening features in Windows 8.

[OOPSLA 2009] **Grace: Safe Multithreaded Programming for C/C++**, E. Berger, T. Yang, T. Liu, G. Novark. In *Proceedings of the 2009 ACM SIGPLAN Conference on Object-Oriented Programming, Systems, Languages, and Applications*, pp. 81-96, October 2009. Acceptance rate: 17% (25/144). [356 citations]

[ECRTS 2009] **Using Randomized Caches in Real-Time Systems**, E. Quiñones, E. Berger, G. Bernat, F. Cazorla. In *Proceedings of the 21st IEEE Euromicro Conference on Real-Time Systems*, pp. 129-138, June 2009. Acceptance rate: 25% (26/102). [69 citations]

[PLDI 2009] **Efficiently and Precisely Locating Memory Leaks and Bloat**, G. Novark, E. Berger, B. Zorn. In *Proceedings of the 2009 ACM Conference on Programming Language Design and Implementation*, pp. 397-407, June 2009. Acceptance rate: 21% (41/194). [111 citations]

[OSDI 2008] **Redline: First Class Support for Interactivity in Commodity Operating Systems**, T. Yang, T. Liu, E. Berger, S. Kaplan, J. Moss. In *Proceedings of the 8th USENIX Symposium on Operating System Design and Implementation*, pp. 73-86, December 2008. Acceptance rate: 13% (26/193). [101 citations]

[ASPLOS 2008] **Archipelago: Trading Address Space for Reliability and Security**, V. Lvin, G. Novark, E. Berger, and B. Zorn. In *Proceedings of the Thirteenth International Conference on Architectural Support for Programming Languages and Operating Systems-XIII*, 10 pages, March 2008. Acceptance rate: 24% (31/127). [99 citations]

[SenSys 2007] **Eon: A Language and Runtime System for Perpetual Systems**, J. Sorber, A. Kostadinov, M. Brennan, M. Garber, M. Corner, and E. Berger. In *Proceedings of the 5th ACM Conference on Embedded Networked Sensor Systems*, pp. 161-174, November 2007. Acceptance rate: 16%. **First energy-aware, approximate computing language.** [277 citations]

[PLDI 2007] **Exterminator: Automatically Correcting Memory Errors with High Probability**, G. Novark, E. Berger, and B. Zorn. In *Proceedings of the 2007 ACM Conference on Programming Language Design and Implementation*, pp. 1-11, June 2007. Acceptance rate: 25% (45/178). ***CACM Research Highlight.*** [194 citations]

[FAST 2007] **TFS: A Transparent File System for Contributory Storage**, J. Cipar, M. Corner, E. Berger. In *Proceedings of the Fifth USENIX Conference on File and Storage Technologies*, pp. 215-229, February 2007. Acceptance rate: 20%. ***Best paper award.*** [42 citations]

[OSDI 2006] **CRAMM: Virtual Memory Support for Garbage-Collected Applications**, T. Yang, E. Berger, S. Kaplan, J. E. B. Moss. In *Proceedings of the 7th USENIX Symposium on Operating Systems Design and Implementation*, pp. 103-116, November 2006. Acceptance rate: 18% (27/150). [142 citations]

[PLDI 2006] **DieHard: Probabilistic Memory Safety for Unsafe Languages**, E. Berger and B. Zorn. In *Proceedings of the 2006 ACM SIGPLAN Conference on Programming Language Design and Implementation*, pp. 158-167, June 2006. Acceptance rate: 21% (36/174). ***Directly inspired the design of the Windows Fault-Tolerant Heap; Winner of Most Influential Paper Award, PLDI 2016.*** [621 citations]

[USENIX 2006] **Flux: A Language for Programming High-Performance Servers**, B. Burns, K. Grimaldi, A. Kostadinov, E. Berger and M. Corner. In *Proceedings of the USENIX 2006 Annual Technical Conference*, pp. 129-142, May 2006. Full paper acceptance rate: 13.7% (21/153). [52 citations]

[USENIX 2006] **Transparent Contribution of Memory**, J. Cipar, M. Corner, E. Berger. In *Proceedings of the USENIX 2006 Annual Technical Conference*, pp. 109-114, May 2006. Acceptance rate: 18.5%. [19 citations]

[OOPSLA 2005] **Quantifying the Performance of Garbage Collection vs. Explicit Memory Management**, M. Hertz and E. Berger. In *Proceedings of the 2005 ACM SIGPLAN Conference on Object-Oriented Programming Systems, Languages, and Applications*, pp. 313-326, October 2005. Acceptance rate: 18% (32/174). [179 citations]

[PLDI 2005] **Garbage Collection Without Paging**, M. Hertz, Y. Feng, and E. Berger. In *Proceedings of the 2005 ACM SIGPLAN Conference on Programming Language Design and Implementation*, pp. 143-153, June 2005. Acceptance rate: 21% (28/135). [114 citations]

[OOPSLA 2004] **MC²: High-Performance Garbage Collection for Memory Constrained Environments**, N. Sachindran, J.E.B. Moss and E. Berger. In *Proceedings of the 2004 ACM SIGPLAN Conference on Object-Oriented Programming Systems, Languages, and Applications*, pp. 81-98, October 2004. Acceptance rate: 15%. [54 citations]

[ISMM 2004] **Automatic Heap Sizing: Taking Real Memory into Account**, T. Yang, M. Hertz, E. Berger, S. Kaplan, J.E.B. Moss. In *Proceedings of the 2004 ACM SIGPLAN International Symposium on Memory Management*, pp. 61-72, October 2004. Acceptance rate: 34% (15/43). [73 citations]

[OOPSLA 2002] **Reconsidering Custom Memory Allocation**, E. Berger, B. Zorn and K. S. McKinley. In *Proceedings of the 2002 ACM SIGPLAN Conference on Object-Oriented Programming Systems, Languages, and Applications*, pp. 1-12, November 2002. Acceptance rate: 20% (25/125). ***Winner of 2012 OOPSLA Most Influential Paper Award.*** [253 citations]

[PLDI 2001] **Composing High-Performance Memory Allocators**, E. Berger, B. Zorn and K. S. McKinley. In *Proceedings of the 2001 ACM SIGPLAN Conference on Programming Language Design and Implementation*, pp. 114-124, June 2001. Acceptance rate: 20% (30/144). http://www.heaplayers.org [208 citations]

[PPSC 2001] **Customizing Software Libraries for Performance Portability**, S. Guyer, E. Berger, and C. Lin. In *10th SIAM Conference on Parallel Processing for Scientific Computing,* March 2001 [9 citations]

[ASPLOS-IX] **Hoard: A Scalable Allocator for Multithreaded Applications**, E. Berger, K. S. McKinley, R. Blumofe and P. Wilson. In *The Ninth International Conference on Architectural Support for Programming Languages and Operating Systems*, pp. 117-128, November 2000. Acceptance rate: 21% (24/114). http://www.hoard.org [710 citations]
Algorithm adopted by Mac OS X and IBM; numerous commercial users. Variant of Hoard awarded test-of-time award at PLDI 2014; Most Influential Paper Award at ASPLOS 2019

PUBLICATIONS: JOURNAL ARTICLES

Note: citations for journal versions of conference papers are omitted here.

[CACM 2021] **PlanAlyzer: Assessing Threats to the Validity of Online Experiments**, E. Tosch, E. Bakshy, E. Berger, D. Jensen, J. E. B. Moss. In *Communications of the ACM (Research Highlight)*, Volume 64, Issue 9, pp. 108-116. September 2021.

[CACM 2020] **BLeak: Automatically Debugging Memory Leaks in Web Applications**, J. Vilk, E. Berger. In *Communications of the ACM (Research Highlight)*, Volume 63, Issue 11, pp. 146–153. November 2020.

[TOPLAS 2019] **On the Impact of Programming Languages on Code Quality**, E. Berger, C. Hollenbeck, P. Maj, J. Vitek, O. Vitek. In *Proceedings of the ACM Transactions on Programming Languages and Systems*, December 2019, Article 21, pp. 1–24. [54 citations]

[CACM 2019] **GOTO Rankings Considered Helpful**, E. Berger, S. Blackburn, C. Brodley, H. V. Jagadish, K. S. McKinley, M. A. Nascimento, M. Shin, L. Xie, K. Wang. In *Communications of the ACM*, Volume 62, Issue 7, pp. 29–30. July 2019. [7 citations]

[CACM 2018] **Coz: Finding Code that Counts with Causal Profiling**, C. Curtsinger, E. Berger. In *Communications of the ACM (Research Highlight)*, Volume 61, Issue 6, pp. 91-99, June 2018.

[CACM 2018] **Effectiveness of Anonymization in Double-Blind Reviewing**, C. LeGoues, Y. Brun, S. Apel, E. Berger, S. Khurshid, Y. Smaragdakis. In *Communications of the ACM*, Volume 61, Issue 6, pp. 30-33, June 2018. [42 citations]

[CACM 2016] **AutoMan: A Platform for Integrating Human-Based and Digital Computation**, D. Barowy, C. Curtsinger, A. McGregor, E. Berger. In *Communications of the ACM (Research Highlight)*, Volume 59, Issue 6, pp. 102-109, June 2016.

[TECS 2013] **PROARTIS: Probabilistically Analysable Real-Time Systems**, F. Cazorla, E. Quiñones, T. Vardanega, L. Cucu, B. Triquet, G. Bernat, E. Berger, J. Abella, F. Wartel, M. Houston, L. Santinelli, L. Kosmidis, C. Lo, D. Maxim. In *ACM Transactions on Embedded Computing Systems*, Volume 12, Issue 2s (94 pages), May 2013. [195 citations]

[CACM 2012] **Software Needs Seatbelts and Airbags**, E. Berger. In *Communications of the ACM*, Volume 55, Issue 9, pp. 48-53, September 2012. [12 citations]

[CACM 2008] **Exterminator: Automatically Correcting Memory Errors with High Probability**, G. Novark, E. Berger, B. Zorn. In *Communications of the ACM (Research Highlight)*, pp. 87-95, December 2008.

[TOS 2007] **TFS: A Transparent File System for Contributory Storage**, J. Cipar, M. Corner, E. Berger. In *ACM Transactions on Storage*, Volume 3, Issue 3, Article 12 (26 pages), October 2007.

[IJHPCA 2000] **Compositional Development of Performance Models in POEMS**, J.C. Browne, E. Berger, and A. Dube. In *International Journal of High Performance Computing Applications*, Sage Science Press, Volume 14, Number 4 (pp. 283-291), Winter 2000 [25 citations]

[IJNME 1998] **A Fast Solution Method for Three-Dimensional Many-Particle Problems of Linear Elasticity**, Y. Fu, K. Klimkowski, G. Rodin, E. Berger, J. C. Browne, J. Singer, R. van de Geijn, and K. Vemaganti. In *International Journal for Numerical Methods in Engineering*, Volume 42, 1998 [220 citations]

PUBLICATIONS: PEER-REVIEWED WORKSHOP PAPERS

[HotCloud 2016] **Scalable Cloud Security via Asynchronous Virtual Machine Introspection**, S. Rajasekaran, Z. Ni, H. Chawla, N. Shah, T. Wood, E. Berger. In *8th USENIX Workshop on Hot Topics in Cloud Computing*, June 2016. [10 citations]

[MSP 2005] **A Locality-Improving Dynamic Memory Allocator**, Y. Feng, E. Berger. In *3rd Annual ACM SIGPLAN Workshop on Memory Systems Performance*, pp. 68-77, June 2005. Acceptance rate: 33%. [66 citations]

PUBLICATIONS: PRE-PRINTS AND TECHNICAL REPORTS (NOT PUBLISHED ELSEWHERE)

Systems computing challenges in the Internet of Things, R. Alur, E. Berger, A. Drobnis, L. Fix, K. Fu, G. Hager, D. Lopresti, K. Nahrstedt, E. Mynatt, S. Patel, J. Rexford, J. Stankovic, B. Zorn E. Berger and B. Zorn (CCC Whitepaper, https://arxiv.org/pdf/1604.02980), September 2015. [65 citations]

Efficient Probabilistic Memory Safety, E. Berger and B. Zorn. UMass CS Technical Report TR-07-17, March 2007.

HeapShield: Library-Based Heap Overflow Protection for Free, E. Berger. UMass CS Technical Report TR-06-28, June 2006. [25 citations]

Custom Object Layout for Garbage-Collected Languages, G. Novark, T. Strohman, and E. Berger. UMass CS Technical Report, TR-06-06, January 2006. [8 citations]

Optimizing Shell Scripting Languages, E. Berger. UMass CS Technical Report TR-03-09, November 2003.

Detecting Errors with Whole-Program Configurable Dataflow Analysis, S. Guyer, E. Berger, and C. Lin. UTCS Technical Report TR-02-04, January 2002. [16 citations]

FP + OOP = Haskell, E. Berger. UTCS Technical Report TR-92-30, January 1992. [11 citations]

PATENTS

US Patent #10,691,526, "Automatic error fixes for high-availability applications", D. Barowy, E. Berger, C. Curtsinger, and R. Rabbah, 6/23/2020. [3 citations]

US Patent #10,102,241, E. Berger and B. Zorn, "Detecting errors in spreadsheets", issued 10/16/2018 [4 citations]

US Patent #7,802,232, E. Berger and B. Zorn, "Software robustness through search for robust runtime implementations", 9/21/2010 [40 citations]

E. Berger and B. Zorn, "Software variation for robustness through randomized execution contexts", application filed 3/31/2006 [28 citations]

RESEARCH SUPPORT

E. Berger (PI). Adobe, Inc., $30,000, 9/2021-unlimited

E. Berger (PI). Facebook (Meta), Inc., $400,000, 4/2021-unlimited

E. Berger (PI). Bloomberg L. P., $110,000, 2/2020-unlimited

E. Berger (co-PI), Michael Hicks, Benjamin Pierce, **SHF:Medium: Bringing Python Up to Speed**, $377,053 (UMass portion), 6/2020-5/2023

E. Berger (PI), **SHF: S^3:Statistical and Structural Analysis for Spreadsheets**, National Science Foundation, $347,400, 9/2016-8/2019

E. Berger (PI), S. Freund (PI), **XPS: SDA: SCORE: Scalability-Oriented Optimization**, National Science Foundation, $648,000, 9/2015-8/2019

E. Berger (PI). Facebook Faculty Research Award, $30,000, 6/2017–unlimited

E. Berger (PI), **System Resiliency**, Raytheon Corporation, $100,000, 12/2016-12/2017

E. Berger (PI), T. Wood (PI), **TWC: EVADE: Evidence-Assisted Detection and Elimination of Security Vulnerabilities**, National Science Foundation, $250,000, 9/2015-8/2017

E. Berger (PI), Alexandra Meliou, **EAGER: Data Debugging**, National Science Foundation, CCF- 1349784, $150,000, 9/2013-3/2015

E. Berger (PI), **EAGER: Programming the Crowd**, National Science Foundation, CCF-1144520, $300,002, 8/2011-8/2013

E. Berger (PI), **CheckCell: Data Debugging for Spreadsheets**, Microsoft Software Engineering Innovation Foundation (SEIF) Award, $25,000, 3/2013-unlimited

E. Berger (PI), **Causal Profiling**, Google Research Award, $50,000, 12/2011-unlimited

E. Berger (PI), **Reliable Performance**, National Science Foundation, CCF-1012195 (collaborative with D. Jiménez, UT-San Antonio), $550,000, 8/1/2010-7/31/2012

E. Berger (PI), **Perpetually-Available Software Systems**, Gigascale Systems Research Center, $315,000, 11/1/2009-10/31/2012

E. Berger (PI), **PASS: Perpetually-Available Software Systems**, National Science Foundation CCF-0910883 (collaborative with K. McKinley, UT-Austin and M. Hicks, Maryland), $639,420, 8/1/2009-7/31/2013

F. Cazorla (PI) (Barcelona Supercomputing Center), Co-PIs: Emery Berger, Guillem Bernat (Rapitime Systems), Tullio Vardanega (University of Padua), Liliana Cucu (INRIA), Benoit Triquet (Airbus). **PROARTIS – PRObabilistic Analyzable Real-Time Systems**. €1,810,621 (2/1/2010 – 1/31/2013), European Commission FP7-ICT-2009-4, Proposal 249100

E. Berger (PI)**, Using Multiple Cores to Improve Reliability and Security**, Intel Research Grant, $30,000, April 2007 – unlimited

E. Berger (PI), **Probabilistically Correct Execution: Hardening Applications Against Error and Attack,** National Science Foundation CNS-0615211, $300,000, 9/15/06 – 9/14/09

R. Manmatha (PI), J. Allan, E. Berger, D. Kulp, **Cluster Acquisition for Computational Research into Large Scale Data Rich Problems**, National Science Foundation CNS-0619337, $350,000, 9/1/06 – 8/31/08

E. Berger (PI)**, Using Multiple Cores to Improve Reliability and Security**, Intel Research Grant, $30,000, 4/06 – unlimited

E. Berger**,** Microsoft Research Gift, $30,000, September 2005

B. Levine (PI), E. Berger, M. Corner. **Building IA Capacity at UMass Amherst**, **DoD**, $130,000, 9/1/05 – 12/31/06

E. Berger (PI), **Cooperative System Support for Robust High Performance**, National Science Foundation CAREER Award CNS-0347339, $477,000, 6/1/04 – 5/31/09

SELECTED SOFTWARE

CSrankings. CSrankings is a metrics-based ranking of top computer science institutions around the world, with checkboxes for individual areas of computer science and links to individual faculty member home pages, Google Scholar pages, and DBLP publication profiles. (www.csrankings.org, over 2.3 million users and approximately 4K visits per day)

Scalene. Scalene is a CPU+GPU+memory profiler for Python that provides high-precision profiles with low overhead. Scalene has been downloaded over 700,000 times and its GitHub repository has over 7,000 stars.

The Coz profiler. Coz is a "causal" profiler that accurately predicts the impact of optimizing lines of code on either throughput or latency. Its GitHub repository has over 3,500 stars.

The Hoard scalable memory allocator. Hoard is a widely-deployed memory management library that provably improves the scalability and performance of multithreaded applications. Commercial users include AOL, British Telecom, Business Objects (SAP), Cisco, Credit Suisse First Boston, Entrust, Kamakura Corporation, Novell, Open Text, Pervasive Software, Philips, Plath GmbH, Reuters, Royal Bank of Canada, Quest, Sonus Networks, TIBCO, and VSNL International. The Mac OS X and IBM memory allocators are directly based on Hoard's design. (www.hoard.org, over 100,000 downloads, winner of the ASPLOS 2019 Most Influential Paper award).

DieHard. A system that transparently improves the reliability and security of C/C++ applications. (www.diehard-software.org, over 20,000 downloads). DieHard was the direct inspiration for the Fault-Tolerant Heap incorporated in Windows 7; DieHarder, a secure variant, inspired the security-hardening features in Windows 8.

Heap Layers. A flexible infrastructure for composing high-performance general and custom memory managers. (www.heaplayers.org). Hoard, DieHard, and DieHarder were built using Heap Layers.

Other software systems available at plasma-umass.org.

TEACHING EXPERIENCE

UNIVERSITY OF MASSACHUSETTS AMHERST, *College of Information and Computer Sciences*

COMPSCI 326:	Web Programming (fully revised): *https://web-programming.org/*
COMPSCI 590S:	Systems for Data Science, 2016, 2017 (new class)
COMPSCI 630:	Graduate Systems, 2011-2019, 2023 (new core class, PhD level)
COMPSCI 691DD:	Research Methods in Empirical Computer Science, 2014-2016
COMPSCI 230:	Computer Systems Principles, 2010-2011 (new required class)
COMPSCI 691W:	Parallel & Concurrent Programming, Spring 2006 (new)
COMPSCI 691S:	Hot Topics in Programming Languages & Systems, Fall 2005
COMPSCI 691R:	Topics in Runtime Systems, Fall 2004 (new)
COMPSCI 377:	Operating Systems (fully revised), Fall 2003, Fall 2004, Fall 2005, Spring 2006, Fall 2007, Fall 2009
COMPSCI 710:	Advanced Compiler Techniques (fully revised) Spring 2003, Spring 2004
COMPSCI 691P:	Robust Software Systems, Fall 2002 (new)

PLISS'22: PROGRAMMING LANGUAGE IMPLEMENTATION SUMMER SCHOOL
(course title: "Performance Matters")
Bertinoro, Italy, October 2022

ISSISP'18: INTERNATIONAL SUMMER SCHOOL ON INFORMATION SECURITY AND PROTECTION
(course title: "Low-Level Systems Security")
Canberra, Australia, July 2018

UNIVERSITAT POLITECNICA DE CATALUNYA (BARCELONA TECH)
(course title: "Systems for Data Science")
Barcelona, Spain, July 2017

HIPEAC SUMMER SCHOOL: Ninth International Summer School on Advanced Computer Architecture and Compilation for High-Performance and Embedded Systems
(course title: "Software Fault Tolerance and Correction")
Fiuggi, Italy, July 2013

Garbage Collection & Memory Management Summer School
UNIVERSITY OF KENT AT CANTERBURY, UK, July 2004

PROFESSIONAL SERVICE (LEADERSHIP ROLES)

Program Co-Chair, International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS) 2021

Program Chair, ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI) 2016

SIGPLAN Executive Committee Member-at-Large, Awards Co-Chair and Research Highlights Chair (elected to second three-year term), 2015–2021

Creator and Maintainer, CSRankings (https://csrankings.org), 2016–present

Associate Editor, ACM Transactions on Programming Languages and Systems (TOPLAS), 2007–2017

Organizer and Co-Program Chair, First Workshop on Approximate and Probabilistic Computing (APPROX) 2014

Co-Program Chair, USENIX Workshop on Hot Topics in Parallelism (HotPar), 2013

Organizer and Program Chair, Workshop on Determinism and Correctness in Parallelism (WoDet 3), 2012

Co-Program Chair and Program Committee Member, ACM SIGPLAN/SIGOPS International Conference on Virtual Execution Environments (VEE) 2010

General Chair and Program Committee Member, ACM SIGPLAN Workshop on Memory Systems Performance & Correctness (MSPC) 2008

Publicity Chair, ACM Conference on Object-Oriented Programming Systems, Languages, and Applications (SPLASH/OOPSLA) 2013

President, **GRACS** (GRAduate student association in Computer Science), University of Texas at Austin, 1995–1997

Developed **TEXbooks**, the official textbook site for the University of Texas at Austin, 1996–2004

PROFESSIONAL SERVICE (OTHER)

Program Committee Member, **17th** USENIX Symposium on Operating Systems Design and Implementation (OSDI) 2023

Program Committee Member, Symposium on Operating Systems Principles (SOSP) 2021

Program Committee Member, International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS) 2020

Program Committee Member, International Symposium on Memory Management (ISMM) 2018

Program Committee Member, ACM Symposium on Operating Systems Principles (SOSP) 2017

Program Committee Member, ACM Conference on Object-Oriented Programming Systems, Languages, and Applications (SPLASH/OOPSLA) 2016

Program Committee Member, USENIX Security 2014

Program Committee Member, International Symposium on Memory Management (ISMM) 2014

Program Committee Member, Workshop on Determinism and Correctness in Parallelism (WoDet) 2014

Program Committee Member, International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS) 2014

Program Committee Member, ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI) 2013

Program Committee Member, Fifth Annual International Systems and Storage Conference (Systor 2012)

Program Committee Member, USENIX Conference on Hot Topics in Parallelism (HotPar) 2012

Program Committee Member, ACM Symposium on Principles and Practice of Parallel Programming (PPoPP) 2012

Program Committee Member, Workshop on Deterministic Parallelism (WoDet) 2011

Program Committee Member, ACM Conference on Computer and Communications Security (CCS) 2010

Program Committee Member, 9th USENIX Symposium on Operating Systems Design and Implementation (OSDI) 2010

Program Committee Member, Fifteenth International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS) 2010

Program Committee Member, ACM SIGPLAN Conference on Programming Languages Design and Implementation (PLDI) 2008

Program Committee Member, ACM Symposium on Principles and Practice of Parallel Programming (PPoPP) 2008

Program Committee Member, ACM SIGPLAN International Symposium on Memory Management (ISMM) 2007

Program Committee Member, Workshop on Linguistic Support for Modern Operating Systems (PLOS) 2007

Program Committee Member, ACM SIGPLAN Conference on Programming Languages Design and Implementation (PLDI) 2007, Student Research Competition

Program Committee Member, 16th International Conference on Compiler Construction (CC) 2007

Program Committee Member, ACM SIGPLAN Workshop on Memory Systems Performance & Correctness (MSPC) 2006

Program Committee Member, ACM SIGPLAN Conference on Programming Languages Design and Implementation (PLDI) 2004

Program Committee Member, ACM SIGPLAN International Symposium on Memory Management (ISMM) 2004

Program Committee Member, Fourth International Workshop on Software and Performance (WOSP) 2004

External Program Committee Member, International Symposium on Computer Architecture (ISCA) 2017

External Program Committee Member, ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI) 2017

External Review Committee Member, ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI) 2015

External Review Committee Member, International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS) 2015

External Review Committee Member, ACM SIGPLAN Conference on Principles of Programming Languages (POPL) 2014

External Review Committee Member, ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI) 2014

External Review Committee Member, 11th USENIX Symposium on Operating Systems Design and Implementation (OSDI) 2014

External Review Committee Member, ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI) 2014

External Review Committee Member, ACM SIGPLAN Conference on Object-Oriented Programming Languages, Systems, and Applications (OOPSLA) 2013

External Review Committee Member, ACM SIGPLAN Conference on Object-Oriented Programming Languages, Systems, and Applications (OOPSLA) 2012

External Review Committee Member, ACM SIGPLAN Conference on Principles of Programming Languages (POPL) 2012

External Review Committee Member, ACM SIGPLAN Conference on Programming Languages Design and Implementation (PLDI) 2010

Editorial Board Member, Science of Programming, Special Issue on Memory Management

Reviewer: ICSE, ASPLOS, HPCA, ICFP, ICPP, INTERACT, IPDPS, ISMM, ISPASS, JISE, JPDC, OOPSLA, PACT, PLDI, POPL, SPAA, SP&E, TOPLAS, IEEE TPDS, IEEE TOC

Panelist: National Science Foundation, 2006, 2007, 2012

PH.D. STUDENTS SUPERVISED

John Vilk ***(Winner of Facebook PhD Fellowship, PLDI 2014 Distinguished Artifact Award, Winner of UMass CICS Outstanding Dissertation Award)*** (First job: Stripe)
Dan Barowy ***(Finalist for Microsoft Research Fellowship, Winner PLDI 2015 Distinguished Artifact Award, Winner of UMass CICS Outstanding Dissertation Award)*** (Assistant Professor, Williams College)
Charlie Curtsinger ***(Winner of Google Research Fellowship, Honorable Mention SIGOPS Dennis Ritchie Dissertation Award, Winner of UMass CICS Outstanding Dissertation Award)*** (Associate Professor, Grinnell College)

Ting Yang (***Winner of UMass CS Outstanding Dissertation Award.*** First job: Intel Corp., now at Meta)
Gene Novark (first job: Morgan Stanley)
Matthew Hertz (first job: Assistant Professor, Canisius College)
Tongping Liu (Associate Professor, University of Massachusetts ECE)
Juan Altmayer Pizzorno (current PhD advisee)
Kyla Levin (current PhD advisee)
Bobby Powers (current PhD advisee)
Sam Stern (current PhD advisee)
Nicolas Van Kempen (current PhD advisee)

MASTER'S STUDENTS SUPERVISED

Breanna Devore-McDonald (2018-2021)
Emma Tosch ***(Winner PLDI 2014 Student Research Competition; Best Paper OOPSLA 2014)***
Dimitar Gochev (2012-14)
Nitin Gupta (2010-12) (first job: Facebook)
Justin Aquadro (2009-11) (first job: Atalasoft)
Divya Krishnan, M.S. thesis advisor (2007-9) (first job: Cisco)
Jim Cipar (co-advised with Mark Corner) (2005-7) (PhD at Carnegie-Mellon University)
Vitaliy Lvin, M.S. thesis advisor (2006-7) (first job: Google)
Yong Yuan, M.S. thesis advisor (2003-4)
Yi (Eric) Feng, M.S. thesis advisor (2002-4) (first job: Google)
Pritesh Sharma, M.S. thesis advisor (2002-3)

UNDERGRADUATE STUDENTS SUPERVISED

Noah Huppert
Michael Steranka
Timm Allmann
Bianca Tamaskar
Kevin Gurney
Molly McMahon
Justin Aquadro
Duane Bailey
Jacob Evans
John Gaquin
Ali Shah
Gabriel Tarasuk-Levin (Hampshire College)
Matthew Meehan
Kevin Grimaldi
Alex Kostadinov
Laura Strickman (Amherst College)
Ana Mocanu (Amherst College), senior thesis co-advisor (2002-3)

OTHER STUDENT SUPERVISION

Eunice Jun, external member Ph.D. committee
Abhinav Jangda, member Ph.D. committee
Baris Kasicki (EPFL), external member Ph.D. commitee

Presley Pizzo, member Ph.D. committee
Santosh Nagarakatte (University of Pennsylvania), external member Ph.D. committee
Amittai Aviram (Yale University), external member Ph.D. committee
Benjamin Ransford, member Ph.D. committee
Trevor Strohman, member Ph.D. committee (Google)
Ed Walters, member Ph.D. committee
Brendan Burns, independent study supervisor (Google)
Bhuvan Urgaonkar, member Ph.D. committee (Penn. State)
John Cavazos, member Ph.D. committee (Univ. of Delaware)
Abhishek Chandra, member Ph.D. committee (U. Minnesota)
Asjad Khan, member Ph.D. committee
Naren Sachindran, member Ph.D. committee (IBM India)
Ying Gong, Synthesis project co-advisor (2003-4)
Andrew Kielbasinski, member Honors Culminating Experience committee (2003-4)
Virginie Guionnet (Universite de La Rochelle), co-advisor (2002-3)

DEPARTMENTAL & UNIVERSITY SERVICE

Creator & Organizer: UMass CS Systems Lunch: https://systems-lunch.org, 2011–present
Chair: SE/PL Faculty Hiring, 2019–20, 2020-21, 2021-22, 2022-23
Chair: External Faculty Awards Committee, 2019–20, 2020-21, 2021-22
Chair: Systems Faculty Hiring, 2016–17
Chair: Public Relations Committee, 2012–16
Chair: Faculty Hiring Committee, 2011–12
Chair: Admissions Committee, 2009–10, 2013–15
Chair: Distinguished Lecture Series Committee, 2010–11
Co-chair: Admissions Committee, 2003–5
Co-chair: Promotion and Tenure Committee, 2016–17
Member: Promotion and Tenure Committee (2015–18), University Academic Honesty Board (2013–18), Faculty Hiring Committee, (2013–14), Awards Committee (2010–11), Strategic Planning Committee (2007), Website Committee (2006–7), Curriculum Committee (2005–6), Faculty Recruiting Committee (2004–7), Personnel Committee (2003–4), Admissions Committee (2002–2003), Computing Committee (2002–3), Ad Hoc Graduate Curriculum committee (2002–3), Outreach Committee (2006)
Ex-Officio Member: Development Committee & Strategic Planning Committee (2012–15).
Representative: University Library Committee, 2006–7.
Panel member: Professionalism Seminar on Job Hunting
Panel member: Professionalism Seminar on Ethics
Speaker: Lab Description Seminar (2002, 2004, 2005, 2006)
Moderator: Panel Discussion, CS Saturday (2005)

KEYNOTES AND DISTINGUISHED INVITED LECTURES

Keynotes:

- "How to get your research adopted", PLDI 2022, June 2022
  https://slideslive.com/38986031/how-to-get-your-research-adopted
  https://www.youtube.com/watch?v=kwto0AQ_Un8

- "Performance Matters", VEE 2018, March 2018
- "Virtualizing the Browser", VEE 2015, March 2015
- "Programming with People", ETAPS Conference, March 2013

Invited Talks:

- "Python Performance Matters", Strange Loop 2022, September 2022: https://www.youtube.com/watch?v=vVUnCXKuNOg [**70,000** views, already in top 20 most viewed Strange Loop talks]

- "How to Get Your Research Adopted", PLDI 2022 keynote, June 2022: https://www.youtube.com/watch?v=kwto0AQ_Un8 [900 views]

- "Scalene: A high-performance, high-precision CPU+GPU+memory profiler for Python", PyCon US 2021, June 2021: https://www.youtube.com/watch?v=nrQPqy3YY5A and https://www.youtube.com/watch?v=5iEf-_7mM1k [combined 15,000 views]

- "Scalene: Scripting-Language Aware Profiling for Python", PyBay 2020, August 2020

- "Performance Matters", CppCon 2020 Plenary, September 2020: https://www.youtube.com/watch?v=koTf7u0v41o [30,000 views]

- "Performance Matters", Strange Loop 2019, September 2019: https://www.youtube.com/watch?v=r-TLSBdHe1A [**460,000 views:** 2nd most viewed Strange Loop talk]

- "Mesh: Automatically Compacting Your C++ Application's Memory", CppCon 2019, September 2019: https://www.youtube.com/watch?v=XRAP3lBivYM [13,000 views]

Distinguished Speaker:

- "Programming Language Technology for the Sciences", Texas A&M, April 2015
- "Programming Language Technology for the Sciences", UCSD, December 2014
- "Programming with People", UCSD, December 2014
- "Programming with People", ETH-Zürich, December 2012

LEGAL CONSULTING

Summit 6, LLC v. **HTC Corp., et al.**, Case No. 7:14-CV-00014-O;
Summit 6, LLC v. **Apple Inc.**, Case No. 7:14-CV-00106
United States District Court, Northern District of Texas, Wichita Falls Division
Reviewed patent, December 2014
Prepared expert report, January 2015
Deposition, January 2015

MISCELLANEOUS

Natural languages: native English speaker, fluent speaker of Spanish, Catalan, and French.
US and EU citizen.