

Gabriel A. Parmer

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Education	Ph.D.	Computer Science, Boston University, September 2009. Thesis: <i>COMPOSITE: A Dependable and Predictable Component-Based Operating System for Application-Specific Extensibility</i> Advisor: Richard West Committee: Richard West, Azer Bestavros, Ibrahim Matta, Assaf Kfoury, Mark Crovella
	B.S.	Computer Science, Boston University, May 2003.
Professional Experience	The George Washington University Washington, DC	<i>Associate Professor</i> 2016 – current
	The George Washington University Washington, DC	<i>Assistant Professor</i> 2009 – 2016
	Oversaw operating systems research investigating predictability, multicore, reliability, and how to providing a safe, and programmable physical infrastructure. Taught basic and advanced operating systems, and encouraged student involvement and interest in both Computer Science, and operating systems. NSF CAREER, and multiple teaching awards. Encouraged the development of a systems culture at GWU.	
	Hewlett Packard Enterprise Palo Alto, CA	<i>Visiting Researcher</i> 2015 (2 months)
	Visiting researcher during sabbatical working on system support for The Machine. Kernel implementation for non-coherent, persistent memory.	
	Boston University Boston, MA	<i>Research Assistant</i> 2006-2009
	Conducted research in operating system design for predictability, reliability, and efficiency. Designed and implemented the COMPOSITE component-based operating system with innovations in mutable protection domains and dependable, configurable scheduling. Research excellence award, 2008.	
	Boston University Boston, MA	<i>Teaching Assistant</i> 2003-2006
	Created curriculum and led labs associated with Introductory Computer Science (cs101) and Computer Programming I (cs111). Runner-up “best TA” award, 2005.	
	Cray Inc. Seattle, WA.	<i>Distributed OS Research Intern</i> Summer 2005
	Designed and developed a prototype for the networking subsystem of a single-system image distributed OS. Required Linux kernel development, integration with FUSE (filesystems in user-space), client/server event-based socket communication, and implementation of policies for managing global port namespaces and port status.	

Los Alamos National Labs (LANL)

Los Alamos, NM.

Application/Library Programmer

Summers 1999 – 2001

Implemented an application for visualizing benchmark data from massively parallel programs; modified and increased the functionality of a library used for parallel image compositing.

Refereed Publications & Software

Ranking – This publication record has significantly contributed to GWU being a top-10 research university in the USA for Embedded & real-time systems on csrankings.org. See <https://csrankings.org/#/index?bed&us> with filters applied.

Conference quality – Note that conferences such as the IEEE Real-Time Systems Symposium (RTSS), IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), the International Conference on Embedded Software (EMSOFT), IEEE Conference on Dependable Systems and Networks (DSN), Middleware, USENIX ATC, and the ACM EuroSys Conference have *acceptance rates between 10% and 30%*. These conferences are among the top research publication venues in my areas. Consistent with most areas of computer science, publication in these selective conferences are the standard by which research is evaluated - see the document “Evaluating Computer Scientists for Promotion and Tenure”, from the Computing Research Association.

Publications that were published based on work at GWU *and* with GWU student first authors are marked with a ★ bullet.

Post-tenure publications

- ★ W. Shao, B. Ye, Y. Ren, H. Wang, and G. Parmer, “Edge-rt: Os support for controlled latency in the multi-tenant, real-time edge,” in *IEEE Real-Time Systems Symposium (RTSS)*, 2022
 - Accepted at RTSS '22
- ★ R. Pan and G. Parmer, “SBIs: Application access to safe, baremetal interrupt latencies,” in *IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, 2022
- S. Mergendahl, S. Jero, B. C. Ward, J. Furgala, G. Parmer, and R. Skowrya, “The thundering herd: Amplifying kernel interference to attack response times,” in *IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, 2022
- ★ X. Lyu, L. Cherkasova, R. Aitken, G. Parmer, and T. Wood, “Towards efficient processing of latency-sensitive serverless DAGs at the edge,” in *International Workshop on Edge Systems, Analytics, and Networking (EdgeSys)*, 2022
- ★ D. M. Yuxin Ren, Gabriel Parmer, “Sharing non-cache-coherent memory with bounded incoherence,” in *Concurrency and Computation: Practice and Experi-*

ence (CPE), 2021

- S. Jero, J. Furgala, R. Pan, P. K. Gadeballi, A. Clifford, B. Ye, R. Khazan, B. C. Ward, G. Parmer, and R. Skowrya, "Practical principle of least privilege for secure embedded systems," in *IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, 2021
- ★ J. Marshall, R. Gifford, G. Bloom, G. Parmer, and R. Simha, "Precise cache profiling for studying radiation effects," *ACM Transactions on Embedded Computer Systems*, 2021
- ★ P. K. Gadeballi, S. McBride, G. Peach, L. Cherkasova, and G. Parmer, "Sledge: a serverless-first, light-weight wasm runtime for the edge," in *Proceedings of the ACM/IFIP Middleware Conference (Middleware)*, 2020
- ★ Y. Ren, G. Parmer, and D. Milojicic, "Ch'i: Scaling microkernel capabilities in cache-incoherent systems," in *the International Workshop on Runtime and Operating Systems for Supercomputers (ROSS)*, 2020
- ★ G. Peach, R. Pan, Z. Wu, G. Parmer, C. Haster, and L. Cherkasova, "eWASM: Practical software fault isolation for reliable embedded devices," in *Proceedings of the International Conference on Embedded Software (EMSOFT)*, 2020
- ★ Y. Ren, G. Liu, V. Nitu, W. Shao, R. Kennedy, G. Parmer, T. Wood, and A. Tchana, "Fine-grained isolation for scalable, dynamic, multi-tenant edge clouds," in *Proceedings of the USENIX Annual Technical Conference (USENIX ATC)*, 2020
- ★ P. K. Gadeballi, R. Pan, and G. Parmer, "Slite: Os support for near zero-cost, configurable scheduling," in *IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, 2020

– **Distinguished paper award**

- ★ Y. Ren, G. Parmer, and D. Milojicic, "Bounded incoherence: A programming model for non-cache-coherent shared memory architectures," in *Proceedings of the Eleventh International Workshop on Programming Models and Applications for Multicores and Manycores (PMAM)*, 2020
- ★ Y. Ren and G. Parmer, "Scalable data-structures with hierarchical, distributed delegation," in *Proceedings of the 20th ACM/IFIP International Middleware Conference (Middleware)*, 2019
- ★ P. K. Gadeballi, G. Peach, G. Parmer, J. Espy, and Z. Day, "Chaos: a system for criticality-aware, multi-core coordination," in *25th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, 2019
- G. Parmer, R. Pan, Y. Ren, P. K. Gadeballi, and W. Shao, "Component-based os design for dependable cyber-physical systems," in *1st International Workshop on*

Next-Generation Operating Systems for Cyber-Physical Systems (NGOSCPS), 2019

- ★ R. Pan and G. Parmer, "Mxu: Towards predictable, flexible, and efficient memory access control for the secure iot," *ACM Transactions on Embedded Computer Systems and EMSOFT.*, 2019
- ★ R. Pan, G. Peach, Y. Ren, and G. Parmer, "Predictable virtualization on memory protection unit-based microcontrollers," in *24th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, 2018
- ★ Y. Ren, L. Guyue, G. Parmer, and B. Brandenburg, "Scalable memory reclamation for multi-core, real-time systems," in *24th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, 2018

– **Best student paper award**

- ★ P. K. Gadepalli, R. Gifford, L. Baier, M. Kelly, and G. Parmer, "Temporal capabilities: Access control for time," in *Proceedings of the 38th IEEE Real-Time Systems Symposium*, 2017
- ★ J. Song, G. Fry, C. Wu, and G. Parmer, "Caml: Machine learning-based predictable, system-level anomaly detection," in *the 1st Workshop on Security and Dependability of Critical Embedded Real-Time Systems*, 2016
- G. Parmer, R. Simha, C. Toombs, P. Vora, and T. Wood, "Teaching design thinking, writing, and oral presentation: Lessons learned from the computer science senior design course at gw," in *the Spring Mid-Atlantic ASEE Conference*, 2016
- ★ Y. Ren, G. Parmer, G. Bloom, and T. Georgiev, "Cbufs: Efficient, system-wide memory management and sharing," in *Proceedings of the 2016 International Symposium on Memory Management (ISMM)*, 2016
- ★ J. Song, G. Bloom, and G. Parmer, "Superglue: Idl-based, system-level fault tolerance for embedded systems," in *The 46th Annual IEEE/IFIP International Conference on Dependable Systems and Networks (DSN)*, 2016
- ★ Q. Wang, T. Stamler, and G. Parmer, "Parallel sections: Scaling system-level data-structures," in *Proceedings of the ACM EuroSys Conference*, 2016
- G. Bloom, G. Parmer, and R. Simha, "Lockdown: An operating system for achieving service continuity by quarantining principals," in *Proceedings of the 9th European Workshop on System Security*, 2016
- ★ Q. Wang, Y. Ren, M. Scaperoth, and G. Parmer, "Speck: A kernel for scalable predictability," in *Proceedings of the 21st IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, 2015

- ★ J. Song and G. Parmer, "C'mon: a predictable monitoring infrastructure for system-level latent fault detection and recovery," in *Proceedings of the 21st IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, 2015
- ★ E. Armbrust, J. Song, G. Bloom, and G. Parmer, "On spatial isolation for mixed criticality, embedded systems," in *2nd International Workshop on Mixed Criticality Systems (WMC)*, 2014

Pre-tenure publications

- ★ J. Taylor, E. Drumwright, and G. Parmer, "Making time make sense in robotic simulation," in *Proceedings of the 4th International Conference on Simulation, Modeling, and Programming for Autonomous Robots (SIMPAN)*, 2014
- ★ W. Qi and G. Parmer, "FJOS: Practical, predictable, and efficient system support for fork/join parallelism," in *Proceedings of the 2014 20th IEEE Symposium on Real-Time and Embedded Technology and Applications (RTAS)*, 2014

– Best student paper award

- ★ J. R. Taylor, E. M. Drumwright, and G. Parmer, "Temporally consistent simulation of robots and their controllers," in *Proc. ASME Intl. Design Engr. Tech. Conf. and Comput. and Inform. in Engr. Conf.*, Buffalo, NY, 2014
- ★ J. Song, J. Wittrock, and G. Parmer, "Predictable, efficient system-level fault tolerance in C³," in *Proceedings of the 2013 34th IEEE Real-Time Systems Symposium (RTSS)*, 2013, pp. 21–32
- ★ J. Song and G. Parmer, "Predictable, system-level fault tolerance in Composite," *SIGBED Review*, vol. 10, no. 2, p. 31, 2013
- ★ J. Song, Q. Wang, and G. Parmer, "The state of COMPOSITE," in *Proceedings of the Workshop on Operating Systems Platforms for Embedded Real-Time applications (OSPRT)*, 2013, pp. 45–46
- ★ J. Song and G. Parmer, "Toward predictable, efficient, system-level tolerance of transient faults," in *Proceedings of the 5th Workshop on Adaptive and Reconfigurable Embedded Systems (APRES)*, 2013
- G. Parmer and R. West, "Predictable and configurable component-based scheduling in the Composite OS," *ACM Transactions on Embedded Computer Systems*, vol. 13, no. 1s, pp. 32:1–32:26, Dec. 2013
- ★ J. Song and G. Parmer, "Predictable, system-level fault tolerance in Composite," in *Proceedings of the IEEE Real-Time Systems Symposium, Work-in-Progress Session (RTSS-WiP)*, December 2012, pp. 20–21
- ★ Q. Wang, J. Song, G. Parmer, G. Venkataramani, and A. Sweeney, "Increasing

memory utilization with transient memory scheduling,” in *Proceedings of the 33rd IEEE Real-Time Systems Symposium (RTSS)*, 2012, pp. 248–259

- ★ Q. Wang, J. Song, G. Parmer, J. Wittrock, Y. Y. Wu, and T. Hossain, “Hijack^{cos}_{linux}: Toward practical, predictable, and efficient OS co-location using Linux,” in *Real-Time Linux Workshop*, 2012
- ★ G. Bloom, G. Parmer, B. Narahari, and R. Simha, “Shared hardware data structures for hard real-time systems,” in *Proceedings of the tenth ACM international conference on Embedded software (EMSOFT)*, 2012, pp. 133–142
- ★ J. Chen, G. Venkataramani, and G. Parmer, “The need for power debugging in the multi-core environment,” *IEEE Computer Architecture Letters*, vol. 11, no. 2, pp. 57–60, 2012
- G. Parmer and R. West, “Mutable Protection Domains: Adapting system fault isolation for reliability and efficiency,” *IEEE Transactions on Software Engineering*, vol. 38, no. 4, pp. 875–888, 2012
- R. West and G. Parmer, “Application-specific service technologies for commodity operating systems in real-time environments,” *ACM Trans. Embed. Comput. Syst.*, vol. 10, no. 3, pp. 30:1–30:21, May 2011
- ★ Q. Wang, J. Song, and G. Parmer, “Stack management for hard real-time computation in a component-based OS,” in *Proceedings of the 32nd IEEE Real-Time Systems Symposium (RTSS)*, Nov 2011, pp. 78–89
- ★ M. Harlan and G. Parmer, “JoinFS: The design and implementation of a semantic file system,” in *In Proceedings of the International Conference on Embedded Systems and Applications (ESA)*, July 2011, pp. 72–78
- G. Parmer and R. West, “HiRes: A system for predictable hierarchical resource management,” in *Proceedings of the 2011 17th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, 2011, pp. 180–190

– **Nominated for best paper award**

- ★ G. Bloom, G. Parmer, B. Narahari, and R. Simha, “Real-time scheduling with hardware data structures,” in *Proceedings of the IEEE Real-Time System Symposium, Work-in-Progress Session (RTSS-WiP)*, December 2010
- G. Parmer and J. Song, “Customizable and predictable synchronization in a component-based OS,” in *Proceedings of the International Conference on Embedded Systems and Applications (ESA)*, 2010, pp. 59–65
- G. Parmer, “The case for thread migration: Predictable IPC in a customizable and reliable OS,” in *Proceedings of the Workshop on Operating Systems Platforms for Embedded Real-Time applications (OSPRT)*, 2010

- G. Parmer and R. West, "Predictable interrupt management and scheduling in the Composite component-based system," in *Proceedings of the 29th IEEE International Real-Time Systems Symposium (RTSS)*, 2008, pp. 232–243
- G. Parmer and R. West, "Mutable Protection Domains: Towards a component-based system for dependable and predictable computing," in *Proceedings of the 28th IEEE International Real-Time Systems Symposium (RTSS)*, 2007, pp. 365–378
- R. West and G. Parmer, "Revisiting the design of systems for high-confidence embedded and cyber-physical computing environment," in *Proceedings of the NSF High Confidence Cyber-Physical Systems Workshop*, July 2007
- G. Parmer, R. West, and G. Fry, "Scalable overlay multicast tree construction for media streaming," in *Proceedings of the International Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA)*, July 2007, pp. 76–83
- G. Parmer and R. West, "Hijack: Taking control of cots systems for real-time user-level services," in *Proceedings of the 13th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, April 2007, pp. 133–146
- R. West and G. Parmer, "A software architecture for next-generation cyber-physical systems," in *Proceedings of the NSF Cyber-Physical Systems Workshop*, October 2006
- R. West and G. Parmer, "Application-specific service technologies for commodity operating systems in real-time environments," in *Proceedings of the 12th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, 2006, pp. 3–13
 - **Best paper award**
- X. Qi, G. Parmer, and R. West, "An efficient end-host architecture for cluster communication services," in *Proceedings of the IEEE International Conference on Cluster Computing (Cluster)*, September 2004, pp. 83–92
- G. Parmer, R. West, Q. Xin, G. Fry, and Z. Yuting, "An internet-wide distributed system for data-stream processing," in *Proceedings of the 5th International Conference on Internet Computing (IC)*, June 2004, pp. 920–926

Thesis *COMPOSITE: A Dependable and Predictable Component-Based Operating System for Application-Specific Extensibility*, PhD Thesis, Computer Science, Boston University, September 2009.

Software **Composite Operating System** – Design, implementation, and distribution of the COMPOSITE component-based operating system. Information found at composite.seas.gwu.edu. Public source found [www.github.com/gwsystems/composite](https://github.com/gwsystems/composite).

- Since coming to GWU, the source code has grown considerably:

```
$ git diff --stat f01b92607f9a9497459f1b6b83e467017df54818 | \
tail -n 1
6731 files changed, 737608 insertions(+), 188219 deletions(-)
```

- The entire system – excluding supported libraries – is 142,540 lines of code (all lines measured with `tokei`) spread across 1173 files. Including supported libraries the system is more than 3.3 million lines of code. Note these libraries require extensive porting, modification, and support to fit into the system.
- The system has 2905 commits, and has had 31 contributors.
- The OS runs on x86-32, x86-64, Arm v7, and (unsupported) Arm v7m.

Sledge – Serverless Platform for the Edge – An edge-centric serverless platform that uses Webassembly sandboxes (using our AwsM compiler) to enable kernel-bypass of all concurrency/parallelism, scheduling, and isolation. Sledge was created in collaboration with Arm Research. Public source and information can be found at

<https://github.com/gwsystems/sledge-serverless-framework>.

- The system was created at GWU and includes 26,365 lines of code.
- The system has 1327 commits, and has had 5 contributors.

AwsM Webassembly Compiler – A flexible compiler for sandboxed code execution that scales from microcontrollers (16KiB of SRAM) up to the cloud. AwsM is one of the fastest ahead-of-time Wasm compilers, and *the fastest* by a large margin on IoT microcontrollers. AwsM was integrated into a Arm-internal product, Bentoboxes. Public sources can be found at <https://github.com/gwsystems/awsM>.

- The compiler and runtime are 19,354 lines of code (with an additional 453,181 lines of code of benchmarks and example code).
- The compiler has 274 commits by 6 contributors.

Grants Awarded

Dollar values listed are GWU shares. Grants for which I'm a * by my name.

Post-Tenure Awards

- Office of Naval Research, Title: *Caission: A System for Secure, Adaptive Network Processing and Introspection*, 2022-2026, PIs Gabriel Parmer*, Tim Wood – **Awarded: \$994,100**
- Office of Naval Research, Title: *Self-healing Adaptation Infrastructure for Loss-tolerance (SAIL)*, STTR, 2021-2021, PI at GWU: Gabriel Parmer – GWU **Awarded \$30,000**, Phase I
- Semiconductor Research Consortium, CONIX Research Center, *Platform Support for A Composable, Secure Common Runtime*, 2020-2022, PI: Gabriel Parmer*, subcontract under CMU, – **Awarded \$467,000**

- Lincoln Labs, *Toward Dependable Embedded Systems: A Case Study in Satellite Software*, 2019-2019, PI: Gabriel Parmer
 - **Awarded \$50,000**
- ARM and the Semiconductor Research Consortium, *The Multi-Tenant Fog: Fine-Grained Isolation for Efficient, Low-latency Processing from Microcontroller to the Edge*, 2019-2022, PI: Gabriel Parmer* with Prof. Wood
 - **Awarded \$210,000**
- National Science Foundation (CPS, CISE), Title: *CPS:MEDIUM: Edge-Cloud Support for Predictable, Global Situational-Awareness and Control for Autonomous Vehicles* PIs: Gabriel Parmer*, Timothy Wood, and Taeyoung Lee (in GWU MAE), 2019-2022
 - **Awarded \$1,000,000**
- National Science Foundation (CNS, CISE), Title: *CSR: SMALL: Toward a Scalable, Multi-Tenant, Edge-Cloud Infrastructure for Real-Time Computation*, PI: Gabriel Parmer* and Tim Wood, 2018-2021
 - **Awarded \$500,000**
 - REU supplement – **\$32,000**
- Office of Naval Research, Title: *An Embedded Architecture for Cyber-Resilience*, STTR, 2016-2019, PI at GWU: Gabriel Parmer, Total award: ~\$1,000,000, with 66% going to collaborators
 - GWU **Awarded \$333,000**, Phase I & II, both with option periods
- Hewlett Packard Enterprise, Title: *Control at Scale: Intelligent, Latency-Aware System Control with The Machine*, PI: Gabriel Parmer, co-PI: Evan Drumwright, 2016-2019
 - **Awarded \$100,000**

Pre-Tenure Awards

- Office of Naval Research, Title: *LOCKDOWNOS: a Component-Based Foundation for System Monitoring, Quarantine, and Recovery.*, PI: Gabriel Parmer*, co-PI: Rahul Simha, Gedare Bloom, 2014-2017.
 - **Awarded \$600,000**
- National Science Foundation (CNS, CISE), Title: *CAREER: A System for Resilient, Mission-Critical Embedded Computation*, PI: Gabriel Parmer*, 2011-2014
 - **Awarded \$400,000**
 - REU supplement, 2014 – **\$10,000**
- Air Force Office of Sponsored Research, Title: *Language Support for Real-Time Distributed Systems to Support Detection and Recovery using Hardware*

Wrappers, PI: Bhagi Narahari, co-PI: Rahul Simha, Gabriel Parmer, 2011-2012. (Modification to AFOSR grant, *Architectural Support for Detection and Recovery using Hardware Wrappers*, \$485,992 with PI: B. Narahari and co-PI: R. Simha.)

– My involvement **Awarded \$79,158**

- National Science Foundation (Cybertrust, CISE), Title: *RAPID: Secure Bulletin Boards and Absentee Voting in Real-World Independently-Verifiable Elections*, PI: Poorvi Vora, co-PI: Gabriel Parmer, 2011-2011

– **Awarded \$99,673**

- National Science Foundation (SHF, CISE/CCF), Title: *ShiftMC: Software and Hardware Integration with Feedback and Transparency for Many-core Computing*, Pls: Gabriel Parmer*, Guru Prasad Venkataramani, 2010-2010

– **Awarded \$139,846.**

- GWU Internal Dilthey Fellowship, Title: *Hardware-Software Codesign for the Efficient Utilization of Multi-Core Processor Architectures*, Dilthey Fellowship, Pls: Gabriel Parmer*, Guru Venkataramani, 2009-2009

– **Awarded \$17,328**

Honors / Awards

Post-tenure Awards

- 2020-21, *CS Professor of the Year Award*, SEAS Engineers Council Award
- 2020, *Distinguished Paper Award* for “Slite: OS Support for Near Zero-Cost, Configurable Scheduling” at the IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)
- 2019-20, *CS Professor of the Year Award* (co-awarded with Prof. Pless), SEAS Engineers Council Award
- 2018, *Best student paper award* and Outstanding Paper for “Scalable Memory Reclamation for Multi-Core, Real-Time Systems” at the IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)
- 2018-19, *CS Professor of the Year Award*, SEAS Engineers Council Award
- 2019, Advisor for Gregor Peach who was awarded *Honorable mention for the Computing Research Association’s (CRA) Outstanding Undergraduate Researcher Award*
- 2018, *Best Student Paper Award* for “Scalable Memory Reclamation for Multi-Core, Real-Time Systems” at the IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)
- 2016-17, *CS Professor of the Year Award*, SEAS Engineers Council Award
- 2015-16, *CS Professor of the Year Award*, SEAS Engineers Council Award
- 2016, SEAS Research Day, Undergraduate Poster competition Runner-Up, “Embedded Virtual Machines”

Pre-tenure Awards

- 2014-15, *CS Professor of the Year Award*, SEAS Engineers Council Award
- 2014, *Best Student Paper Award* for “FJOS: Practical, Predictable, and Efficient System Support for Fork/Join Parallelism” at the IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)
- 2011, *NSF CAREER Award*
- 2012, *SEAS Outstanding Young Teacher Award*, Annual award given to a junior faculty in the engineering school
- 2011-12, *CS Professor of the Year Award*, SEAS Engineers Council Award
- 2011-12, *Most Influential CS Professor Award*, ACM Student Chapter Teaching Award
- 2011, *Best Paper Award Nomination* for “HiRES: A System for Predictable Hierarchical Resource Management,” at the IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)
- 2010-11, *CS Professor of the Year*, SEAS Engineers Council Award
- 2010-11, *Most Influential CS Professor Award*, ACM Student Chapter Teaching Award
- 2009-10, *CS Professor of the Year Award*, SEAS Engineers Council Award
- 2009-10, GWU Dilthey Fellowship (with Prof. Venkataramani)
- 2006, *Best Paper Award* for “Application-specific Service Technologies for Commodity Operating Systems in Real-Time Environments” at the IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)
- 2006-2008, US DoEd Graduate Assistance in Areas of National Need Fellowship
- 2008, Boston University CS Department's Annual *Research Excellence Award*
- 2005, Runner-up *Best Teaching Fellow Award*
- 2008, *Best Poster Presentation Award* for “On the Design and Implementation of Mutable Protection Domains Towards Reliable Component-Based Systems,” Boston University CS Dept. Industrial Affiliates Research Day
- 2006, National Science Foundation *Travel Grant* to the Real-Time Systems Symposium (RTSS)
- 2003, Undergraduate degree with *Cum Laude* honors

Advising

All Doctoral Awardees were awarded post-tenure. All advising 2015 and later is post-tenure.

PhD. Candidates:

- Maorui Bai, *OMNIWasm: a universal programming model for the latency-sensitive IoT*, PhD candidate
- Emil Abbasov, *Latency-sensitive multi-tenancy on the edge*, PhD candidate
- Xinyu Han, *Efficient, predictable secure systems*, PhD candidate

- Wenyuan Shao, *Edge multi-tenancy*, PhD candidate

Doctoral Awardees (all awarded post-tenure):

- Runyu Pan, *Embedded virtualization*, completed in 2020
- Phani Kishore Gadepalli, *Access Control for Rate-Based Resources*, completed in 2019
- Yuxin Ren, *System support for non-coherent, parallel hardware*, PhD candidate, **co-advised** with Prof. Wood completed in 2018
- James Taylor, *Temporally Consistent Robotics Simulation*, PhD candidate, **co-advised** with Prof. Drumwright, Professor of Practice at GWU
- James Marshall, *Fault Tolerant Cyber-Physical Systems*, PhD candidate, **co-advised** with Prof. Simha (completion in 2020)
- Jiguo Song, *System Support for Predictable, Efficient Fault Recovery*, completed in 2016, Ford Research
- Qi Wang, Thesis: *Multi-Core Composite: Toward a Scalable and Predictable OS*, completed in 2015, Facebook

PhD Committee Member:

- Bibek Bhattacharai, 2022
- Zhen Ni, 2022
- Pradeep Kumar, 2019
- External examiner for Anna Lyons, *University of New South Wales*, Australia, Advisor: *Gernot Heiser*, PhD 2018
- Manohar Vanga, *external committee member*, PhD candidate at Max Plank Institute
- James Marshall, PhD candidate
- Joshua Lurz, PhD 2019
- James Taylor, PhD 2019
- Sam Zapolsky, PhD 2017
- Jiguo Song, PhD 2016
- Qi Wang, PhD 2015
- Dengyuan Wu, PhD 2014
- Jie Chen, PhD 2014
- Jinho Hwang, PhD 2013
- External examiner for Bernard Blackham, *University of New South Wales*, Australia, Advisor: *Gernot Heiser*, PhD 2013
- Paul Moubarak, PhD 2012 (*Mechanical and Aerospace Engineering Dept.*)
- Gedare Bloom, PhD 2012
- Eugen Leontie, PhD 2012
- Kerry McKay, PhD 2011

- Mike Wakid, PhD 2011
- Mary Whittaker, PhD candidate

MS Committee Member

- Austin “AJ” Read, 2021

Post-doctoral Advisees:

- Gedare Bloom, PhD, *System Support for Hardware Data-Structures*, 2016

Research Scientists:

- Sean McBride, supporting the SRC CONIX and ONR STTR grants.

Masters Awardees:

- Bite Ye, low-latency, high-throughput network systems with strong isolation properties
- Sean McBride, Thesis: *SledgeEDF: Deadline-driven Serverless for the Edge*, MS 2021
- Zhuoyi Wu, Webassembly for micro-controllers, MS
- Wenyuan Shao, Framework for edge processing, MS
- Zheng Yang, (multi-processor support), MS
- Jakob Kaivo, *An Authentication Framework for Embedded Systems*, 2016
- Teodor Georgiev, *System support for generalized forking*, 2017
- Tareque Hossain, Thesis Title – *KMux: Kernel Extension At The Hardware Interface*, Committee: Poorvi Vora and Nan Zhang, MS 2011
- Andrew Sweeney, *Stack Management in COMPOSITE*, MS 2011

Undergraduate Research Advisees (* = published, or publication in progress):

- Evan Stella* *efficient shared memory for systems with fine-grained isolation*, BS 2023
- Aisha Mohammed *Wasm automated testing*, BS 2023
- Bite Ye* *a secure real-time OS based on the principle of least privilege*, BS 2021
- Jon Terry *Multi-tenant embedded system power management*, BS 2022
- Ryan Fisk *Multi-tenant embedded system power management*, BS 2022
- Jonathan Lee *Intelligent recycling*, BS 2023
- Jacob Cannizzaro *Custom, secure sandboxing in Linux*, BS 2021
- Linnea Dierksheide* *Composite paravirtualization and feather-weight isolation models*, BS 2022
- Graham Schock, *System configuration visualization and OS continuous integration for a component-based model*, BS 2022
- Samuel Gassman, *Fuschia OS security*, BS 2022
- Michael Hegarty, *Multi-tenant power management*, BS 2020

- Sebastian Velasquez-foubert, *Conjoined kernels and μ -kernel unit testing*, BS 2019
- Riley Kennedy*, *Scalable network processing*, BS 2019
- Ziheng Fan, *OS support for non-coherent architecture*, BS 2019
- Henry Jaensch, *Embedded Virtual Machines*, BS 2020
- Gregor Peach*, *Reliable satellites and General WASM runtime*, BS 2020
- Zacharie Day*, *Reliable satellites and power management*, BS 2020
- Joseph Espy*, *Reliable satellites*, BS 2020
- Lucas Baier*, *Embedded Virtual Machines*, BS 2018
- Robert Gifford*, *Embedded Virtual Machines*, BS 2018
- Amy Armbrust*, *Dynamic TCB in a component-based OS*, BS 2017
- Jack Shannon, *Predictable IPC with ZeroMQ*, BS 2015
- John Wittrock*, *sepOS: Minimizing interference in COMPOSITE*, BS 2013
- Yang Yang Wu*, *Quantifying and Controlling Interference in COMPOSITE*, BS 2013
- Andrew Hirsch, *cIDL: A Communication Protocol-aware Interface Definition Language*, BS 2013
- David Marchevsky, *A μ -Rebootable Webserver*, BS 2012
- Mike Shick, *Toward a Cyberphysical OS*, BS 2012
- Samy Bahra, *ConcurrencyKit: Generalized Parallelism*, BS 2011
- Patrick Thompson, *Pony: A Framework for Language Extensibility*, BS 2011
- Matt Harlan*, *JoinFS: A Relational Database*, BS 2011

Undergraduate Thesis Advisees (outside of Senior Design):

- Sara Harrison, *Hardware-in-the-loop Simulation for Telemetry Recording Testing*, BA 2015

High-school Advisees:

- Michael Kelly, Battlefield High School, *A Comprehensive Study of DoS Attacks in Xen*, Summer 2016
- Jeevan Karamsetty, Thomas Jefferson High School, *A component-based foundation for the Intel Galileo board*, Summer 2014

Teaching Activities

Courses marked as **bold** indicate significant curriculum development in a new class, or a revamp of a class.

- csci3410, Spring '22 – **Systems Programming**
- csci3411, Fall '21 – Undergraduate Operating Systems
- csci6411, Spring '21 – **Advanced Operating Systems**
- csci3411, Fall '20 – **Undergraduate Operating Systems**
- csci3907/6907, Spring '20 – **Internet of Things - Systems and Security**

- csci3411, Fall '19 – Undergraduate Operating Systems
- csci4243W, Fall '18-Spring '19 – Senior Design
- csci3411, Fall '18 – Undergraduate Operating Systems
- csci3411, Fall '17-Spring '18 – Senior Design
- csci3411, Spring '17 – Advanced Operating Systems
- csci3411, Fall '17 – Undergraduate Operating Systems
- csci3907/6907, Fall '16 – Special Topics in Operating Systems
- csci3411, Fall '16 – Undergraduate Operating Systems

Pre-tenure Teaching

- csci6907, Spring '14 – Special Topics in Operating Systems
- csci1111, Fall '14 – **Intro to Software Development** (cs1 equivalent)
- csci3411, Fall '14 – Undergraduate Operating Systems
- csci6411, Fall '13 – **Advanced Operating Systems**
- csci6907, Spring '13 – Special Topics in Advanced Operating & Distributed Systems
- csci3411, Fall '13 – Undergraduate Operating Systems
- csci3907, Fall '13 – Speed programming (ACM programming contest)
- csci4244, Fall '12/Spring '13 – Senior Design (supervised 9 projects)
- csci3411, Fall '12 – Undergraduate Operating Systems
- csci3240, Spring '12 – Pre-Senior Design
- csci3907, Fall '12 – Speed programming (ACM programming contest)
- csci4244, Fall '11/Spring '12 – Senior Design (supervised 8 projects)
- csci3907, Fall '11 – Speed programming (ACM programming contest)
- csci3411, Fall '11 – Undergraduate Operating Systems
- csci3240, Spring '11 – Pre-Senior Design
- csci297, Spring '10 – Special Topics in Operating Systems
- csci4244, Fall '10/Spring '11 – **Senior Design** (supervised 7 projects)
- csci3907, Fall '10 – Speed programming (ACM programming contest)
- csci154, Fall '10 – Undergraduate Operating Systems
- csci154/156, Fall '09 – **Undergraduate Operating Systems**

I created *student-led classes* at GWU with support from the department. These are one-credit classes, taught by students in areas we wouldn't cover in normal classes. I have been faculty advisor for:

- Spring '21 – Interview Preparation, taught by Tuhina Dasgupta, Graham Schock, and Kevin Deems

- Spring '22 – Raspberry Pi Programming and Embedded Systems, taught by Jonathan Terry and John Umina, most advising done by Kartik Bulusu and Bhagi Narahari
- Fall '23 – Internet Sociology, taught by Grady McPeak and Marshall Thompson

**Service:
Professional
Organization**

Post-tenure Service

- **Finance Chair**, IEEE Real-Time Systems Symposium (RTSS), 2020
- **IEEE Technical Committee on Real-Time Systems (TCRTS) Treasurer**, 2020
- **Finance Chair**, IEEE Real-Time Systems Symposium (RTSS), 2019
- **IEEE Technical Committee on Real-Time Systems (TCRTS) Treasurer**, 2019
- **Finance Chair**, IEEE Real-Time Systems Symposium (RTSS), 2018
- **IEEE Technical Committee on Real-Time Systems (TCRTS) Treasurer**, 2018
- **General Chair**, IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), 2018
- **IEEE Technical Committee on Real-Time Systems Assistant Treasurer**, Technical Committee on Real-Time Systems (TCRTS), 2016-2017
- **Program Committee Chair**, IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), 2017
- **Demo Chair**, IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), 2015
- **Web Chair**, IEEE Real-Time Systems Symposium (RTSS), 2015

Pre-tenure Service

- **Web Chair**, IEEE Real-Time Systems Symposium (RTSS), 2014
- Panel member and scribe at the invitation-only, NSF Workshop on Cloud Computing for Cyber-Physical Systems, 2013.
- **Technical Program Committee Chair for Track 1**, Track 1 (the Applications, Systems, RTOSs, and Tools track) in the IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), 2013 held in Philadelphia.
- **Co-Chair** for the *Workshop on Operating Systems Platforms for Embedded Real-Time applications* (OSPRT), 2012 held with the 24rd Euromicro Conference on Real-Time Systems (ECRTS) in Pisa, Italy
- **Co-Chair** for the *Workshop on Operating Systems Platforms for Embedded Real-Time applications* (OSPRT), 2011 held with the 23rd Euromicro Conference on Real-Time Systems (ECRTS) in Porto, Portugal

- NSF Panel member, 2011
- **Program Committee member:**
 - IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), 2022
 - ACM International Conference on Embedded Software (EMSOFT), external reviewer, 2022
 - IEEE Real-Time Systems Symposium (RTSS), 2021
 - Euromicro Conference on Real-Time Systems (ECRTS), 2021
 - USENIX Annual Technical Conference (USENIX ATC), 2020
 - IEEE International Conference on Cloud Engineering (IC2E), 2020
 - IEEE International Conference on Cloud Engineering (IC2E), 2019
 - ACM International Conference on Embedded Software (EMSOFT), 2018
 - IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), 2018
 - IEEE International Conference on Rebooting Computing (ICRC), 2017
 - ACM International Conference on Embedded Software (EMSOFT), 2017
 - IEEE International Symposium on Real-Time Computing (ISORC), 2017
 - IEEE Real-Time Systems Symposium (RTSS), Work-in-progress session 2016
 - IEEE Middleware, 2016
 - Workshop on Software-Based Methods for Robust Embedded Systems (SOBRES), 2015
 - IEEE Real-Time Systems Symposium (RTSS), Work-in-Progress session, 2014
 - IEEE Workshop on Mixed Criticality Systems (WMC), 2014
 - IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), 2015
 - IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), 2014
 - Workshop on Operating Systems Platforms for Embedded Real-Time applications (OSPERT), 2014
 - IEEE Workshop on Mixed Criticality Systems (WMC), 2013
 - IEEE Real-Time Systems Symposium (RTSS), 2013
 - Euromicro Conference on Real-Time Systems, Work-in-Progress session (ECRTS), 2013
 - IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSCA), 2013
 - Workshop on Operating Systems Platforms for Embedded Real-Time applications (OSPERT), 2013
 - Euromicro Conference on Real-Time Systems (ECRTS), 2013
 - Workshop on High-Performance and Real-Time Embedded Systems (HiRES), 2013

- IEEE Real-Time Systems Symposium (RTSS), 2012
- International Conference on Real-Time and Network Systems (RTNS), 2012
- IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSEA), 2012
- International Conference on Embedded Software (EMSOFT), 2012
- IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), 2012
- IEEE Real-Time Systems Symposium (RTSS) WiP, 2012
- IEEE Real-Time Systems Symposium (RTSS) WiP, 2011
- IEEE Real-Time Systems Symposium (RTSS) WiP, 2010
- ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS) WiP, 2011
- Reviewer for:
 - IEEE Transactions on Embedded Computer Systems (TECS), 2018
 - IEEE Transactions on Computer Systems (TOCS), 2017
 - Springer Real-Time Systems Journal, 2017
 - IEEE Transactions on Embedded Computer Systems (TECS), 2017
 - IEEE Computer Architecture Letters, 2016
 - Elsevier Journal of Systems Architecture, 2014
 - IEEE Transactions on Embedded Computer Systems (TECS) on multiple manuscripts, 2014
 - Springer Real-Time Systems Journal, 2013
 - IEEE Transactions on Embedded Computer Systems (TECS) on multiple manuscripts, 2013
 - IEEE Transactions on Computer Systems (TOCS), 2012
 - IEEE Transactions on Computer Systems (TOCS), 2011
- Secondary reviewer for the following conferences:
 - Euromicro Conference on Real-Time Systems (ECRTS) in 2004, 2007, 2008, 2010
 - Real-Time and Embedded Technology and Applications Symposium (RTAS) in 2006 and 2007
 - Real-Time Systems Symposium (RTSS) in 2004, 2005, 2006, and 2008
 - Workshop on Parallel and Distributed Real-Time Systems (WPDRTS) in 2005
- Conference Session Chair:
 - IEEE Real-Time Systems Symposium (RTSS), 2014
 - IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), 2014
 - Euromicro Conference on Real-Time Systems (ECRTS), 2013
 - IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), 2013

- IEEE International Conference on Embedded Software (EMSOFT), 2012
- IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), 2011

**Service:
GWU**

Departmental Committees & Duties:

- JEDI Committee (Justice, Equity, Diversity, and Inclusion), newly created, 2022
- Curriculum Committee, 2021-22
- UTA/LA Coordinator, 2022
- Undergraduate Tzar, 2019-22
- UTA/LA Coordinator, 2021
- Curriculum Committee, 2020-21
- UTA/LA Coordinator, 2020
- Curriculum Committee, 2019-20
- UTA/LA Coordinator, 2019
- Curriculum Committee, 2018-19
- UTA/LA Coordinator, 2018
- Graduate Admission and Services Committee 2017-18
- Undergraduate program, long-term vision, 2017-19 including
 - bulletin updates
 - webpage updates
- Curriculum Committee, 2017-18
- UTA/LA Coordinator, 2017
- Curriculum Committee, 2016-17
- CS Search Committee, 2016-17
- UTA/LA Coordinator, 2016

Pre-tenure Service

- Curriculum Committee, Fall 2014-16
- Pilot study for the UTA/LA program in CSCI 1111
- CS Chair Search Committee, 2014
- Undergraduate Recruiting and Retention Committee, 2013-14
- Research Committee, 2013-14
- Undergraduate Recruiting and Retention Committee, 2012-13
- Finance Committee, 2012-13
- Undergraduate Recruitment & Retention Committee, 2012-13
- CS Academic Standards Committee, 2012-13
- Student Relations Committee, 2011-12
- Curriculum Committee, Fall 2010-11

- Student Relations Committee, 2010-11
- Graduate Admissions Committee, 2010-11
- Curriculum Committee, Fall 2010-11
- Curriculum Committee, Fall 2009-10
- Graduate Admissions Committee, 2009-10
- Accreditation Task Force, 2010

Student group organization and advising

- ACM Chapter Faculty Sponsor, 2022
- ACM Chapter Faculty Advisor, 2021
- ACM Chapter Faculty Advisor, 2020
- Cyber Club Faculty Advisor, 2019
- Systems Hacking Club (SHC) Faculty Advisor, 2019
- ACM Chapter Faculty Advisor, 2019
- Cyber Club Faculty Advisor, 2018
- Systems Hacking Club (SHC) Faculty Advisor, 2018
- ACM Chapter Faculty Advisor, 2018
- Buff and Blue Hat Security Club Faculty Advisor, 2017
- Systems Hacking Club (SHC) Faculty Advisor, 2017
- ACM Chapter Faculty Advisor, 2017
- Buff and Blue Hat Security Club Faculty Advisor, 2016
- Systems Hacking Club (SHC) Faculty Advisor, 2016
- ACM Chapter Faculty Advisor, 2016
- ACM programming contest coach, 2016
- Buff and Blue Hat Security Club Faculty Advisor, 2015
- Systems Hacking Club (SHC) Faculty Advisor, 2015
- ACM Chapter Faculty Advisor, 2015

Pre-tenure Service

- Buff and Blue Hat Security Club Faculty Advisor, 2014
- Systems Hacking Club (SHC) founding, 2014
- ACM Chapter Faculty Advisor, 2014
- ACM programming contest coach, 2014
- ACM Chapter Faculty Advisor, 2013
- ACM programming contest coach, 2013
- ACM Chapter Faculty Advisor, 2012

- ACM programming contest coach, 2012
- ACM Chapter Faculty Advisor, 2011
- ACM programming contest coach, 2011
- ACM Chapter Faculty Advisor, 2010
- ACM Chapter Faculty Advisor, 2009
- ACM programming contest judge, 2009

GW-wide, SEAS-wide Services:

- SEAS Digital Presence Committee, 2018-19
- Seas Computing Committee, 2018-19
- SUPER Presentation Workshop, 2017
- UTA/LA Workshop, 2017
- SUPER Presentation Workshop, 2016
- Seas Computing Committee, 2016-17
- Seas Computing Committee, 2015-16

Pre-Tenure Service

- Seas Computing Committee, 2013-14
- Clark Scholar Selection Committee, 2013
- SEAS-1001 Department Introduction Presentation, 2013
- SEAS Grading Committee, 2012-13
- Research and Instructional Technology Committee (RITC), 2011-12
 - Implement study group into using emerging technologies (chromebooks) in the student population
- Research and Instructional Technology Committee (RITC), 2010-11
- Committee for Amsterdam Award for outstanding GTAs evaluation, 2011
- New Faculty Orientation, SEAS panel of “Starting a Research Group”, 2011

Student Admissions and Recruiting:

- Presentation for Admitted students, 2017
- Admitted Freshman Luncheons, 2014
- Admitted Student Recruiting trip in Philadelphia, 2013
- 5 year masters program promotional happy hour, 2012
- Admitted Freshman Luncheons, 2012
- Admitted Student Recruiting trip in Boston, 2012
- Admitted Freshman Luncheons, 2011
- Faculty presence at the freshman getaway, West Virginia, 2011
- Colonial Inauguration Presentation to incoming Freshman, 2010

- Admitted Freshman Luncheons, 2010
- Faculty presence at the freshman getaway, West Virginia, 2010

Other Duties:

- SEH Corporate Breakfast, 2013
- Alumni dinner at Flemings in VA, Spring 2012
- GTA Orientation: Presentation on student relations/academic integrity, 2012
- Dinner with Clark Scholars, Fall 2011
- Northern Virginia Technical Council dinner recognizing GW's work on the Arlington Cemetery record-keeping, Fall 2011
- GW-wide, Provost's strategic planning lunch, Fall 2011
- Admitted students phone calls, 2011
- GTA Orientation: Presentation on student relations/academic integrity, and grading, 2013
- GTA Orientation: Presentation on student relations/academic integrity, and grading, 2012
- GTA Orientation: Presentation on student relations/academic integrity, 2011