Baris Kasikci

Assistant Professor
Electrical Engineering and Computer Science
University of Michigan

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Research Interests

My research is centered around developing techniques, tools, and environments that help us build more reliable, secure, and efficient systems. I am interested in developing techniques and building systems that allow programmers to better reason about their code. I am also interested in system support for emerging hardware platforms, efficient runtime instrumentation, hardware and runtime support for enhancing system security, program analysis, and formal verification.

Education

Ecole Polytechnique Fédérale de Lausanne (EPFL)   *Lausanne, Switzerland*

PhD in Computer Science   Sep. 2010–Dec. 2015
Thesis: Techniques for Detection, Root Cause Diagnosis,
       and Classification of In-Production Concurrency Bugs
Advisor: Prof. George Candea

Middle East Technical University (METU)   *Ankara, Turkey*

M.Sc. in Electrical and Electronics Engineering   Sep. 2006–Jun. 2009
Thesis: Variability Modeling in Software Product Lines
Graduated with the top grade
Advisor: Prof. Semih Bilgen

B.Sc. in Electrical and Electronics Engineering   Sep. 2002–Jun. 2006
Project: Embedded Target Estimation, Detection, and Tracking
Graduated with High Honors
Advisor: Prof. Arzu Koc

Awards and Honors

NSF CAREER Award	2020
Intel Rising Star Award	2020
IEEE Micro Top Pick Honorable Mention, "NDA"	2020
Google Faculty Research Award	2019
IEEE Micro Top Pick, "Foreshadow"	2019
Intel Faculty Award	2019
Jay Lepreau Best Paper Award, OSDI	2018
Intel Faculty Award	2018
Outstanding Reviewer Award, WWW	2017
Patrick Denantes Memorial Prize for outstanding PhD thesis, EPFL	2016
EuroSys Roger Needham Award for Best PhD. Thesis in Computer Systems in Europe	2016
Intel Corp. Software and Services Group, Grant	2014–2016
VMware Inc., Doctoral Fellowship	2014–2015
EPFL, Doctoral Fellowship	2010–2011
Scientific and Technological Research Council of Turkey, Master Scholarship	2006–2008

Funding

NSF CAREER grant, 576K USD, PI	2020
NSF/Intel FoMR grant, 180K USD (360K USD total), co-PI	2020
NSF FMitF grant, 375K USD (750K USD total), co-PI	2020
DARPA AMP grant, 600K USD (1.8M USD total), PI	2020
SRC seed grant, 50K USD (150K USD total), PI	2020
Intel Rising Star Award, 50K USD, PI	2020
Intel Faculty Award, Performance Debugging, 75K USD, PI	2019
Google Cloud Computing Grant, 5K USD, PI	2019
Google Faculty Research Award, 80K USD, PI	2019
Intel Faculty Award, Automated Performance Optimization, 75K USD, PI	2018
Michigan College of Engineering Grant, 3K USD, PI	2018
Michigan Cambridge Research Initiative, 15K USD, PI	2018
Intel Gift, SysTEX'18 Workshop Sponsorship, 2K USD, PI	2018
Microsoft Azure Cloud Computing Grant, 25K USD, PI	2018
SRC JUMP grant, 1,25M USD (31.2M USD total), PI	2017

University of Michigan	*Ann Arbor, Michigan, USA*
Assistant Professor	Sep. 2017–present

Electrical Engineering and Computer Science Deparment

Microsoft Research	*Cambridge, United Kingdom*
Researcher	Aug. 2016–Aug. 2017

Research on computer systems and networks

Ecole Polytechnique Fédérale de Lausanne (EPFL)	*Lausanne, Switzerland*
Postdoctoral Researcher	Dec. 2015–Jul. 2016

Research on software security

- I developed infrastructure that relies on hardware support to improve software security.

Research Assistant	Sep. 2010–Dec. 2015

Research on software reliability with an emphasis on concurrent software

- I developed **Gist**, the first technique for accurately, efficiently, and automatically diagnosing the root causes of in-production failures, by using a combination of static and dynamic program analysis.

- I developed **RaceMob**, the first automated in-production data race detection technique that can be kept always-on and provides high accuracy, by combining static data race detection with adaptive, crowdsourced dynamic data race detection.

- I developed **Portend**, a high-accuracy technique to classify data races according to their potential consequences under arbitrary memory models, by using symbolic program analysis to explore multiple program paths and schedules to determine the effects of data races.

- I developed **Bias-Free Sampling**, a technique that allows efficient sampling of rarely executed code (where bugs often lurk) without over-sampling frequently executed code, by using a new sampling algorithm and existing hardware support.

Intel Corp.	*Santa Clara, CA, USA*
Research Intern	Jul. 2015–Sep. 2015

Automated root cause diagnosis of failures and security enhancements using hardware support

- I developed a tool that allows developers to determine which program statements operate on a given data type at runtime using a mix of static program analysis and hardware support. In our experiments, this tool reduces the number of statements to examine during debugging by an order of magnitude. This tool is being extended internally at Intel.

- I began investigating hardware support for enhancing system security, in particular, efficient path profiling for auditing and detecting control flow hijack attacks.

VMware Inc.	*Palo Alto, CA, USA*
Research and Development Intern	Jun. 2014–Sep. 2014

Automated debugging and runtime control flow tracking

- I implemented a runtime for efficient control flow tracking in software. This work formed the basis of my **Gist** work on root cause diagnosis.

- I designed and implemented an infrastructure to remotely debug and profile VMware VCenter virtual machine management software, while it is running in production. This infrastructure is used by VCenter developers at VMWare.

Microsoft Research   *Redmond, WA, USA*
Research Intern   Jun. 2013–Sep. 2013
Efficient runtime execution sampling technique and low overhead coverage measurement

- I worked on the design of the **Bias-Free Sampling** framework for efficient runtime sampling. I designed and implemented the bias-free sampling framework for managed code (i.e., C#). This tool is internally used at Microsoft.

- I designed and implemented a fault injection tool to detect resource leakage problems using dynamic binary instrumentation.

Siemens Corporate Technology   *Istanbul, Turkey*
Senior Software Engineer   Mar. 2008–May 2010
Embedded home and industrial automation software

- I designed and implemented a real-time embedded gateway software between Siemens communication processors and a building automation system using C++ on top of VxWorks.

Aselsan Electronic Industries   *Ankara, Turkey*
Software Engineer   May 2006–Mar. 2008
Embedded motor control and functional testing infrastructure

- I was responsible for a real-time embedded control software for turret motor control. I also designed and implemented a full-system functional testing software using C++ on top of VxWorks for Power PC architectures.

Student Intern   Jun. 2005–Jul. 2005
Embedded software development

- I developed embedded control software for a night vision camera using C++ and PIC assembly on a PIC microcontroller.

PEER-REVIEWED PUBLICATIONS

[1] DOLMA: Securing Speculation with the Principle of Transient Non-Observability. Kevin Loughlin, Ian Neal, Jicheng Ma, Elisa Tsai, Ofir Weisse, Satish Narayanasamy, and Baris Kasikci. *USENIX Security*, Vancouver, Canada, August 2021.

[2] Agamotto: How Persistent is your Persistent Memory Application? Ian Neal, Ben Reeves, Ben Stoler, Andrew Quinn, Youngjin Kwon, Simon Peter, and Baris Kasikci. *Symp. on Operating Sys. Design and Implementation (OSDI)*, Vancouver, USA, November 2020.

[3] I-SPY: Context-Driven Conditional InstructionPrefetching with Coalescing. Tanvir Ahmed Khan, Akshitha Sriraman, Joseph Devietti, Gilles Pokam, Heiner Litz, and Baris Kasikci. *IEEE/ACM Intl. Symp. on Microarchitecture (MICRO)*, Athens, Greece, October 2020.

[4] Optimus: A Hypervisor for Shared-Memory FPGA Platforms. Jiacheng Ma, Gefei Zuo, Kevin Loughlin, Xiaohe Cheng, Yanqiang Liu, Abel Mulugeta Eneyew, Zhengwei Qi, and Baris Kasikci. *Intl. Conf. on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, Lausanne, Switzerland, March 2020.

[5] I4: Incremental Inference of Inductive Invariants. Haojun Ma, Aman Goel, Jean-Baptiste Jeannin, Manos Kapritsos, Baris Kasikci, and Karem Sakallah. *Symp. on Operating Systems Principles (SOSP)*, Ontario, Canada, October 2019.

[6] NDA: Preventing Speculative Execution Attacks at Their Source. Ofir Weisee, Ian Neal, Kevin Loughlin, Thomas Wenisch, and Baris Kasikci. *IEEE/ACM Intl. Symp. on Microarchitecture (MICRO)*, Cleaveland, USA, October 2019.

[7] Huron: Hybrid False Sharing Detection and Repair. Tanvir Ahmed Khan, Yifan Zhao, Gilles Pokam, Barzan Mozafari, and Baris Kasikci. *Conf. on Programming Language Design and Implem.*, Phoenix, USA, June 2019.

[8] Morpheus: A Vulnerability-Tolerant Secure Architecture Based on Ensembles of Moving Target Defenses with Churn. Mark Gallagher, Lauren Biernacki, Shibo Chen, Zelalem Birhanu Aweke, Salessawi Ferede Yitbarek, Misiker Tadesse Aga, Austin Harris, Zhixing Xu, Baris Kasikci, Valeria Bertacco, Sharad Malik, Mohit Tiwari, and Todd Austin. *Intl. Conf. on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, Providence, RI, March 2019.

[9] REPT: Reverse Debugging of Failures in Deployed Software. Xinyang Ge Weidong Cui, Baris Kasikci, Ben Niu, Upamanyu Sharma, Ruoyu Wang, and Insu Yun. *Symp. on Operating Sys. Design and Implementation (OSDI)*, Carlsbad, USA, October 2018.

[10] Foreshadow: Extracting the Keys to the Intel SGX Kingdom with Transient Out-of-Order Execution. Jo Van Bulck, Marina Minkin, Ofir Weisse, Daniel Genkin, Baris Kasikci, Frank Piessens, Mark Silberstein, Thomas F. Wenisch, Yuval Yarom, and Raoul Strackx. *USENIX Security*, Baltimore, USA, August 2018.

[11] Cntr: Lightweight OS Containers. Jorg Thalheim, Pramod Bhatotia, Pedro Fonseca, and Baris Kasikci. *USENIX ATC*, Boston, USA, July 2018.

[12] Foreshadow-NG: Breaking the Virtual Memory Abstraction with Transient Out-of-Order Execution. Ofir Weisse, Jo Van Bulck, Marina Minkin, Daniel Genkin, Baris Kasikci, Frank Piessens, Mark Silberstein, Raoul Strackx, Thomas F. Wenisch, and Yuval Yarom. *Technical report*, 2018.

[13] Lazy Diagnosis of In-Production Concurrency Bugs. Baris Kasikci, Weidong Cui, Xinyang Ge, and Ben Niu. *Symp. on Operating Systems Principles (SOSP)*, Shanghai, China, October 2017.

[14] Failure Sketching: A Technique for Automated Root Cause Diagnosis of In-Production Failures. Baris Kasikci, Benjamin Schubert, Cristiano Pereira, Gilles Pokam, and George Candea. *Symp. on Operating Systems Principles (SOSP)*, Monterey, CA, October 2015.

[15] Failure Sketches: A Better Way to Debug. Baris Kasikci, Benjamin Schubert, Cristiano Pereira, Gilles Pokam, Madanlal Musuvathi, and George Candea. *Workshop on Hot Topics in Operating Systems*, Kartause Ittingen, Switzerland, May 2015.

[16] Automated Classification of Data Races Under Both Strong and Weak Memory Models. Baris Kasikci, Cristian Zamfir, and George Candea. *ACM Transactions on Programming Languages and Systems (TOPLAS)*, May 2015.

[17] Efficient Tracing of Cold Code Via Bias-Free Sampling. Baris Kasikci, Thomas Ball, George Candea, John Erickson, and Madanlal Musuvathi. *USENIX ATC*, Philadelphia, PA, June 2014.

[18] Lockout: Efficient Testing for Deadlock Bugs. Ali Kheradmand, Baris Kasikci, and George Candea. *5th Workshop on Determinism and Correctness in Parallel Programming (WoDet)*, Salt Lake City, UT, March 2014.

[19] RaceMob: Crowdsourced Data Race Detection. Baris Kasikci, Cristian Zamfir, and George Candea. *Symp. on Operating Systems Principles (SOSP)*, Farmington, PA, November 2013.

[20] Automated Debugging for Arbitrarily Long Executions. Cristian Zamfir, Baris Kasikci, Johannes Kinder, Edouard Bugnion, and George Candea. *Workshop on Hot Topics in Operating Systems*, Santa Ana Pueblo, NM, May 2013.

[21] CORD: A Collaborative Framework for Distributed Data Race Detection. Baris Kasikci, Cristian Zamfir, and George Candea. *Workshop on Hot Topics in Dependable Systems (HotDep)*, Hollywood, CA, October 2012.

[22] Data Races vs. Data Race Bugs: Telling the Difference with Portend. Baris Kasikci, Cristian Zamfir, and George Candea. *Intl. Conf. on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, London, UK, March 2012.

[23] Scalable Modeling of Software Product Line Variability. Baris Kasikci and Semih Bilgen. *Workshop on Scalable Modeling Techniques for Software Product Lines (SCALE)*, San Francisco, CA, August 2009.

TALKS

Eliminating Speculative Execution Vulnerabilities
- DARPA (Invited Talk)   Sep 2019

Towards Continuous In-Production Failure Diagnosis
- Ohio State University (Invited Talk)   July 2018
- Greater Chicago Area Systems Research Workshop, University of Chicago (Invited Talk)   May 2018
- Purdue University (Invited Talk)   May 2018

Hardware-Software Co-Design for Debugging and Performance Anlysis
- Workshop on Resilient Systems, TU Dresden (Keynote)   Apr. 2017

Symbolic Execution: A Gentle Introduction
- Cyber In Bretagne Summer School (Invited Talk)   Jul. 2016

Stamping Out Concurrency Bugs
- Royal Holloway, University of London, Seminar   Apr. 2016
- Georgia Institute of Technology, Seminar   Apr. 2016
- Carnegie Mellon University, Seminar   Apr. 2016
- University of Southern California, Seminar   Mar. 2016
- University of Rochester, Seminar   Mar. 2016
- Microsoft Research Redmond, Seminar   Mar. 2016
- Microsoft Research Cambridge, Seminar   Mar. 2016
- MPI Software Systems, Seminar   Mar. 2016
- University College London, Seminar   Mar. 2016
- Rice University, Seminar   Feb. 2016
- University of Toronto, Seminar   Feb. 2016
- University of Michigan, Seminar   Feb. 2016
- Boston University, Seminar   Feb. 2016
- Georgia Institute of Technology, Seminar   Feb. 2016
- VMWare Research, Seminar   Feb. 2016
- University of British Columbia, Seminar   Feb. 2016
- Simon Fraser University, Seminar   Jan. 2016

Automated Root Cause Diagnosis of In-Production Failures
- Symposium on Operating System Principles (SOSP)   Oct. 2015
- Intel Corp.   Sep. 2015
- Google   Sep. 2015
- VMware Inc.   Sep. 2015

Failure Sketches: A Better Way to Debug

- EcoCloud Annual Event   Jun. 2015
- Hot Topics in Operating Systems (HotOS)   May 2015

Efficient Tracing of Cold Code via Bias-Free Sampling
- USENIX Annual Technical Conference (USENIX ATC)   Jun. 2014

Lockout: Efficient Testing for Deadlock Bugs
- Workshop on Determinism and Correctness in Parallel Programming (WoDet)   Mar. 2014

RaceMob: Crowdsourced Data Race Detection.
- Symposium on Operating System Principles (SOSP)   Oct. 2013
- EPFL Systems Seminar   Oct. 2013

CoRD: A Collaborative Framework for Distributed Data Race Detection
- Workshop on Hot Topics in System Dependability (HotDep)   Oct. 2012

Data Races vs. Data Race Bugs: Telling the Difference with Portend
- International Conference on Architectural Support for Programming Languages and
  Operating Systems (ASPLOS)   Mar. 2012

How to Build Reliable Software?
- Seminar talk to the incoming undergraduate students at EPFL   Sep. 2011

PROFESSIONAL SERVICE

PC Chair

EuroSys Doctoral Workshop (Euro'DW)	2021
International Conference on Virtual Execution Environments (VEE)	2020
Workshop on System Software for Trusted Execution (SysTEX) (co-located with CCS'18)	2018
Symposium on Cloud Computing (SoCC) Poster Session	2018

PC Member

Symp. on Operating System Design and Implementation (OSDI)	2021, 2020
Symp. on Operating Systems Principles (SOSP)	2019
Intl Conf. on Architectural Support for Programming Languages and Operating Systems (ASPLOS)	2021
EuroSys	2019, 2021
Intl. Conf. on Virtual Execution Environments (VEE)	2019
Intl. Conf. on Distributed Computing Systems (ICDCS)	2019, 2017
EuroSys Roger Needham PhD Award Committee	2019
EuroSys Doctoral Workshop (EuroDW)	2018
Symp. on Cloud Computing (SoCC)	2018
World Wide Web Conference (WWW)	2017
Intl. Symp. on Software Testing and Analysis (ISSTA), Artifact Evaluation Committee	2014

Journal Reviewer

Transactions on Architecture and Code Optimization	2018
Transactions on Software Engineering	2015
Transactions on Software Engineering and Methodology	2015

Extended Review Committee

Intl. Conf. on Architectural Support for Programming Languages and Operating Systems (ASPLOS)	2018

Shadow PC Member

EuroSys Conference on Computer Systems (EuroSys)	2013, 2015

External Reviewer

Symp. on Operating Systems Principles (SOSP)	2011. 2013
EuroSys Conf. on Computer Systems (EuroSys)	2011, 2012
USENIX Annual Technical Conf. (USENIX ATC)	2011
Intl. Conf. on Compiler Construction (CC)	2017
Workshop on Hot Topics in Operating Systems (HotOS)	2011, 2013
Conf. on Innovative Data Systems Research (CIDR)	2013
Intl. Conf. on Dependable Systems and Networks (DSN)	2011, 2013
Symposium on Cloud Computing (SOCC)	2012
Intl. SPIN Workshop on Model Checking of Software (SPIN)	2011

Committee Member

EPFL Doctoral School of Computer and Communication Sciences Audit Committee	2015

Teaching

Introduction to Operating Systems (EECS 482) (undergrad level, University of Michigan) 2018, 2019

Advanced Operating Systems (EECS 582) (grad level, University of Michigan)   2017, 2019, 2020

Research Mentoring

PhD

Tanvir Ahmed Khan	Jan 2018–
Kevin Loughlin	Sep 2018–
Andrew Loveless	Sep 2018–
Jiacheng Ma	Sep 2018–
Ian Neal	Sep 2018–
Ofir Weisse	Sep 2017–May 2020
Gefei Zuo	Sep 2018–
Marina Minkin	Sep 2020 –

Master's

Nathan Brown	Sep 2019–

Undergraduate

Yineng Yan	May 2020–
Dexin Zhang	May 2020–

Alumni

Morgan Borjigin-Wang	BSc → Michigan MSc, 2020
Zhiqi Chen	BSc → CMU MSc, 2020
Yongwei Yuan	BSc → Purdue PhD, 2020
Ruiyang Zhu	BSc → Michigan PhD, 2020
Elisa Tsai	BSc → Michigan PhD, 2020
Ben Reeves	MSc → Qumulo, 2020
Ben Stoler	MSc → Johns Hopkins, 2020
Ofir Weisse	PhD → Google, 2020
Upamanyu Sharma	BSc → MIT PhD, 2020
Yimeng Zhou	BSc → Google, 2020
Xiaohe Cheng	BSc → Google, 2019

John Wu MSc → Apple, 2019
Liran Xiao BSc → UCLA MSc, 2019
Yifan Dai BSc → University of Wisconsin PhD, 2019
Yifan Zhao BSc → UIUC PhD, 2019

Languages

English: fluent
French: fluent
Turkish: native
German: beginner

References

Available upon request