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 developers build more reliable, secure, and efficient software. 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, and program analysis.

Education

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

Ph.D. 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

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
Middle East Technical University, Dean's High Honor List	2006
Middle East Technical University, Award for Best Team Performance, Undergraduate Final Project	2006
Turkish Customs Association, Scholarship	2002–2006

Employment

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] 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.

[2] 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.

[3] 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 (HotOS)*, Kartause Ittingen, Switzerland, May 2015.

[4] 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.

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

[6] 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.

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

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

[9] 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.

[10] 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.

[11] 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

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

Reviewer

Transactions on Software Engineering	2015
Transactions on Software Engineering and Methodology	2015

PC Member

World Wide Web Conference (WWW)	2017
International Symposium on Software Testing and Analysis, Artifact Evaluation Committee	2014

Extended Review Committee

Intl. Conf. on Architectural Support for Programming Languages and Operating Systems	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

Advanced Topics in Operating Systems (EECS 582) (grad level, University of Michigan) — 2017

Research Mentoring

Ofir Weisse (Ph.D.) Sep. 2017–present

- Ofir and I are working on making system security more useful and usable. We primarily focus on techniques to effectively and efficiently migrate legacy code into cloud environments, while improving security properties using a combination of system support and new hardware technologies.

Lisa Zhou (1st year Master's) Sep. 2015–Feb. 2016

- Lisa and I worked on using hardware support for improving the security of software systems. In that regard, Lisa and Benjamin (see below) built a framework for reproducing security bugs in large applications (e.g., Chrome).

Benjamin Schubert (3rd year undergraduate) Feb. 2015–Dec. 2015

- Benjamin and I worked on a framework that enables reliably reproducing failures in systems software like Apache and MySQL. We used this framework to evaluate my **Gist** work on root cause diagnosis. We extended this framework to encompass security vulnerabilities.

Ali Kheradmand (3rd year undergraduate) Jul. 2013–Sep.2013

- Ali and I worked on the **Lockout** project and developed a technique to systematically perturb program executions (without modifying program semantics) to increase the probability of deadlock manifestation. Ali is currently pursuing his Ph.D. at UIUC.

Radu Coman (Master's thesis) Jan. 2012–Sep. 2012

- Radu and I surveyed common concurrency bug patterns in open source software. After we identified data races as a common bug pattern among the 100 bugs we looked at in Google Code, we built a static data race detector, which I used in my **RaceMob** project. Radu is currently a senior software engineer at Ixia.

Languages

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

References

Available upon request