

BARIS KASIKCI

Researcher
Microsoft Research

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RESEARCH INTERESTS

My research is centered around developing techniques, tools and environments that help build more reliable and secure software. I am interested in finding solutions that allow programmers to better reason about their code, and that efficiently detect bugs, classify them, and diagnose their root cause. I especially focus on bugs that manifest in production, because they are hard and time consuming. I am also interested in efficient runtime instrumentation, hardware and runtime support for enhancing system security, and program analysis under various memory models.

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

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

RESEARCH AND WORK EXPERIENCE

Microsoft Research

Cambridge, United Kingdom

Researcher

Aug. 2016–present

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

Research Intern

Efficient runtime execution sampling technique and low overhead coverage measurement

Redmond, WA, USA

Jun. 2013–Sep. 2013

- 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

Senior Software Engineer

Embedded home and industrial automation software

Istanbul, Turkey

Mar. 2008–May 2010

- 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

Software Engineer

Embedded motor control and functional testing infrastructure

Ankara, Turkey

May 2006–Mar. 2008

- 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

Embedded software development

Jun. 2005–Jul. 2005

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

PEER-REVIEWED PUBLICATIONS

- [1] 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.
- [2] 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)*, Kartaue Ittingen, Switzerland, May 2015.
- [3] 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.
- [4] 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.
- [5] 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.
- [6] RaceMob: Crowdsourced Data Race Detection. Baris Kasikci, Cristian Zamfir, and George Candea. *Symp. on Operating Systems Principles (SOSP)*, Farmington, PA, November 2013.
- [7] 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.

- [8] 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.
- [9] 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.
- [10] 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

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

- International Symposium on Software Testing and Analysis, Artifact Evaluation Committee 2014

Shadow PC Member

- EuroSys Conference on Computer Systems (EuroSys) 2013, 2015

External Reviewer

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

Committee Member

- EPFL Doctoral School of Computer and Communication Sciences Audit Committee 2015

TEACHING ASSISTANTSHIP

- Principles of Computer Systems** (graduate level, EPFL) 2014

- Software Engineering** (3rd year undergraduate level, EPFL) 2011, 2012

In 2012, I was the head teaching assistant

- Programming II** (1st year undergraduate level, EPFL) 2010

RESEARCH MENTORING

Lisa Zhou (1st year Master's)

Sep. 2015–present

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

Benjamin Schubert (3rd year undergraduate)

Feb. 2015–present

- Benjamin and I have been working 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 are now extending 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