

# BARIS KASIKCI

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## RESEARCH INTERESTS

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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

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### Ecole Polytechnique Fédérale de Lausanne (EPFL)

*Lausanne, Switzerland*

*Ph.D. in Computer Science*

Sep. 2010–present

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

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Intel 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

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### Ecole Polytechnique Fédérale de Lausanne (EPFL)

*Lausanne, Switzerland*

Research Assistant

Sep. 2010–present

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 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 which allows efficient sampling of rarely-executed code (where bugs often lurk), without over-sampling frequently-executed code, by conceiving a new sampling algorithm and implementing it using 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. This tool reduces by an order of magnitude the number of statements to examine while debugging in our experiments. 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

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

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

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- [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)*, Kartause 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

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### **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

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### **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

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<b>Principles of Computer Systems</b> (graduate level, EPFL)	2014
<b>Software Engineering</b> (3 <sup>rd</sup> year undergraduate level, EPFL) In 2012, I was the head teaching assistant	2011, 2012
<b>Programming II</b> (1 <sup>st</sup> year undergraduate level, EPFL)	2010

## RESEARCH MENTORING

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Lisa Zhou (1<sup>st</sup> year master) 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 (3<sup>rd</sup> 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 (3<sup>rd</sup> 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

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

## REFERENCES

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Available upon request