# Erdal Mutlu

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**Research Interests**

I am interested in Software Engineering and Reliability, mainly static and dynamic analysis techniques for verifying and detecting anomalies in programs using asynchronous constructs as a way of concurrency. My dissertation focused on developing race detection techniques for asynchronous programming models specifically asynchronous JavaScript applications and hybrid applications using dataflow constructs along with shared memory programming model.

**Education**

**Koç University**, İstanbul, TURKEY
*Ph.D.*, Computer Science and Engineering, September 2016
**Dissertation topic:** Race Detection Techniques for Applications using Asynchronous Programming Models
**Advisor:** Serdar Taşıran
**Sabancı University**, İstanbul, TURKEY
*Master of Science*, Computer Science and Engineering, February 2011
*Bachelor of Science*, Computer Science and Engineering, June 2008

**Work Experience**

**Visiting Researcher**　　　　　　　　　　Barcelona Supercomputing Center
Barcelona, SPAIN　　　　　　　　　　　　　　　　Sept 2013–Dec 2013
Developed behavior exploration techniques for a hybrid programming model "Atomic DataFlow(ADF)" which combines "Transactional Memory" concurrent programming models with data-flow constructs.

**Ph.D. Intern**　　　　　　　　　　　　　　　　ST-Microelectronics
Milan, ITALY　　　　　　　　　　　　　　　　Aug 2012–Dec 2012
Worked on optimizing and parallelizing Viola-Jones face detection algorithm for a new prototype system-on-chip, SecSoC, which targets to achieve video surveillance application on energy optimized microprocessors.

**Researcher - Software Engineer**　　　　The Scientific and Technological
　　　　　　　　　　　　　　　　　　　　　Research Council of Turkey
Kocaeli, TURKEY　　　　　　　　　　　　　　May 2010–Sept 2011
Worked in IYON (Forensic Image Enhancement and Restoration Software) project on developing plug-in manager and custom filter generator modules.

**GSM/UMTS Global Product**　　　　　　　　　　　　Nortel-Netas
**Support Engineer**
İstanbul, TURKEY　　　　　　　　　　　　　　Feb 2008–Aug 2008
Worked as part time product support engineer for Nortel's GSM/UMTS products on investigating and solving reported issues on the software stack.

**Research Experience**

**Race Detection for Hybrid Applications**　　　　**Fall 2015–Present**
We developed race detection techniques for applications using hybrid programming models combining data-flow constructs with shared memory programming model. We implemented our tool for Atomic Dataflow programming model that is developed in Barcelona Supercomputing Center.

**Race Detection for JavaScript Web Applications**   Fall 2014–Present
We introduced a race detection technique for JavaScript web applications using asynchronous constructs(user interaction, server requests). We instrumented Firefox web browser for collecting traces and applied our race detection technique on real world web applications.

**Behavior Exploration Techniques**
**for Distributed Data Types**                    Spring 2014
We investigated different data types used in distributed systems (Conflict-free Replicated Data Types (CRDTs), Cloud Types etc.) and formalized techniques for exploring possible behaviors of interactions between client and server.

**Randomized Schedule Exploration**
**for Hybrid Applications**                       Fall 2013
We presented a dynamic verification technique for a class of concurrent programming models that combine dataflow and shared memory programming. We identified and illustrated a novel category of bugs in these hybrid concurrency programming models and provide a technique for randomized exploration of program behaviors in this setting.

**Face Detection Optimization for System-on-Chip**       Fall 2012
We developed an optimized scheme for calculating the integral image and applying the face detection which optimizes the memory usage so that it can be used in SecSoC, which targets to achieve video surveillance application on energy optimized microprocessors.

**High Level Rule Modeling Language**
**for Airline Crew Pairing**                      Fall 2009–2010
We introduced a high-level domain specific language and implement a compiler for generating rule based feasibility controls and cost calculations in crew pairing systems. We generate run time methods for the crew pairing systems where end-users are able to change the feasibility rules without interacting with the crew pairing engine itself.

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| **Computer Skills** | **Languages**: Advanced knowledge of C/C++/C#, Java; Basic knowledge of OCaml, Python.<br>**Web Development**: HTML, JavaScript, React.JS, Node.JS.<br>**Applications**: Eclipse, Visual Studio, Git, GNU Flex, GNU Bison. |

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| **Honors and Awards** | Microsoft Research invitation to Summer School in Cambridge, UK | **2015** |
| | EuroTM Short Term Scientific Mission (STSM) Scholarship | **2013** |
| | EuroTM travel award to attend DMTM | **2013** |
| | EuroTM financial support award to attend HTDC Winter School | **2013** |
| | HiPEAC Industrial Ph.D. Internship Scholarship | **2012** |
| | Merit Scholarship for 4 years of education awarded for ranking 2842th in 2004 Nationwide Student Selection Examination | **2004** |

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|---|---|---|
| **References** | *Serdar Taşıran*, Koç University - Amazon AWS | stasiran@ku.edu.tr |
| | *Ben Livshits*, Microsoft Research | livshits@microsoft.com |
| | *Hüsnü Yenigün*, Sabancı University | yenigun@sabanciuniv.edu |

**Publications**

**FSE'15** – Erdal Mutlu, Serdar Tasiran, and Benjamin Livshits. Detecting JavaScript races that matter. In *Proceedings of the 2015 10th Joint Meeting on Foundations of Software Engineering*, ESEC/FSE 2015, pages 381–392, New York, NY, USA, 2015. ACM

**RV'14** – Erdal Mutlu, Vladimir Gajinov, Adrián Cristal, Serdar Tasiran, and Osman S. Unsal. *Runtime Verification: 5th International Conference, RV 2014, Toronto, ON, Canada, September 22-25, 2014. Proceedings*, chapter Dynamic Verification for Hybrid Concurrent Programming Models, pages 156–161. Springer International Publishing, Cham, 2014

**DYLA@PLDI'14** – Erdal Mutlu, Serdar Tasiran, and Benjamin Livshits. I know it when I see it: Observable races in javascript applications. In *Proceedings of the Workshop on Dynamic Languages and Applications*, Dyla'14, pages 1:1–1:7, New York, NY, USA, 2014. ACM

**PaPEC'14** – Burcu Kulahcioglu Ozkan, Erdal Mutlu, and Serdar Tasiran. Towards verifying eventually consistent applications. In *Proceedings of the First Workshop on Principles and Practice of Eventual Consistency*, PaPEC '14, pages 11:1–11:4, New York, NY, USA, 2014. ACM

**SCLIT'11** – Erdal Mutlu, Ilker Birbil, Kerem Bulbul, and Husnu Yenigun. High level rule modeling language for airline crew pairing. In *International Conference on Numerical Analysis and Applied Mathematics*, pages 798–801, 2011