# Marko Dimjašević, PhD


Contact Information

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Summary

I am a computer scientist with a PhD in computer science from the University of Utah, USA. I have seven years of experience in software verification, automatic testing and security in academia, government and the IT sector, with an international track record of delivering complex projects and research results.

- 9-year experience in communicating and managing work within dislocated teams
- Strong coding abilities (numerous prizes won at national competitions in algorithm problem solving)
- Strong fundamentals in computer science (programming languages and paradigms, software design, advanced algorithms and data structures)
- Strong fundamentals in software verification, automatic testing and security (PhD dissertation)
- Developed an automatic verification framework for NASA's aircraft separation assurance system
- Interested in proving software correctness via dependent types and static type systems
- Interested in typed pure functional programming (Haskell, Agda, Idris) for software verification
- Contributor to Idris, a dependently typed pure functional programming language
- Experience with: Haskell, Agda, Idris, C
- Experience in modeling and implementing domains as composable architecture via eDSLs
- Peer-reviewed research in machine learning for malware detection


## Work Experience

**Input Output**, Hong Kong, Hong Kong
*Formal Methods Engineer* — *July 2018 – present*

**Oradian**, Zagreb, Croatia
*Scala Developer* — Property-based testing and design of FP APIs — *October 2017 – June 2018*

**School of Computing, University of Utah**, Salt Lake City, Utah, USA
*Teaching Assistant and Research Assistant* — *August 2012 – May 2017*

**Robust Software Engineering Group, NASA Ames Research Center**, Moffett Field, California, USA
*Research Intern* — *September 2014 – December 2014*

**Grammar School "Gimnazija Ivana Zakmardija Dijankovečkoga"**, Križevci, Croatia
*Math Teacher and Informatics Teacher* — *January 2012 – May 2012*

**Elementary School "Osnovna škola Ljudevita Modeca"**, Križevci, Croatia
*Math Teacher* — *January 2011 – June 2011*

## Education

**School of Computing, University of Utah, Salt Lake City, Utah, USA**
*PhD in Computer Science* — *August 2012 – June 2018*

- Dissertation topic: Enhancing Automatic Software Testing for Broader Applicability
- Supervisor: Zvonimir Rakamarić

**Faculty of Electrical Engineering and Computing, University of Zagreb, Croatia**
*Dipl. ing. in Computing* — *October 2004 – October 2010*

- Thesis Topic: Adding MOBIKE Support into the IKEv2 Implementation
- Supervisor: Leonardo Jelenković

## Software Developed

**Cardano Chain**: Cardano Blockchain Layer, **JDoop**: Automatic Test Case Generation for Java, **Clover**: Dynamic Symbolic Execution of Un-closed Software, **artifact-eval**: Reproducible Research Evaluation, **maline**: Malware Detection for Android, **The Runtime Verifier for AutoResolver**. Available at:

- Github – https://github.com/mdimjasevic
- Gitlab – https://gitlab.com/mdimjasevic

## Computer Skills

**Languages**

Haskell, Agda, Idris, C, C++, Bash, HTML, LaTeX, R

**Software Technologies**

Git, Cabal, Stack, QuickCheck, Xen, cgroups, QEMU, libvirt, Vagrant, Docker

**Programming Paradigms**

Functional programming, imperative programming, object-oriented programming, aspect-oriented programming, declarative programming

**Other**

Software and data reproducibility, advanced algorithms in optimization, graph theory, and heuristics

**Operating systems**

GNU/Linux, Android

## Honors and Awards

The International Alumni Club Scholarship, The University of Utah Alumni Association, 2016

Ministry of Science, Education and Sports' National Scholarship for Talented Students, 2006 – 2009

3rd place in the Croatian National Informatics Student Team Competition, October 2005

2nd place in the Croatian National Programming League 2003/04, November 2004

Acknowledgment for Achieved Results in Advancement of Technical Culture, Technical Culture Association of Koprivnica – Križevci County, June 2004

6th place in the Croatian National Informatics Team election, June 2003

6th place in the IX. Croatian Olympiad in Informatics, May 2003

4th place in the National Competition in Informatics, Croatia, May 2003

First price "summa cum Taude" won with the Tamburica Orchestra of the Albert Štriga Music School at the 47th European Music Festival, Neerpelt, Belgium, 1999

Three gold plaquettes at the Croatian Tamburica Music Festival, won with the Tamburica Orchestra of the Albert Štriga Music School, 1998 – 2001

## Peer-Reviewed Publications

M. Dimjašević, F. Howar, K. Luckow, and Z. Rakamarić, "Study of Integrating Random and Symbolic Testing for Object-oriented Software", *The International Conference on integrated Formal Methods*, Maynooth, Ireland, 2018.

K. Luckow, M. Dimjašević, D. Giannakopoulou, F. Howar, M. Isberner, T. Kahsai, Z. Rakamarić, and V. Raman, "JDart: A Dynamic Symbolic Analysis Framework", *The International Conference on Tools and Algorithms for the Construction and Analysis of Systems*, Eindhoven, The Netherlands, 2016.

M. Dimjašević, S. Atzeni, I. Ugrina, and Z. Rakamarić, "Evaluation of Android Malware Detection Based on System Calls", *The International Workshop on Security and Privacy Analytics*, New Orleans, Louisiana, USA, 2016.

M. Dimjašević, D. Giannakopoulou, "Test-Case Generation for Runtime Analysis and Vice Versa: Verification of Aircraft Separation Assurance", *The International Symposium on Software Testing and Analysis*, Baltimore, Maryland, USA, 2015.

M. Dimjašević, D. Giannakopoulou, F. Howar, M. Isberner, Z. Rakamarić, and V. Raman, "The Dart, the Psyco, and the Doop", *Java PathFinder Workshop*, Salt Lake City, Utah, USA, 2014.

M. Dimjašević, Z. Rakamarić, "JPF-Doop: Combining Concolic and Random Testing for Java", Extended abstract, *Java PathFinder Workshop*, Palo Alto, California, USA, 2013.

M. Dimjašević, "Automatic Testing of Software Libraries", Presentation-only paper, Student Forum at the *13th conference on Formal Methods in Computer Aided Design*, Portland, Oregon,

USA, 2013.

**Technical Reports**

M. Dimjašević, S. Atzeni, I. Ugrina, and Z. Rakamarić, "Android Malware Detection Based on System Calls", University of Utah, School of Computing, UUCS-15-003, 2015.

**Software and Data**

**Cardano Chain — Cardano Blockchain Layer**

*Formal specification and prototype implementation* *September 2018 – present*

Cardano Chain is a re-implementation of the Cardano blockchain layer, replacing the Byron release. I have been working on formally specifying it and implementing a prototype based on the specification.

https://github.com/input-output-hk/cardano-chain

**Idris — Pure functional programming language with dependent types**

*Language contributor* *September 2017 – present*

Idris is a general purpose pure functional programming language with dependent types, implemented in Haskell. I have been contributing to the development of Idris.

https://idris-lang.org/

**JDoop — Automatic Test Case Generation for Java**

*Mentor: Zvonimir Rakamarić* *January 2013 – May 2017*

JDoop is a tool for automatic test case generation for Java libraries and programs. It is based on a combination of random testing and dynamic symbolic execution.

https://github.com/psycopaths/jdoop
https://github.com/soarlab/jdoop-wrapper

**Clover — Dynamic Symbolic Execution of Un-closed Software**

*Mentor: Zvonimir Rakamarić* *February 2016 – October 2016*

In the Clover project I work on a challenging problem of analyzing un-closed real-world software with KLEE, a symbolic execution tool. KLEE is a symbolic execution tool for C programs. We target programs and libraries from the Debian operating system.

https://github.com/soarlab/clover

**artifact-eval — Reproducible Research Evaluation**

*Conferences: CAV 2015, PLDI 2016* *February 2015 – September 2016*

As as a member of artifact evaluation committees for two computer science conferences, I wrote a virtualization environment that facilitates evaluation of research software artifacts.

https://gitlab.com/mdimjasevic/artifact-eval

**Google Summer of Code 2016 — Support for KLEE in Debile**

*Mentors: Sylvestre Ledru, Clément Schreiner, Zvonimir Rakamarić* *May 2016 – August 2016*

During the summer of 2016 I worked with the Debian Project on supporting KLEE in Debile, a Debian package analysis infrastructure. During the project I made contributions to a number of software projects: Debile, sbuild, WLLVM, and KLEE. With a prototype infrastructure I found a bug in Debian.

https://wiki.debian.org/SummerOfCode2016/StudentApplications/MarkoDimjasevic

**maline — Malware Detection for Android**

*Mentor: Zvonimir Rakamarić* *October 2013 – December 2015*

maline is a malware detection tool for Android applications based on dynamic analysis and machine learning. Google's Android Security Team showed interest in the tool.

https://github.com/soarlab/maline

**maline — Malware Detection for Android: Dataset**

*Mentor: Zvonimir Rakamarić* *October 2013 – December 2015*

In order to facilitate reproducible research, we made our extensive dataset of over 300 GB from the malware detection project freely available to the public and other scientists.

https://zenodo.org/record/154737

**Runtime Verification of AutoResolver**

*Mentor: Dimitra Giannakopoulou* *September 2014 – December 2014*

During my internship at the NASA Ames Research Center, I worked on specifying and verifying a future air traffic control system called AutoResolver. I specified properties, developed a novel way to generate test cases for runtime verification of the complex software system, developed a framework, and implemented the properties. We published this work at ISSTA 2015.

**Google Summer of Code 2013 — Combining JDart and Randoop**

*Mentor: Zvonimir Rakamarić* *June 2013 – September 2013*

During the Google Summer of Code 2013 program, I developed an automatic software testing tool called JPF-Doop. The tool builds on Java PathFinder's jDART, a concolic execution engine, and Randoop, a feedback-directed random testing engine.

https://github.com/psycopaths/jdoop

**Google Summer of Code 2012 — Model Checking Android Services**

*Mentors: Zvonimir Rakamarić, Eric Mercer* *April 2012 – August 2012*

This project had a goal of extending Java PathFinder by adding support for model checking Android services.

https://gitlab.com/mdimjasevic/jpf-android-services

## Other Education

"School and Workshop on Univalent Mathematics", University of Birmingham, United Kingdom, 2019.

"Functional Correctness Training", internal Input Output Hong Kong workshop, Regensburg, Germany, 2018.

"Software Systems Safety", Summer School Marktoberdorf, Marktoberdorf, Germany, 2013.

"Third Summer School on Formal Techniques", Atherton, California, USA, 2013.

"Albert Štriga Music School", Elementary music school, Križevci, Croatia, 1995 – 2000.

## Talks

"¬ Everything is for ∀ (But there ∃ an Introduction to Propositions as Types)", March 2019, Lambda Zagreb Meetup, Zagreb, Croatia

"Introduction to Dependent Types", February 2019, a workshop given at Lambda Days 2019, Kraków, Poland

"Function Totality: Abstraction Tool in Programming", February 2019, Lambda Days 2019, Kraków, Poland

"Terminating and Productive Functions", February 2019, Lambda Zagreb Meetup, Zagreb, Croatia

"Function Totality: Abstraction Tool in Programming", December 2018, IEEE Croatia Section, University of Zagreb, Zagreb, Croatia

"The Role of Types in Programming", February 2018, Lambda Zagreb Meetup, Zagreb, Croatia

"Precise Types in Idris", August 2017, Lambda Zagreb Meetup, Zagreb, Croatia

"Evaluation of Android Malware Detection Based on System Calls", March 2016, The 2nd International Workshop on Security and Privacy Analytics, New Orleans, Louisiana, USA

"Test-Case Generation for Runtime Analysis and Vice Versa: Verification of Aircraft Separation Assurance", July 2015, The International Symposium on Software Testing and Analysis, Baltimore, Maryland, USA

"Runtime Verification of AutoResolver", January 2015, NASA Ames Research Center, Moffett Field, California, USA

"JPF-Doop: Combining Concolic and Random Testing for Java", November 2013, The Java Pathfinder Workshop 2013, Palo Alto, California, USA

"Automated Testing of Software Libraries", October 2013, The 13th Conference on Formal Methods in Computer Aided Design, Portland, Oregon, USA

"Copy–wrong — Copyleft as a Cultural Reversing Mechanism", March 2011, the Culture Shock Festival, Križevci, Croatia

"The Wealth of Networks — How Social Production Transforms Markets and Freedom", March 2010, the Culture Shock Festival, Križevci, Croatia

"The Impact of Copyright on the Development of Culture", March 2010, the Culture Shock Festival, Križevci, Croatia

"GNU/Linux — How Did the Penguin Fly in Through the Window", March 2009, the Culture Shock Festival, Križevci, Croatia

## Professional Activities

**International Conference for High Performance Computing, Networking, Storage and Analysis**, Salt Lake City, Utah, USA

*Volunteer at SC12* *November 2012*

**Free Software Croatia**, Križevci, Croatia

*Founder and President* *June 2011 – June 2012*

http://slobodansoftver.hr

**Board of European Students of Technology (BEST) – Zagreb**, Zagreb, Croatia

*Project Manager and President* *2006 – 2009*

http://www.best.hr

## Professional Service

International Workshop on Malware Analysis — Program Committee member *2016*

Conference on Programming Language Design and Implementation — Artifact Evaluation Committee member *2016*

Conference on Computer Aided Verification — Artifact Evaluation Committee member *2015*

Executive Committee member, Competition in Informatics, Križevci, Croatia *March 2006*

High school students' mentor, Competition in Informatics, Križevci, Croatia *2004 – 2006*