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## ALEKSANDAR PROKOPEC

### Personal Information

Birth date: 6. August 1985.  
Slovenian, married

### Research Focus

My expertise is in the area of programming languages, compilers, concurrency and distributed computing. At Google, I designed Big Data systems for distributed real-time analytics of smart device usage, which helped improve Google Maps products for millions of users. My current research goal is to design and implement a next-generation programming runtime for distributed computing. This runtime will be specifically tailored towards computing under the Internet of Things paradigm, and it will overcome the difficulties of constructing programs for a large number of unreliable devices in an open network.

In the past, I published 17 research papers at international peer-reviewed conferences such as PPOPP, ECOOP, Onward! and Euro-Par. I proposed and implemented novel persistent, concurrent, and incremental data structures that support parallel programming paradigms, and I applied these techniques to improve the Scala programming language. As a principal researcher at Oracle Labs, I work on a novel multi-language virtual machine called GraalVM. I improved the Graal compiler on collection and data-processing workloads, and I have a pending patent with Oracle about inlining during JIT compilation.

### Education

École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland	2009 – 2014
Ph.D. in Computer Science	
Advisor: Martin Odersky	
Committee: Douglas Lea, Erik Meijer, Viktor Kuncak, Ola Svensson	
Faculty of Electrical Engineering and Computing, Zagreb, Croatia	2004 – 2009
M.A. in Computer Science	
Advisor: dr. Marin Golub	
Fifth Mathematical Gymnasium, Zagreb, Croatia	2001 – 2004

### Professional Experience

Principal Researcher, Oracle Labs, Zürich, Switzerland	2016 –
<ul style="list-style-type: none"><li>Working on the Graal language infrastructure project, the next generation runtime for modern programming languages used in the Oracle Cloud.</li></ul>	
Software Engineer, Google Inc., Zürich, Switzerland	2014 – 2016
Product area: Geo	
<ul style="list-style-type: none"><li>Designed a distributed real-time analytics system for Google Maps products.</li><li>Working on a massively distributed system for Geo product usage analysis.</li></ul>	

- Led the implementation of a real-time distributed pipeline for spam detection. Awarded a Google Spot Bonus for this effort.
- Main organizer of the team-internal monthly Hackathon events. Awarded a Google Peer Bonus for this effort.

Doctoral Assistant, Scala Team, EPFL, Switzerland

2009 – 2014

- Designed and implemented Scala Coroutines – language extension for first-class coroutines, used to facilitate asynchronous programming.
- Designed and implemented Parallel Collections – support for data-parallel programming (part of the Scala programming language since 2011).
- Core part of the Futures and Promises working group, aimed to design the support for asynchronous programming (part of Scala programming language since 2012).
- Maintained and improved the Scala compiler and the Scala standard library, member of the Scala software transactional memory expert group.
- Engaged in various open-source activities: ScalaDays conference organization, Scala Workshop program committee member, Scala Improvement Proposal process, on-line education (MOOCs) and documentation, etc.

## Patents

A Generic Priority-Based Inlining Algorithm  
Aleksandar Prokopec, Thomas Wuerthinger

August 2017

## Honors and Awards

Google Spot Bonus for the Distributed Real-Time Spam Detection Project	2015
Google Peer Bonus for the Team Hackathon Initiative	2015
Nominated for the Patrick Denantes Doctoral Thesis Award	2014
EPFL Outstanding Teaching Assistant Award	2013
LCPC Best Paper Presentation Award	2011
EPFL Computer Science Fellowship	2009 – 2010
University of Zagreb Rector Award for Best Project (VHDLlab)	2008
Faculty of Electrical Engineering and Computing Josip Loncar Award	2007
Faculty of Electrical Engineering and Computing Josip Loncar Award	2006
Croatian Scholarship for Excellent Students	2004-2009
Participation in the International Physics Olympiad (IPhO)	2004
1st Place in the Croatian National Physics Competition (Finals)	2004
Participation in the Croatian National Physics Competition (Finals)	2002
Participation in the Croatian National Physics Competition (Finals)	2001

## Professional Service

Reviewer or program committee member on various scientific conferences and journals.

Journal of Logical and Algebraic Methods in Programming, reviewer	2017
AGERE! 2017, program committee	2017
HLPP 2017, program committee	2017
SPAA 2017, external reviewing	2017
POPL 2017, external reviewing	2017
PLACES 2017, program committee	2017
Parallel Processing Letters 2016, external reviewing	2016
AGERE! 2016, program committee	2016
ICPADS 2016, program committee	2016

	HLPP 2016, program committee	2016
	On Principles of Distributed Systems (OPODIS 2015), external reviewer	2015
	Transactions on Computers 2015, reviewer	2015
	Scala Workshop 2014, program committee	7/2014
	High-Level Parallel Programming and Applications 2014, external reviewer	4/2014
	ECOOP 2013, external reviewer	7/2013
	Scala Workshop 2013, program committee (co-chair)	7/2013
	ScalaDays 2010, external reviewer	6/2010
	ICADIWT 2009, external reviewer	8/2009
Teaching Experience	External Lecturer, Parallelism and Concurrency, at EPFL	2017
	Lecturer and main organizer for the Parallel Programming MOOC at Coursera Developed a massive online open course on Parallel Programming, which attracted over 50,000 students. This course became a part of the five-course Scala Specialization program, which ultimately earned over 1.3 million dollars from student subscriptions.	2016
	External Lecturer, Co-Organizer, Reactive Programming and Parallelism Co-organized, prepared materials and exercises, led teaching staff (~7 people) on the undergraduate course on parallel, distributed, and asynchronous programming at EPFL, ~90 students.	2015
	Lead Organizer, Principles of Reactive Programming Coursera MOOC on reactive programming in Scala, with 2 iterations and >60,000 participants so far.	2013
	<ul style="list-style-type: none"> <li>Coordinated a team of three lecturers during recording and lecture material production.</li> <li>Led graduate student teaching staff (~8 people), directed content production, designed and implemented exercise materials, managed the production of lecture videos, organized community TAs on Coursera.</li> <li>Received the EPFL IC Teaching Award for this effort.</li> </ul>	
	Teaching Assistant, Functional Programming in Scala Required EPFL undergraduate course on functional programming (~160 students).	2010-2013
Collaborations	Johannes Kepler University, Linz (Austria), System Software Group Collaboration on the development of the Graal open-source compiler.	2016 – now
	FORTH Institute of Computer Science (Greece), Computer Architecture and VLSI Systems Laboratory Research collaboration aimed at developing a novel high-performance concurrent data structures for traditional embedded systems.	2015 – now

	Typesafe (USA), Collaborating on maintenance, development, technology and innovation exchange related to the Scala project (~30 Scala developers).	2011 – 2014
	Akka team (Sweden), Member of the working group (~10 people) that developed a unifying asynchronous programming framework for Scala.	2011 – 2012
	Stanford University (USA), Pervasive Parallelism Laboratory Collaborated on the LMS and Delite compiler frameworks and runtimes for parallel embedded domain-specific languages (~10 people). Designed high-performance data structures and collections frontends.	2011 – 2013
Publications	Authored 17 international research publications, 1 patent, 1 doctoral thesis, 1 book, 4 tech reports, and 2 additional publications under submission (list included separately).	
Open Source	Scala Programming Language, Scala team member <ul style="list-style-type: none"> <li>• <a href="#">Scala Coroutines</a>, lead Scala language extension for first-class coroutines, used for easier asynchronous programming.</li> <li>• <a href="#">Reactors Framework for Distributed Programming</a>, lead Programming framework aimed at building asynchronous, composable, distributed systems.</li> <li>• <a href="#">Scala-Blitz – High-Performance Data-Parallelism Framework</a>, lead Scala module for highly efficient data-parallel programming.</li> <li>• <a href="#">ScalaMeter Benchmarking Framework</a>, lead Microbenchmarking and performance regression testing framework for Scala and JVM, adopted in various open source projects.</li> <li>• <a href="#">Scala Futures &amp; Promises (Scala Improvement Proposal 14)</a>, team member Asynchronous programming framework for Scala, used as a basic building block for other concurrency frameworks within the Scala ecosystem (part of standard Scala distribution since 2012).</li> <li>• <a href="#">Parallel Collections Framework</a>, lead Scala standard library module for data-parallel programming (part of the standard Scala distribution in 2011).</li> </ul>	2009 – now
	Java Group at Faculty of Electrical Engineering and Computing, Zagreb, <ul style="list-style-type: none"> <li>• <a href="#">VHDLLab</a>, team member Award-winning online educational VHDL editor for modeling and simulation of digital circuits (used as part of the computer science curriculum at the Faculty of Electrical Engineering and Computing in Zagreb since 2007).</li> </ul>	2006 – 2008

## Supervised Projects<sup>1</sup>

Supervised 14 bachelor and master student projects.

Joël Rossier, MacroGL Scala.JS Backend B.Sc. level	2/2014 – 6/2014
Sven Reber, MacroGL API Extensions B.Sc. level	2/2014 – 6/2014
Gwangbae Choi, ScalaMeter Inline Benchmarking B.Sc. level	2/2014 – 6/2014
Kristof Szabo, ScalaMeter Java API B.Sc. level	2/2014 – 6/2014
Nicolas Stucki, Scala Multiset Collection M.Sc. level	9/2013 – 1/2014
Timo Babst, Data-Parallel Raytracer B.Sc. level	9/2013 – 1/2014
Clément Moutet, Data-Parallel Flocking Algorithm B.Sc. level	9/2013 – 1/2014
Roman Zoller, ScalaMeter D3js Frontend M.Sc. level	2/2013 – 6/2013
Tobias Schlatter, FlowSeqs: Barrier-Free ParSeqs M.Sc. level, co-supervision w/ Philipp Haller & Heather Miller	9/2012 – 1/2013
Roger Vion, Improvements to ScalaMeter B.Sc. level	9/2012 – 1/2013
Tobias Schlatter, Multi-Lane FlowPools M.Sc. level, co-supervision w/ Philipp Haller & Heather Miller	2/2012 – 6/2012
Bruno Studer, A Non-Blocking Concurrent Queue Algorithm B.Sc. level	2/2012 – 6/2012
Ngoc Duy Pham, Scala Benchmarking Suite – Performance Regression Pinpointing M.Sc. level	8/2011 – 1/2012
Pamela Delgado, Scala Invariant Verifier M.Sc. level	8/2011 – 1/2012

## GSoC Projects<sup>2</sup>

Supervised 5 Google Summer of Code projects.

Jess Smith, Implementation of Coroutine-Based Utilities	5/2016 – 9/2016
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<sup>1</sup>EPFL research labs prepare projects for B.Sc./M.Sc. students to complete for credits. These projects are designed and supervised by EPFL doctoral assistants.

<sup>2</sup>These are 3-month paid projects offered to students all over the world, sponsored by Google and supervised by members of various open-source organizations.

Krzysztof Janosz, ScalaMeter -- Binary Compatible Serialization Format and Invocation Measurers	5/2015 – 9/2015
Dmitry Petrashko, Specializing Parallel Collections with Scala Macros	5/2013 – 9/2013
Ivan Oreskovic, Porting Scala Parallel Collections to the Android Platform	5/2012 – 9/2012
Heather Miller, Parallel Collections Extensions	5/2011 – 9/2011

**Selected Talks** Gave over 20 academic and industrial talks, 8 as an invited speaker.

<a href="#">Bridging the Gap Towards High-Level Distributed Computing</a> Developer Conference Talk Ljubljana, Slovenia, November 25, 2016	BeeScala 2016
<a href="#">Pluggable Scheduling for the Reactor Programming Model</a> Academic Conference Talk Amsterdam, Netherlands, October 30, 2016	AGERE! 2016
<a href="#">First-Class Coroutines for the Scala Programming Language</a> Developer Conference Talk Lake District, UK, September 12, 2016	Scala World 2016
<a href="#">Reactors - Road to Composable Distributed Computing</a> Developer Conference Talk Berlin, Germany, June, 2016	ScalaDays 2016
<a href="#">Reactor Model for Composable Distributed Computing</a> Developer Conference Talk Zurich, Switzerland, March 3, 2016	Voxxed Days Zurich 2016
<a href="#">Isolates, Channels and Event Streams for Composable Distributed Programming</a> Academic Conference Talk Pittsburgh, Pennsylvania, USA, October 29, 2015	Onward! 2015
<a href="#">Scala – The Learning Curve</a> Developer Conference Talk Zurich, Switzerland, October 23, 2015	Jazoon 2015
<a href="#">Conc-Tree Data Structure for Functional and Parallel Programming</a> Academic Conference Talk Raleigh, North Carolina, USA, September 10, 2015	LCPC 2015
<a href="#">SnapQueue: Lock-Free Queue with Constant Time Snapshots</a> Academic Conference Talk Portland, Oregon, USA, June 13, 2015	SCALA 2015

<a href="#">ScalaMeter – Performance Regression Testing Framework</a> Academic Meetup Talk ETH, Zürich, Switzerland, September 11, 2014	Oracle VM Meetup 2014
Containers and Aggregates, Mutators and Isolates for Reactive Programming Academic Conference Talk Uppsala, Sweden, July 28, 2014	SCALA 2014
<a href="#">Reactive Collections and 3D Engine Design</a> Industrial Conference Talk (800 attendees) Berlin, Germany, June 24, 2014	ScalaDays 2014
<a href="#">Macro-based Scala Parallel Collections</a> Industrial Conference Talk (350 attendees, invited talk) London, UK, December 2, 2013	Scala eXchange 2013
<a href="#">Work-Stealing Tree Scheduling</a> Academic Conference Talk San Jose, CA, USA, September 26, 2013	LCPC 2013
Scala as a Research Tool ECOOP Tutorial (w/ Heather Miller and Philipp Haller) Montpellier, France, July 1, 2013	ECOOP 2013
<a href="#">Scala Performance Regression Testing</a> Industrial Conference Talk (invited talk) London, UK, November 19, 2012	Scala eXchange 2012
<a href="#">Parallel Concurrent Hash Tries</a> Industrial Conference Talk (400 attendees) London, UK, April 18, 2012	ScalaDays 2012
Concurrent Hash Tries in Scala Academic Meetup Talk (invited talk) Zagreb, Croatia, April 11, 2012	Croatian IEEE Chapter Meetup
<a href="#">Concurrent Tries with Efficient Non-Blocking Snapshots</a> Academic Conference Talk New Orleans, Louisiana, USA, February 29, 2012	PPOPP 2012
<a href="#">Lock-Free Resizeable Concurrent Tries</a> Academic Conference Talk Fort Collins, CO, USA, September 9, 2011	LCPC 2011
<a href="#">Generic Parallel Collection Framework</a> Academic Conference Talk Bordeaux, France, September 2, 2011	Euro-Par 2011

[Parallel Collections](#)

Industrial Conference Talk (280 attendees, invited talk)

London, UK, June 15, 2011

Scala eXchange 2011

[Scala Parallel Collections](#)

Industrial Conference Talk

Palo Alto, CA, USA, June 3, 2011

ScalaDays 2011

[Introduction to Scala](#)

Industrial Talk, Java User Group Grenoble (invited talk)

Grenoble, France, March, 2011

JUG Meetup 2011

[Parallel Collections](#)

Industrial Conference Talk (150 attendees, invited talk)

Lausanne, Switzerland, April 15, 2010

ScalaDays 2010



## References

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