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ALEKSANDAR PROKOPEC

Personal Information

Birth date: 6. August 1985.
Slovenian, married
Swiss Permit B (2014 – 2019)

Summary

I am a computer science researcher with 6 years of academic and industrial experience. I published 10 peer-reviewed research publications, and I am a member of the Scala programming language core team. I personally led multiple software projects, supervised EPFL-hosted open source projects with external funding from Google, and organized a highly successful Coursera massive open online course on reactive programming. I have participated in several international collaborations with top universities and industrial partners. I have promoted Scala on 17 industrial and research conferences and meetups, held 6 invited talks, and authored a textbook on concurrent programming in Scala. Since 2014, I am employed as a software engineer at Google.

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: Marin Golub

Professional Experience

Software Engineer, Google Inc., Zürich, Switzerland 2014 – now
Product area: Geo

- Maintaining a distributed logging infrastructure for Google Maps products.
- Working on a massively distributed system used to analyze Geo product usage.
- Led the implementation of a real-time distributed pipeline for spam detection. Awarded a *Google Spot Bonus* for this effort.
- Designed and implemented a test automation suite for product documentation.
- Main organizer of the team-internal monthly Hackathon events. Awarded a *Google Peer Bonus* for this effort.

Scala Open Source Developer, Scala Team, Lausanne, Switzerland 2009 – now

- 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.
- 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.

Collaborations	FORTH Institute of Computer Science (Greece), <i>Computer Architecture and VLSI Systems Laboratory</i> Leading the research collaboration (~5 people) aimed at developing 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 – now
	Akka team (Sweden), Member of the working group (~10 people) that developed a unifying asynchronous programming framework for Scala.	2011 – 2012
	Stanford University (USA), <i>Pervasive Parallelism Laboratory</i> 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
Teaching Experience	External Lecturer, Co-Organizer, <i>Reactive Programming and Parallelism</i> 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
	Lecturer, Co-Organizer, <i>Parallel Programming and Data Analysis</i> Coursera MOOC on parallel, distributed, and asynchronous programming, release planned in December 2015.	2015
	Lead Organizer, <i>Principles of Reactive Programming</i> Coursera MOOC on reactive programming in Scala, with 2 iterations and >60,000 participants so far. <ul style="list-style-type: none"> • Coordinated a team of three lecturers during recording and lecture material production. • 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. • Received the <i>EPFL IC Teaching Award</i> for this effort. 	2013
	Teaching Assistant, <i>Functional Programming in Scala</i> Required EPFL undergraduate course on functional programming (~160 students).	2010-2013

Research Interests	My focus is design and implementation of frameworks, programming languages, and runtime support for concurrent, parallel and distributed software development. I proposed and implemented novel persistent, concurrent and incremental data structures that support these programming paradigms. I use the Scala programming language as both the underlying development platform and research vehicle.	
Thesis	Data Structures and Algorithms for Data-Parallel Computing in a Managed Runtime Aleksandar Prokopec	EPFL 2014
Books	Learning Concurrent Programming in Scala Aleksandar Prokopec	Packt Publishing 2014
Publications	Authored 13 high-impact international research publications (3 under submission) and several technical reports.	
	SnapQueue: Lock-Free Queue with Constant Time Snapshots Aleksandar Prokopec <i>Scala Symposium 2015, co-located with PLDI</i>	SCALA 2015
	Efficient Lock-Free Work-stealing Iterators for Data-Parallel Collections Aleksandar Prokopec, Dmitry Petrashko, Martin Odersky <i>Parallel, Distributed and Network-Based Processing 2015</i>	PDP 2015
	Containers and Aggregates, Mutators and Isolates for Reactive Programming Aleksandar Prokopec, Philipp Haller, Martin Odersky <i>Annual Scala Workshop 2014, co-located with ECOOP</i>	SCALA 2014
	Near Optimal Work-Stealing Tree Scheduler for Highly Irregular Data-Parallel Workloads Aleksandar Prokopec, Martin Odersky <i>Languages and Compilers for Parallel Computing 2013</i>	LCPC 2013
	Composition and Reuse with Compiled Domain-Specific Languages Arvind K. Sujeeth, Tiark Rompf, Kevin J. Brown, HyoukJoong Lee, Hassan Chafi, Victoria Popic, Michael Wu, Aleksandar Prokopec, Vojin Jovanovic, Martin Odersky, Kunle Olukotun <i>European Conference on Object-Oriented Programming 2013</i>	ECOOP 2013
	FlowPools: A Lock-Free Deterministic Concurrent Dataflow Abstraction Aleksandar Prokopec, Heather Miller, Tobias Schlatter, Philipp Haller, Martin Odersky <i>Languages and Compilers for Parallel Computing 2012</i>	LCPC 2012

	<p>Concurrent Tries with Efficient Non-blocking Snapshots Aleksandar Prokopec, Nathan Bronson, Phil Bagwell, Martin Odersky <i>Symposium on Principles and Practice of Parallel Programming 2012</i></p>	<i>PPOPP 2012</i>
	<p>Lock-Free Resizeable Concurrent Tries Aleksandar Prokopec, Phil Bagwell, Martin Odersky <i>Languages and Compilers for Parallel Computing 2011</i></p>	<i>LCPC 2011</i>
	<p>A Generic Parallel Collection Framework Aleksandar Prokopec, Phil Bagwell, Tiark Rumpf, Martin Odersky <i>Euro-Par 2011</i></p>	<i>Euro-Par 2011</i>
	<p>Adaptive Mutation Operator Cycling Aleksandar Prokopec, Marin Golub <i>International Conference on the Applications of Digital Information and Web Technologies 2009</i></p>	<i>ICADIWT 2009</i>
Under Submission	<p>Isolates, Channels and Event Streams for Composable Distributed Programming Aleksandar Prokopec, Martin Odersky</p> <p>Conc-Trees for Functional and Parallel Programming Aleksandar Prokopec, Martin Odersky</p> <p>Cache Tries – High-Performance Lock-Free Hashtables Aleksandar Prokopec, Nikos Papakonstantinou, Polyvios Pratikakis</p>	
Selected Tech Reports	<p>Achieving Efficient Work-Stealing for Data-Parallel Collections Aleksandar Prokopec, Martin Odersky</p> <p>Multi-Lane FlowPools: A Detailed Look Tobias Schlatter, Aleksandar Prokopec, Heather Miller, Philipp Haller, Martin Odersky</p> <p>FlowPools: A Lock-Free Deterministic Concurrent Dataflow Abstraction – Proofs Aleksandar Prokopec, Heather Miller, Philipp Haller</p> <p>Cache-Aware Lock-Free Concurrent Hash Tries Aleksandar Prokopec, Phil Bagwell, Martin Odersky</p>	<p><i>April 2013</i></p> <p><i>September 2012</i></p> <p><i>June 2012</i></p> <p><i>June 2011</i></p>
Open Source	<p>Scala Programming Language, <i>Scala team member</i></p> <ul style="list-style-type: none"> • Reactive Collections Distributed Programming Framework, <i>lead</i> Reactive programming framework aimed at building asynchronous, composable, distributed systems. • Scala-Blitz – High-Performance Data-Parallelism Framework, <i>lead</i> Scala module for highly efficient data-parallel programming. • ScalaMeter Benchmarking Framework, <i>lead</i> Microbenchmarking and performance regression testing framework for Scala and JVM, adopted in various open source projects. 	<i>2009 – now</i>

- [Scala Futures & Promises \(Scala Improvement Proposal 14\)](#), *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).
- [Parallel Collections Framework](#), *lead*
Scala standard library module for data-parallel programming (part of the standard Scala distribution in 2011).

Java Group at Faculty of Electrical Engineering and Computing, Zagreb, 2006 – 2008

- [VHDDLab](#), *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).

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 (VHDDLab)	2008
Faculty of Electrical Engineering and Computing Josip Loncar Award	2007
Faculty of Electrical Engineering and Computing Josip Loncar Award	2006
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

Selected Talks

Gave 17 academic and industrial talks, 6 as an invited speaker.

[SnapQueue: Lock-Free Queue with Constant Time Snapshots](#) SCALA 2015
Academic Conference Talk
Portland, Oregon, USA, June 13, 2015

[ScalaMeter – Performance Regression Testing Framework](#) Oracle VM Meetup 2014
Academic Meetup Talk
ETH, Zürich, Switzerland, September 11, 2014

[Containers and Aggregates, Mutators and Isolates for Reactive Programming](#) SCALA 2014
Academic Conference Talk
Uppsala, Sweden, July 28, 2014

[Reactive Collections and 3D Engine Design](#) ScalaDays 2014
Industrial Conference Talk (800 attendees)
Berlin, Germany, June 24, 2014

Macro-based Scala Parallel Collections Industrial Conference Talk (350 attendees, invited talk) London, UK, December 2, 2013	<i>Scala eXchange 2013</i>
Work-Stealing Tree Scheduling Academic Conference Talk San Jose, CA, USA, September 26, 2013	<i>LCPC 2013</i>
Scala as a Research Tool ECOOP Tutorial (w/ Heather Miller and Philipp Haller) Montpellier, France, July 1, 2013	<i>ECOOP 2013</i>
Scala Performance Regression Testing Industrial Conference Talk (invited talk) London, UK, November 19, 2012	<i>Scala eXchange 2012</i>
Parallel Concurrent Hash Tries Industrial Conference Talk (400 attendees) London, UK, April 18, 2012	<i>ScalaDays 2012</i>
Concurrent Hash Tries in Scala Academic Meetup Talk (invited talk) Zagreb, Croatia, April 11, 2012	<i>Croatian IEEE Chapter Meetup</i>
Concurrent Tries with Efficient Non-Blocking Snapshots Academic Conference Talk New Orleans, Louisiana, USA, February 29, 2012	<i>PPOPP 2012</i>
Lock-Free Resizeable Concurrent Tries Academic Conference Talk Fort Collins, CO, USA, September 9, 2011	<i>LCPC 2011</i>
Generic Parallel Collection Framework Academic Conference Talk Bordeaux, France, September 2, 2011	<i>Euro-Par 2011</i>
Parallel Collections Industrial Conference Talk (280 attendees, invited talk) London, UK, June 15, 2011	<i>Scala eXchange 2011</i>
Scala Parallel Collections Industrial Conference Talk Palo Alto, CA, USA, June 3, 2011	<i>ScalaDays 2011</i>
Introduction to Scala Industrial Talk, Java User Group Grenoble (invited talk) Grenoble, France, March, 2011	<i>JUG Meetup 2011</i>
Parallel Collections Industrial Conference Talk (150 attendees, invited talk) Lausanne, Switzerland, April 15, 2010	<i>ScalaDays 2010</i>

External Service

Reviewer or program committee member of 7 scientific conferences and journals.

Transactions on Computers 2015 , journal submission reviewer	2015
Scala Workshop 2014 , program committee member	7/2014
High-Level Parallel Programming and Applications 2014 , external reviewer	4/2014
ECOOOP 2013 , external reviewer	7/2013
Scala Workshop 2013 , program committee member (co-chair)	7/2013
ScalaDays 2010 , external reviewer	6/2010
ICADIWT 2009 , external reviewer	8/2009

Supervised Projects¹

Supervised 14 bachelor and master student projects.

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

¹ 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.

Pamela Delgado, *Scala Invariant Verifier*
M.Sc. level

8/2011 – 1/2012

GSoC
Projects²

Supervised 4 Google Summer of Code projects.

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

²The Scala Team is a regular host of Google Summer of Code Projects. 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.

References

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