Sergey Mechtaev

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Professional interests

- software engineering
- programming languages
- formal methods
- automated program repair
- program synthesis
- symbolic execution
- constraint solving

Education

Aug 2012–Jul 2018	*Doctor of Philosophy.* School of Computing, National University of Singapore. Thesis: Semantic program repair. Supervisor: Abhik Roychoudhury. GPA: 4.4 (out of 5.0).
Sep 2006–Jul 2011	*Specialist.* Mathematics & Mechanics Faculty, Saint Petersburg State University. Thesis: Generic programming library for OCaml. Supervisor: Dmitry Boulytchev. GPA: 4.7 (out of 5.0).

Employment history

Mar 2017–Present	*Research Assistant.* National University of Singapore (Singapore). Developed a methodology of program repair based on a reference implementation (ICSE'18).
Feb 2016–Jun 2016	*Intern.* Fondazione Bruno Kessler (Trento, Italy). Developed a methodology of second-order constraint solving (FSE'18).
May 2010–Jul 2012	*Developer.* Lanit-Tercom, Inc (Saint-Petersburg, Russia). Implemented a library for eliminating boilerplate code in the compiler of HaSCoL hardware-description language. Implemented a hardware block for image processing using HaSCoL.
Jun 2009–Apr 2010	*Developer.* OOO Dvin (Saint-Petersburg, Russia). Implemented database (MS SQLServer, LINQ), concurrency, network communication (WCF), web application (Silverlight) for a video surveillance software.

Refereed publications

Google Scholar: https://scholar.google.com.sg/citations?user=XTFR93cAAAAJ&hl=en
DBLP: https://dblp.uni-trier.de/pers/hd/m/Mechtaev:Sergey

FSE'18	Sergey Mechtaev, Alberto Griggio, Alessandro Cimatti and Abhik Roychoudhury. "Symbolic Execution with Existential Second-Order Constraints". *Foundations of Software Engineering 2018*. Acceptance: $61/289 = 21\%$.
TOSEM'18	Sergey Mechtaev, Xiang Gao, Shin Hwei Tan and Abhik Roychoudhury. "Test-equivalence Analysis for Automatic Patch Generation". *Transactions on Software Engineering and Methodology 2018*. Accepted subject to minor revision.
ICSE'18	Sergey Mechtaev, Manh-Dung Nguyen, Yannic Noller, Lars Grunske and Abhik Roychoudhury. "Semantic Program Repair Using a Reference Implementation". *International Conference on Software Engineering 2018*. Acceptance: $105/502 = 21\%$.
EMSE'17	Jooyong Yi, Shin Hwei Tan, Sergey Mechtaev, Marcel Boehme, Abhik Roychoudhury. "A Correlation Study Between Automated Program Repair and Test-suite Metrics". *Empirical Software Engineering Journal 2017*.
ICSE Poster'17	Shin Hwei Tan, Jooyong Yi, Yulis, Sergey Mechtaev, Abhik Roychoudhury. "Codeflaws: A Programming Competition Benchmark for Evaluating Automated Program Repair Tools". *International Conference on Software Engineering, Poster track 2017*.
ICSE'16	Sergey Mechtaev, Jooyong Yi and Abhik Roychoudhury. "Angelix: Scalable Multiline Program Patch Synthesis via Symbolic Analysis". *International Conference on Software Engineering 2016*. Acceptance: $101/530 = 19\%$.
ICSE'15	Sergey Mechtaev, Jooyong Yi and Abhik Roychoudhury. "DirectFix: Looking for Simple Program Repairs". *International Conference on Software Engineering 2016*. Acceptance: $84/452 = 18\%$.
SysProg'11	Sergey Mechtaev. "Eliminating Boilerplate Code in Objective Caml Programs" (In Russian). *System Programming 2011*.
ML'11	Dmitri Boulytchev, Sergey Mechtaev. "Efficiently Scrapping Boilerplate Code in OCaml". *Workshop on ML 2011*.

Non-refereed publications

2017	Sergey Mechtaev, Xiang Gao, Shin Hwei Tan, Abhik Roychoudhury. "Partitioning Patches into Test-equivalence Classes for Scaling Program Repair". *arXiv 1707.03139*. 2017.

Released software

2016	*Angelix* — the first constraint-based program repair system that scales to large real-world programs. Angelix generated a patch for the well-known Heartbleed vulnerability; it has been downloaded by researchers from over 60 institutions, and has been used in several projects including an intelligent tutoring system at IIT Kanpur. http://angelix.io.
2016	*program-repair.org* — a community-driven website on program repair that was initiated and designed by me. Since its release, researchers from 7 institutions have contributed to this website; it has 200-300 unique visitors per month. http://program-repair.org.
2011	*ocaml-syb* — an adaptation of Scrap Your Boilerplate approach for OCaml. This library has been used in the compiler of HaSCoL hardware-description language. The prototype is available here: http://oops.math.spbu.ru/syb-ocaml/. Some of the innovations of this library were later adopted by other researchers: https://github.com/yallop/staged-generic-programming.

Teaching and mentoring

2017–2018	*Student mentor*, At the National University of Singapore, I co-advised one master-by-research thesis "Use of Repairs Tool to Fix Security Vulnerabilities" by Edwin Lesmana Tjiong.
Jan 2015–May 2015	*Teaching Assistant*, National University of Singapore. CS4218 Software Testing and Debugging. Designed and graded programming assignments, conducted tutorials (20 people in class).
2008	*Instructor*. School 419 (Saint-Petersburg, Russia). Algorithms and Programming. Taught a course on algorithms and programming (10 people in class).

Formal presentations

May 2018	"Semantic Program Repair Using a Reference Implementation". International Conference on Software Engineering, Gothenburg, Sweden.
April 2018	"Semantic Program Repair Using a Reference Implementation". Dagstuhl Seminar 18151 on Program Equivalence, Schloss Dagstuhl, Germany.
May 2017	"Semantics-based Program Repair". School of Computing, National University of Singapore.
March 2017	"Efficient Exploration of Patch Spaces for Automated Program Repair". JetBrains Research, Saint-Petersburg, Russia.
January 2017	"Towards a Synergy of Syntax-based and Semantics-based Program Repair". Dagstuhl Seminar 17022 on Automated Program Repair, Schloss Dagstuhl, Germany.
May 2016	"Angelix: Scalable Multiline Program Patch Synthesis via Symbolic Analysis". International Conference on Software Engineering, Austin, USA.
May 2016	"Constraint-based Automated Program Repair". Fondazione Bruno Kessler, Trento, Italy.
May 2015	"DirectFix: Looking for Simple Program Repairs". International Conference on Software Engineering, Florence, Italy.

Professional service

Subreviewer	ASE 2013, ISSTA 2015, ICST 2017, FSE 2017.
Reviewer	EMSE 2017, TSE 2017.

Awards

2016	Research Achievement Award, National University of Singapore.
2007	Northeastern European Region Programming Contest (ACM ICPC), honorable mention.

Skills

Languages	English (fluent), Russian (native), Mandarin Chinese (basic).
Programming	C, C++, Java, C#, Python, Perl, Shell (Bash), OCaml, Scheme, Scala, Haskell
Systems & Tools	Windows, Linux, Git, Subversion, Docker, Latex

References

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