

Sergey Mechtaev

Lecturer (Assistant Professor), University College London

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Address: Department of Computer Science, University College London,
Gower Street, London WC1E 6BT, United Kingdom

Office: Room 3.02, Engineering Front Building

Email: s.mechtaev@ucl.ac.uk

Personal email: mechtaev@gmail.com

Website: <https://mechtaev.com>

Mobile phone: +44 (0)79 3560 2279

RESEARCH INTERESTS

- **Software engineering:** automated program repair, software testing.
- **Formal methods:** symbolic execution, constraint solving, software verification.
- **Programming languages:** program synthesis, program analysis.

EDUCATION

- **National University of Singapore, School of Computing** Singapore
Doctor of Philosophy
August 2012–July 2018
Thesis: Semantic program repair; Supervisor: Abhik Roychoudhury; GPA: 4.4
- **Saint Petersburg State University, Mathematics & Mechanics Faculty** Saint Petersburg, Russia
Specialist
September 2006–July 2011
Thesis: Generic programming library for OCaml; Supervisor: Dmitry Boulytchev; GPA: 4.7

EMPLOYMENT

- **University College London** London, United Kingdom
Lecturer
February 2019–Present
Software System Engineering group, CREST centre
- **National University of Singapore** Singapore
Research Assistant
March 2017–January 2019
TSUNAMi centre
- **Fondazione Bruno Kessler** Trento, Italy
Intern
February 2016–June 2016
Research Unit in Embedded Systems
- **Lanit-Tercom, Inc** Saint-Petersburg, Russia
Software Developer
May 2010–July 2012
HaSCoL hardware-description language
- **OOO Dvin** Saint-Petersburg, Russia
Software Developer
June 2009–April 2010
Video surveillance software startup

PUBLICATIONS

Google Scholar: <https://scholar.google.com.sg/citations?user=XTFR93cAAAAJ&hl=en>

DBLP: <https://dblp.uni-trier.de/pers/hd/m/Mechtaev:Sergey>

- **Continuously Accelerating Research** ICSE'23 NIER
Jonathan Bell, Christopher Timperley, Sergey Mechtaev, Earl Barr, Michael Hilton
International Conference on Software Engineering 2023, New Ideas and Emerging Results
- **Rete: Learning Namespace Representation for Program Repair** ICSE'23
Nikhil Parasaram, Earl Barr, Sergey Mechtaev
International Conference on Software Engineering 2023

- **Efficient SMT-based Network Fault Tolerance Verification** FM'23
Yu Liu, Pavle Subotic, Emmanuel Letier, Sergey Mechtaev, Abhik Roychoudhury
 International Symposium on Formal Methods 2023
- **Modus: A Datalog Dialect for Building Container Images** FSE'22
Chris Tomy, Tingmao Wang, Earl Barr, Sergey Mechtaev
 Symposium on the Foundations of Software Engineering 2022
- **Fair Decision Making via Automated Repair of Decision Trees** Fairware'22
Jiang Zhang, Ivan Beschastnikh, Sergey Mechtaev, Abhik Roychoudhury
 International Workshop on Equitable Data & Technology 2022
- **Trident: Controlling Side Effects in Automated Program Repair** TSE'21
Nikhil Parasaram, Earl Barr, Sergey Mechtaev
 Transactions on Software Engineering
- **Evaluating Automatic Program Repair Capabilities to Repair API Misuses** TSE'21
Maria Kechagia, Sergey Mechtaev, Federica Sarro, Mark Harman
 Transactions on Software Engineering
- **Re-factoring Based Program Repair Applied to Programming Assignments** ASE'19
Yang Hu, Umair Z. Ahmed, Sergey Mechtaev, Ben Leong, Abhik Roychoudhury
 International Conference on Automated Software Engineering 2019
- **Crash-Avoiding Program Repair** ISSTA'19
Xiang Gao, Sergey Mechtaev, Abhik Roychoudhury
 International Symposium on Software Testing and Analysis 2019
- **Symbolic Execution with Existential Second-Order Constraints** FSE'18
Sergey Mechtaev, Alberto Griggio, Alessandro Cimatti, Abhik Roychoudhury
 Symposium on the Foundations of Software Engineering 2018
- **Test-equivalence Analysis for Automatic Patch Generation** TOSEM'18
Sergey Mechtaev, Xiang Gao, Shin Hwei Tan, Abhik Roychoudhury
 Transactions on Software Engineering and Methodology 2018
- **Semantic Program Repair Using a Reference Implementation** ICSE'18
Sergey Mechtaev, Manh-Dung Nguyen, Yannic Noller, Lars Grunske, Abhik Roychoudhury
 International Conference on Software Engineering 2018, Acceptance: $105/502 = 21\%$
- **A Correlation Study Between Automated Program Repair and Test-suite Metrics** EMSE'17
Jooyong Yi, Shin Hwei Tan, Sergey Mechtaev, Marcel Boehme, Abhik Roychoudhury
 Empirical Software Engineering Journal 2017
- **Codeflaws: A Programming Competition Benchmark for Evaluating Automated Program Repair Tools** ICSE'17-Poster
Shin Hwei Tan, Jooyong Yi, Yulis, Sergey Mechtaev, Abhik Roychoudhury
 International Conference on Software Engineering, Poster track 2017
- **Angelix: Scalable Multiline Program Patch Synthesis via Symbolic Analysis** ICSE'16
Sergey Mechtaev, Jooyong Yi, Abhik Roychoudhury
 International Conference on Software Engineering 2016, Acceptance: $101/530 = 19\%$
- **DirectFix: Looking for Simple Program Repairs** ICSE'15
Sergey Mechtaev, Jooyong Yi, Abhik Roychoudhury
 International Conference on Software Engineering 2015, Acceptance: $84/452 = 18\%$
- **Eliminating Boilerplate Code in Objective Caml Programs** SysProg'11
Sergey Mechtaev
 System Programming 2011
- **Efficiently Scrapping Boilerplate Code in OCaml** ML'11
Dmitri Boulytchev, Sergey Mechtaev
 Workshop on ML 2011

PROJECTS

GitHub: <https://github.com/mechtaev>

- **Modus:** Modus is a language for building Docker/OCI container images. Modus uses logic programming to express interactions among build parameters, specify complex build workflows, automatically parallelise and cache builds, help to reduce image size, and simplify maintenance. <https://modus-continens.com/>
- **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>
- **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>

SUPERVISION

- **Nikhil Parasaram (PhD)** University College London
First supervisor. Second supervisor: Earl T. Barr
Thesis: TBA
September 2019–Present
- **Liu Yu (PhD)** National University of Singapore/CREST
Co-advisor. Other advisors: Abhik Roychoudhury, Emmanuel Letier
Thesis: TBA
September 2020–Present

TEACHING

- **COMP0010 Software Engineering** University College London
Module Leader
September 2022–December 2022
- **COMP0174 Practical Program Analysis** University College London
Module Leader
January 2022–March 2022
- **COMP0010 Software Engineering** University College London
Module Leader
September 2021–December 2021
- **COMP0010 Software Engineering** University College London
Module Leader
September 2020–December 2020
- **COMP0010 Software Engineering** University College London
Module Leader
September 2019–December 2019
- **CS4218 Software Testing and Debugging** National University of Singapore
Teaching Assistant
January 2015–May 2015

TALKS

- **Modus: A Datalog Dialect for Building Container Images** JetBrains Open Reading Club
Online
December 2022
- **To Build is to Query: Building Container Images with Datalog** Microsoft, MDCS Tech & Science Talks
Online
November 2022
- **To Build is to Query: Building Container Images with Datalog** National University of Singapore, CS Seminar
Singapore
August 2022
- **Semantic Program Repair** Singapore (via video conferencing)
NUS Computing Research Week
August 2020
- **Synthesis of Software Patches Using Symbolic Execution** London, United Kingdom
62nd CREST Open Workshop on Program Repair and GI
January 2020

- **Automated Repair of Security Vulnerabilities** Tokyo, Japan
Shonan Meeting 160 on Fuzzing and Symbolic Execution September 2019
- **Semantic Program Repair** Shenzhen, China
Southern University of Science and Technology July 2019
- **Semantic Program Repair** London, United Kingdom
Imperial College London May 2019
- **First-Order and Second-Order Symbolic Execution** Saint-Petersburg, Russia
JetBrains Research April 2019
- **Semantic Program Repair** London, United Kingdom
University College London July 2018
- **Semantic Program Repair Using a Reference Implementation** Gothenburg, Sweden
International Conference on Software Engineering 2018 May 2018
- **Semantic Program Repair Using a Reference Implementation** Schloss Dagstuhl, Germany
Dagstuhl Seminar 18151 on Program Equivalence April 2018
- **Semantics-based Program Repair** Singapore
School of Computing, National University of Singapore April 2017
- **Efficient Exploration of Patch Spaces for Automated Program Repair** Saint-Petersburg, Russia
JetBrains Research March 2017
- **Towards a Synergy of Syntax-based and Semantics-based Program Repair** Schloss Dagstuhl, Germany
Dagstuhl Seminar 17022 on Automated Program Repair January 2017
- **Angelix: Scalable Multiline Program Patch Synthesis via Symbolic Analysis** Austin, USA
International Conference on Software Engineering 2016 May 2016
- **Constraint-based Automated Program Repair** Trento, Italy
Fondazione Bruno Kessler May 2016
- **DirectFix: Looking for Simple Program Repairs** Florence, Italy
International Conference on Software Engineering 2015 May 2015

SERVICE

- **Organiser:**
 - International Workshop on Automated Program Repair (APR) co-located with ICSE 2023
 - International Conference on Software Engineering Student Research Competition (ICSE SRC) 2022
 - International Workshop on Automated Program Repair (APR) co-located with ICSE 2022
 - International Workshop on Automated Program Repair (APR) co-located with ICSE 2021
 - 62nd CREST Open Workshop (COW) on Automated Program Repair and Genetic Improvement 2020
 - International Workshop on Automated Program Repair (APR) co-located with ICSE 2020
- **Program committee:**
 - International Conference on Software Engineering (ICSE) 2024
 - Symposium on the Foundations of Software Engineering (FSE) 2023
 - International Conference on Automated Software Engineering (ASE) 2019, 2020, 2021
 - International Conference on Software Engineering Demonstrations (ICSE-Demo) 2022
 - Symposium on the Foundations of Software Engineering Doctoral Symposium (FSE-DS) 2022
 - International Conference on Automated Software Engineering Student Research Competition (ASE SRC) 2021
- **Reviewer:**
 - Transactions on Software Engineering (TSE) 2017, 2018, 2019, 2021, 2022
 - Empirical Software Engineering (EMSE) 2017, 2018, 2019, 2020, 2021, 2022

- Transactions on Software Engineering and Methodology (TOSEM) 2018, 2019, 2020, 2021, 2022
- Journal of Software: Evolution and Process 2022
- Science of Computer Programming 2020
- Formal Method in System Design (FMSD) 2020
- **Subreviewer:**
 - International Conference on Automated Software Engineering (ASE) 2013
 - International Symposium on Software Testing and Analysis (ISSTA) 2015
 - International Conference on Software Testing, Verification, and Validation (ICST) 2017
 - Symposium on the Foundations of Software Engineering (FSE) 2017
 - International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS) 2019

AWARDS

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| • IMDA Excellence Prize 2019
<i>National University of Singapore</i> | Singapore
2019 |
| • Outstanding Doctoral Dissertation Award
<i>ACM SIGSOFT</i> | Montreal, Canada
2019 |
| • Research Achievement Award
<i>National University of Singapore</i> | Singapore
2016 |
| • NEERC Northern Subregional Programming Contest Honorable Mention
<i>ACM ICPC</i> | Saint Petersburg, Russia
2007 |