Michael Pradel

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Research Interests

My research focuses on tools and techniques for building reliable, efficient, and secure software. To this end, I work on testing and analysis of complex software systems. As part of my research, I have contributed to techniques that detected thousands of bugs and security problems in widely used software.

Positions and Experience

Sep 2019 – now	**University of Stuttgart**, *Germany* Full Professor
Feb 2019 – Jul 2019	**Facebook**, *Menlo Park, USA* Sabbatical/industrial leave
Oct 2014 – Aug 2019	**TU Darmstadt**, *Germany* Assistant Professor (since April 2017, before: Independent research group leader)
Sep 2013 – Aug 2014	**University of California, Berkeley**, *USA* Postdoctoral researcher
Jan 2013 – Jun 2013	**ETH Zurich**, *Switzerland* Postdoctoral researcher and lecturer in the Laboratory for Software Technology lead by Thomas Gross
2008 – 2012	**ETH Zurich**, *Switzerland* Research assistant in the Laboratory for Software Technology lead by Thomas Gross
Aug 2006 – Sep 2006	**Fraunhofer Institute for Secure Information Technology SIT**, *Darmstadt, Germany* Internship. Survey of static source code analysis tools. Study on Ajax-related security issues
Jul 2005 – Aug 2005	**Computer science research center FZI**, *Karlsruhe, Germany* Internship. Developed a Java application to visualize large object-oriented software
2001 – 2002	**Community service**, *Jena, Germany* Day-care center for disabled children

Education

2008 – 2012	**ETH Zurich**, *Switzerland* Ph.D. (Dr. sc.) in computer science. Laboratory for Software Technology lead by Thomas Gross. Dissertation: *Program Analyses for Automatic and Precise Error Detection*. **Software Engineering Award of the Ernst-Denert-Foundation (best dissertation)** Examinors: Thomas Gross, Jonathan Aldrich, Andreas Zeller
Jan 2008 – Jul 2008	**Ecole Polytechnique Fédérale de Lausanne (EPFL)**, *Switzerland* Diploma thesis in the Programming Methods Laboratory lead by Martin Odersky. **Best student paper award at ICSOFT'08**
2006 – 2008	**TU Dresden**, *Germany* Diplom ($\approx$ M.S.) in computer science, with distinction. Specialization: software engineering. **Awarded as one of the best engineering graduates of the year**
2004 – 2006	**Ecole Centrale Paris**, *France* Diplôme d'Ingénieur ($\approx$ M.S.) in engineering
2002 – 2004	**TU Dresden**, *Germany* Vordiplom ($\approx$ B.S.) in computer science

Peer-reviewed Conference and Journal Publications

ICSE'24 — **PyTy: Repairing Static Type Errors in Python**
Yiu Wai Chow, Luca Di Grazia, Michael Pradel. *International Conference on Software Engineering*

ICSE'24 — **Fuzz4All: Universal Fuzzing with Large Language Models**
Chunqiu Steven Xia, Matteo Paltenghi, Jia Le Tian, Michael Pradel, Lingming Zhang. *International Conference on Software Engineering*

ICSE'24 — **Resource Usage and Optimization Opportunities in Workflows of GitHub Actions**
Islem Bouzenia, Michael Pradel. *International Conference on Software Engineering*

FSE'23 — **LExecutor: Learning-Guided Execution**
Beatriz Souza, Michael Pradel. *Symposium on the Foundations of Software Engineering*

ISSTA'23 — **That's a Tough Call: Studying the Challenges of Call Graph Construction for WebAssembly**
Daniel Lehmann, Michelle Thalakottur, Frank Tip, Michael Pradel. *International Symposium on Software Testing and Analysis*

ISSTA'23 — **Beware of the Unexpected: Bimodal Taint Analysis**
Yiu Wai Chow, Max Schäfer, Michael Pradel. *International Symposium on Software Testing and Analysis*

ICSE'23 — **MorphQ: Metamorphic Testing of the Qiskit Quantum Computing Platform**
Matteo Paltenghi, Michael Pradel. *International Conference on Software Engineering*

ICSE'23 — **When to Say What: Learning to Find Condition-Message Inconsistencies**
Islem Bouzenia, Michael Pradel. *International Conference on Software Engineering*

ICSE'23 — **SecBench.js: An Executable Security Benchmark Suite for Server-Side JavaScript**
Masudul Hasan Masud Bhuiyan, Adithya Srinivas Parthasarathy, Nikos Vasilakis, Michael Pradel, Cristian-Alexandru Staicu. *International Conference on Software Engineering*

ICSE'23 — **VulGen: Realistic Vulnerability Generation Via Pattern Mining and Deep Learning**
Yu Nong, Yuzhe Ou, Michael Pradel, Feng Chan, Haipeng Cai. *International Conference on Software Engineering*

TSE'22 — **DiffSearch: A Scalable and Precise Search Engine for Code Changes**
Luca Di Grazia, Paul Bredl, Michael Pradel. *IEEE Transactions on Software Engineering*

CSUR'22 — **Code Search: A Survey of Techniques for Finding Code**
Luca Di Grazia, Michael Pradel. *ACM Computing Surveys*

FSE'22 — **DynaPyt: A Dynamic Analysis Framework for Python**
Aryaz Eghbali, Michael Pradel. *Symposium on the Foundations of Software Engineering*

FSE'22 — **The Evolution of Type Annotations in Python: An Empirical Study**
Luca Di Grazia, Michael Pradel . *Symposium on the Foundations of Software Engineering*

FSE'22 — **Generating Realistic Vulnerabilities via Neural Code Editing: An Empirical Study**
Yu Nong, Yuzhe Ou, Michael Pradel, Feng Chen, Haipeng Cai. *Symposium on the Foundations of Software Engineering*

ASE'22 — **CrystalBLEU: Precisely and Efficiently Measuring the Similarity of Code**
Aryaz Eghbali, Michael Pradel. *International Conference on Automated Software Engineering*

OOPSLA'22 — **Bugs in Quantum Computing Platforms: An Empirical Study**
Matteo Paltenghi, Michael Pradel. *Proceedings of the ACM on Programming Languages*

PLDI'22 — **Finding the Dwarf: Recovering Precise Types from WebAssembly Binaries**
Daniel Lehmann, Michael Pradel. *Conference on Programming Language Design and Implementation*

ICSE'22 — **Nalin: Learning from Runtime Behavior to Find Name-Value Inconsistencies in Jupyter Notebooks**
Jibesh Patra, Michael Pradel. *International Conference on Software Engineering*

ICSE'22 — **Nessie: Automatically Testing JavaScript APIs with Asynchronous Callbacks**
Ellen Arteca, Sebastian Harner, Michael Pradel, Frank Tip. *International Conference on Software Engineering*

S&P'22 — **Wobfuscator: Obfuscating JavaScript Malware via Opportunistic Translation to WebAssembly**
Alan Romano, Daniel Lehmann, Michael Pradel, Weihang Wang. *Symposium on Security and Privacy*

CACM'22 — **Neural Software Analysis**
Michael Pradel, Satish Chandra. *Communications of the ACM* 65(1), pages 86–96

ASE'21 **Thinking Like a Developer? Comparing the Attention of Humans with Neural Models of Code**

Matteo Paltenghi, Michael Pradel. *International Conference on Automated Software Engineering*

FSE'21 **Semantic Bug Seeding: A Learning-Based Approach for Creating Realistic Bugs**

Jibesh Patra, Michael Pradel. *Symposium on the Foundations of Software Engineering*

CCS'21 **Preventing Dynamic Library Compromise on Node.js via RWX-Based Privilege Reduction**

Nikos Vasilakis, Cristian-Alexandru Staicu, Grigoris Ntousakis, Konstantinos Kallas, Ben Karel, Andre DeHon, Michael Pradel. *Conference on Computer and Communications Security*

ISSTA'21 **Finding Data Compatibility Bugs with JSON Subschema Checking**

Andrew Habib, Avraham Shinnar, Martin Hirzel, Michael Pradel. *International Symposium on Software Testing and Analysis*

ISSTA'21 **Continuous Test Suite Failure Prediction**

Cong Pan, Michael Pradel. *International Symposium on Software Testing and Analysis*

ICSE'21 **IdBench: Evaluating Semantic Representations of Identifier Names in Source Code**

Yaza Wainakh, Moiz Rauf, Michael Pradel. *International Conference on Software Engineering*

WWW'21 **An Empirical Study of Real-World WebAssembly Binaries: Security, Languages, Use Cases**

Aaron Hilbig, Daniel Lehmann, Michael Pradel. *The Web Conference (WWW)*

ICPE'21 **ConfProf: White-Box Performance Profiling of Configuration Options**

Xue Han, Tingting Yu, Michael Pradel. *International Conference on Performance Engineering*

IEEE Sw.'21 **Automatic Program Repair**

Claire Le Goues, Michael Pradel, Abhik Roychoudhury, Satish Chandra. *IEEE Software* 38(4), pages 22–27

ASE'20 **No Strings Attached: An Empirical Study of String-related Software Bugs**

Aryaz Eghbali, Michael Pradel. *International Conference on Automated Software Engineering*

USENIX Security'20 **Everything Old is New Again: Binary Security of WebAssembly**

Daniel Lehmann, Johannes Kinder, Michael Pradel. *USENIX Security Symposium*

FSE'20 **TypeWriter: Neural Type Prediction with Search-based Validation**

Michael Pradel, Georgios Gousios, Jason Liu, Satish Chandra. *Symposium on the Foundations of Software Engineering*

ISSTA'20 **Scaffle: Bug Localization on Millions of Files**

Michael Pradel, Vijayaraghavan Murali, Rebecca Qian, Mateusz Machalica, Erik Meijer, Satish Chandra. *International Symposium on Software Testing and Analysis*

ICSE'20 **Extracting Taint Specifications for JavaScript Libraries**

Cristian-Alexandru Staicu, Martin Toldam Torp, Max Schäfer, Anders Møller, Michael Pradel. *International Conference on Software Engineering*

IEEE Sw.'20 **Satisfying Increasing Performance Requirements with Caching at the Application Level**

Jhonny Mertz, Ingrid Nunes, Luca Della Toffola, Marija Selakovic, Michael Pradel. *IEEE Software*

OOPSLA'19 **Getafix: Learning to Fix Bugs Automatically**

Johannes Bader, Andrew Scott, Michael Pradel, Satish Chandra. *Conference on Object-Oriented Programming, Systems, Languages, and Applications*

ISSTA'19 **Interactive Metamorphic Testing of Debuggers**

Sandro Tolksdorf, Daniel Lehmann, Michael Pradel. *International Symposium on Software Testing and Analysis*

USENIX Security'19 **Small World with High Risks: A Study of Security Threats in the npm Ecosystem**

Markus Zimmermann, Cristian-Alexandru Staicu, Cam Tenny, Michael Pradel. *USENIX Security Symposium*

USENIX Security'19 **Leaky Images: Targeted Privacy Attacks in the Web**

Cristian-Alexandru Staicu, Michael Pradel. *USENIX Security Symposium*

WWW'19 **Anything to Hide? Studying Minified and Obfuscated Code in the Web**

Philippe Skolka, Cristian-Alexandru Staicu, Michael Pradel. *The Web Conference (WWW)*

ICSE'19 **NL2Type: Inferring JavaScript Function Types from Natural Language Information**

Rabee Sohail Malik, Jibesh Patra, Michael Pradel. *International Conference on Software Engineering*

ASPLOS'19 **Wasabi: A Framework for Dynamically Analyzing WebAssembly**
Daniel Lehmann, Michael Pradel. *International Conference on Architectural Support for Programming Languages and Operating Systems*

CACM'19 **Automated Program Repair**
Claire Le Goues, Michael Pradel, Abhik Roychoudhury. *Communications of the ACM*, 62(12), pages 56–65

CSUR'19 **A Survey of Compiler Testing**
Junjie Chen, Jibesh Patra, Michael Pradel, Yingfei Xiong, Hongyu Zhang, Dan Hao, Lu Zhang. *ACM Computing Surveys*, 53(1), pages 1–36

OOPSLA'18 **DeepBugs: A Learning Approach to Name-based Bug Detection**
Michael Pradel, Koushik Sen. *Conference on Object-Oriented Programming, Systems, Languages, and Applications*

OOPSLA'18 **Test Generation for Higher-Order Functions in Dynamic Languages**
Marija Selakovic, Michael Pradel, Rezwana Karim Nawrin, Frank Tip. *Conference on Object-Oriented Programming, Systems, Languages, and Applications*

ASE'18 **How Many of All Bugs Do We Find? A Study of Static Bug Detectors**
Andrew Habib, Michael Pradel. *International Conference on Automated Software Engineering*

ASE'18 **Is This Class Thread-Safe? Inferring Documentation using Graph-based Learning**
Andrew Habib, Michael Pradel. *International Conference on Automated Software Engineering*

FSE'18 **Feedback-Directed Differential Testing of Interactive Debuggers**
Daniel Lehmann, Michael Pradel. *European Software Engineering Conference and Symposium on the Foundations of Software Engineering*

ICSME'18 **Change-aware Dynamic Program Analysis for JavaScript**
Dileep R. K. Murthy, Michael Pradel. *International Conference on Software Maintenance and Evolution*

USENIX Security'18 **Freezing the Web: A Study of ReDoS Vulnerabilities in JavaScript-based Web Servers**
Cristian-Alexandru Staicu, Michael Pradel. *USENIX Security Symposium*

ICSE'18 **ConflictJS: Finding and Understanding Conflicts Between JavaScript Libraries**
Jibesh Patra, Pooja N. Dixit, Michael Pradel. *International Conference on Software Engineering*

NDSS'18 **Synode: Understanding and Automatically Preventing Injection Attacks on Node.js**
Cristian-Alexandru Staicu, Michael Pradel, Ben Livshits. *Network and Distributed System Security Symposium*

CGO'18 **Synthesizing Programs that Expose Performance Bottlenecks**
Luca Della Toffola, Michael Pradel, Thomas R. Gross. *International Symposium on Code Generation and Optimization*, pages 314–326

ASE'17 **Automatically Reducing Tree-Structured Test Inputs**
Satia Herfert, Jibesh Patra, Michael Pradel. *International Conference on Automated Software Engineering*, pages 861–871

ASE'17 **Saying "hi!" Is Not Enough: Mining Inputs for Effective Test Generation**
Luca Della Toffola, Cristian-Alexandru Staicu, Michael Pradel. *International Conference on Automated Software Engineering*, pages 44–49

OOPSLA'17 **Detecting Argument Selection Defects**
Andrew Rice, Edward Aftandilian, Ciera Jaspan, Emily Johnston, Michael Pradel, Yulissa Arroyo-Paredes. *Conference on Object-Oriented Programming, Systems, Languages, and Applications*, pages 104:1–104:22

PLDI'17 **Systematic Black-Box Analysis of Collaborative Web Applications**
Marina Billes, Anders Møller, Michael Pradel. *Conference on Programming Language Design and Implementation*, pages 171–184

ISSTA'17 **An Actionable Performance Profiler for Optimizing the Order of Evaluations**
Marija Selakovic, Thomas Glaser, Michael Pradel. *International Symposium on Software Testing and Analysis*, pages 170–180

ICSE'17 **Making Malory Behave Maliciously: Targeted Fuzzing of Android Execution Environments**
Siegfried Rasthofer, Steven Arzt, Stefan Triller, Michael Pradel. *International Conference on Software Engineering*, pages 300-311

ICSE'17 **Efficient Detection of Thread Safety Violations via Coverage-Guided Generation of Concurrent Tests**
Ankit Choudhary, Shan Lu, Michael Pradel. *International Conference on Software Engineering*, pages 266-277

CSUR'17 **A Survey of Dynamic Analysis and Test Generation for JavaScript**
Esben Andreasen, Liang Gong, Anders Møller, Michael Pradel, Marija Selakovic, Koushik Sen, Cristian-Alexandru Staicu. *ACM Computing Surveys*, 50(5), pages 1–36

EMSE'17 **Pinpointing and Repairing Performance Bottlenecks in Concurrent Programs**
Tingting Yu, Michael Pradel. *Empirical Software Engineering (EMSE)*, 23(5), pages 3034–3071

ICSE'16 **Performance Issues and Optimizations in JavaScript: An Empirical Study**
Marija Selakovic, Michael Pradel. *International Conference on Software Engineering*, pages 61–72

ICSE'16 **Nomen Est Omen: Exploring and Exploiting Similarities between Argument and Parameter Names**
Hui Liu, Qiurong Liu, Cristian-Alexandru Staicu, Michael Pradel, Yue Luo. *International Conference on Software Engineering*, pages 1063–1073

ISSTA'16 **Monkey See, Monkey Do: Effective Generation of GUI Tests with Inferred Macro Events**
Markus Ermuth, Michael Pradel. *International Symposium on Software Testing and Analysis*, pages 82–93

ISSTA'16 **SyncProf: Detecting, Localizing, and Optimizing Synchronization Bottlenecks**
Tingting Yu, Michael Pradel. *International Symposium on Software Testing and Analysis*, pages 389–400

OOPSLA'15 **Performance Problems You Can Fix: A Dynamic Analysis of Memoization Opportunities**
Luca Della Toffola, Michael Pradel, Thomas R. Gross. *Conference on Object-Oriented Programming, Systems, Languages, and Applications*, pages 607–622

FSE'15 **JITProf: Pinpointing JIT-Unfriendly JavaScript Code**
Liang Gong, Michael Pradel, Koushik Sen. *European Software Engineering Conference and Symposium on the Foundations of Software Engineering*, pages 357–368

ISSTA'15 **DLint: Dynamically Checking Bad Coding Practices in JavaScript**
Liang Gong, Michael Pradel, Manu Sridharan, Koushik Sen. *International Symposium on Software Testing and Analysis*, pages 94–105

ECOOP'15 **The Good, the Bad, and the Ugly: An Empirical Study of Implicit Type Conversions in JavaScript**
Michael Pradel, Koushik Sen. *European Conference on Object-Oriented Programming*, pages 519–541

ICSE'15 **TypeDevil: Dynamic Type Inconsistency Analysis for JavaScript**
Michael Pradel, Parker Schuh, Koushik Sen. *International Conference on Software Engineering*, pages 314–324

OOPSLA'14 **EventBreak: Analyzing the Responsiveness of User Interfaces through Performance-Guided Test Generation**
Michael Pradel, Parker Schuh, George Necula, Koushik Sen. *Conference on Object-Oriented Programming, Systems, Languages, and Applications*, pages 33-47

ISSTA'14 **Performance Regression Testing of Concurrent Classes**
Michael Pradel, Markus Huggler, Thomas R. Gross. *International Symposium on Software Testing and Analysis*, pages 13–25

ASE'13 **Bita: Coverage-guided, Automatic Testing of Actor Programs**
Samira Tasharofi, Michael Pradel, Yu Lin, Ralph Johnson. *International Conference on Automated Software Engineering*, pages 114-224

ICSE'13 **Automatic Testing of Sequential and Concurrent Substitutability**
Michael Pradel, Thomas R. Gross. *International Conference on Software Engineering*, pages 282–291

TSE'13 **Name-based Analysis of Equally Typed Method Arguments**
Michael Pradel, Thomas R. Gross. *IEEE Transactions on Software Engineering*, 39(8), pages 1127–1143

PLDI'12 **Fully Automatic and Precise Detection of Thread Safety Violations**
Michael Pradel, Thomas R. Gross. *Conference on Programming Language Design and Implementation*, pages 521–530

ISSTA'12 **Static Detection of Brittle Parameter Typing**
Michael Pradel, Severin Heiniger, Thomas R. Gross. *International Symposium on Software Testing and Analysis*, pages 265–275

ICSE'12	**Leveraging Test Generation and Specification Mining for Automated Bug Detection without False Positives** Michael Pradel, Thomas R. Gross. *International Conference on Software Engineering*, pages 288–298
ICSE'12	**Statically Checking API Protocol Conformance with Mined Multi-Object Specifications** Michael Pradel, Ciera Jaspan, Jonathan Aldrich, Thomas R. Gross. *International Conference on Software Engineering*, pages 925–935
ICSE'12	**Ballerina: Automatic Generation and Clustering of Efficient Random Unit Tests for Multithreaded Code** Adrian Nistor, Qingzhou Luo, Michael Pradel, Thomas R. Gross, Darko Marinov. *International Conference on Software Engineering*, pages 727–737
ISSTA'11	**Detecting Anomalies in the Order of Equally-typed Method Arguments** Michael Pradel, Thomas R. Gross. *International Symposium on Software Testing and Analysis*, pages 232–242
ICSM'10	**A Framework for the Evaluation of Specification Miners Based on Finite State Machines** Michael Pradel, Philipp Bichsel, Thomas R. Gross. *International Conference on Software Maintenance*, pages 1–10
IJEIS'10	**A Good Role Model for Ontologies: Collaborations** Michael Pradel, Jakob Henriksson, Uwe Aßmann. *International Journal of Enterprise Information Systems*, 6(1), pages 1–11
ASE'09	**Automatic Generation of Object Usage Specifications from Large Method Traces** Michael Pradel, Thomas R. Gross. *International Conference on Automated Software Engineering*, pages 371–382
ICSOFT'08	**Scala Roles - A Lightweight Approach towards Reusable Collaborations** Michael Pradel, Martin Odersky. *International Conference on Software and Data Technologies*, pages 13–20. **Best student paper award**
RR'08	**Ontology Design and Reuse with Conceptual Roles** Jakob Henriksson, Michael Pradel, Steffen Zschaler, Jeff Z. Pan. *International Conference on Web Reasoning and Rule Systems*, pages 104–118

Awards and Distinctions

2023	ACM SIGSOFT Distinguished Paper Award at FSE'23 for *LExecutor: Learning-Guided Execution*
2023	ACM SIGSOFT Distinguished Paper Award at ISSTA'23 for *Beware of the Unexpected: Bimodal Taint Analysis*
2023	ACM SIGSOFT Distinguished Artifact Award at ISSTA'23 for *That's a Tough Call: Studying the Challenges of Call Graph Construction for WebAssembly*
2022	Distinguished Member of the ACM
2022	ACM SIGSOFT Distinguished Paper Award at FSE'22 for *The Evolution of Type Annotations in Python: An Empirical Study*
2022	ACM SIGSOFT Distinguished Paper Award at ASE'22 for *CrystalBLEU: Precisely and Efficiently Measuring the Similarity of Code*
2021	ACM SIGSOFT Distinguished Paper Award at FSE'21 for *Semantic Bug Seeding: A Learning-Based Approach for Creating Realistic Bugs*
2021	ACM SIGSOFT Distinguished Artifact Award at ISSTA'21 for *Finding Data Compatibility Bugs with JSON Subschema Checking*
Since 2021	Faculty Member in the International Max Planck Research School for Intelligent Systems (IMPRS-IS)
Since 2021	Member of the European Laboratory for Learning and Intelligent Systems (ELLIS)
Since 2019	Member of the IFIP Working Group 2.4 (Software Implementation Technology)
2019	Best Paper Award at ASPLOS'19 for *Wasabi: A Framework for Dynamically Analyzing WebAssembly*
2016	Distinguished Poster Award at ECOOP'16 for *Language-Independent Fuzz Testing with Probabilistic, Generative Models*

2014	Software Engineering Award of the Ernst-Denert-Foundation for the best dissertation (€5,000)
2009	Enno Heidebroek award (best engineering graduates at TU Dresden)
2009	Second winner in the Student Research Competition at OOPSLA'09 for paper *Dynamically Inferring, Refining, and Checking API Usage Protocols*
2008	Best student paper award at the International Conference on Software and Data Technology for paper *Scala Roles - A Lightweight Approach towards Reusable Collaborations*

Awards Received by Students Under My Supervision

2023	Daniel Lehmann. Best PhD Thesis in Computer Science at the University of Stuttgart. *Program Analysis of WebAssembly Binaries*
2022	Islem Bouzenia. Winner at ACM Student Research Competition at ASE'22. *Detecting Inconsistencies in If-Condition-Raise Statements*
2022	Luca Di Grazia. Second winner at ACM Student Research Competition at ICSE'22. *Efficiently and Precisely Searching for Code Changes with DiffSearch*
2018	Daniel Lehmann. Best Master Thesis in Computer Science at TU Darmstadt (Datenlotsen-Preis). *Automatic Testing of Interactive JavaScript Debuggers*

External Funding

November 2023	Individual research project funded by the German Research Foundation (DFG). *LExecution: Learning to Guide and Analyze Program Executions*. Principal investigator.
August 2023	Individual research project funded by the German Research Foundation (DFG). *QPTest: Automated Testing of Quantum Computing Platforms*. Principal investigator.
December 2021	Individual research project funded by the German Research Foundation (DFG). *DeMoCo: Developer-Centered, Neural Models of Code*. Principal investigator.
September 2019	ERC Starting Grant. *LearnBugs: Learning to Find Software Bugs*. Principal investigator. €1,500,000
October 2017	Individual research project funded by the German Research Foundation (DFG). *Perf4JS: Automatically Fixing Performance Problems in Real-World JavaScript Applications*. Principal investigator.
July 2017	Collaborative research project funded by the State of Hesse. *Software-Factory 4.0*. Principal investigator.
May 2017	Collaborative research project funded by the German Federal Ministry of Education and Research (BMBF) and by the State of Hesse. *Center for Research in Security and Privacy (CRISP)*. Principal investigator.
October 2015	Collaborative research project funded by the German Federal Ministry of Education and Research (BMBF) and by the State of Hesse. *Center for Research in Security and Privacy (CRISP)*. Principal investigator.
October 2014	Collaborative research project funded by the German Federal Ministry of Education and Research (BMBF). *European Center for Security and Privacy by Design (EC-SPRIDE)*. Principal investigator.
September 2014	Emmy Noether research group funded by DFG. *ConcSys: Reliable and Efficient Complex, Concurrent Software Systems*. Principal investigator. €1,300,000
Spring 2008	Scholarship of the German Academic Exchange Service DAAD. €4,250
2004 – 2006	Scholarship of the French-German University UFA/DFH. €6,000

Talks

Note: The following does not include regular paper presentations at conferences and workshops

2023	Microsoft Research. Hosts: Sumit Gulwani and Gustavo Soares
	LLMs for Code Seminar. Host: Nadav Timor
	IBM Research. Host: Saurabh Sinha
	AI4Code Meetup London. Host: Konstantina Dritsa

SDD Workshop at FSE'23. Invited talk

MET Workshop at ICSE'23. Keynote

inteNSE Workshop at ICSE'23. Keynote

April meeting of the IFIP Working Group 2.4 (Software Implementation Technology)

Uber. Host: Raj Barik

Dagstuhl seminar on *Programming Language Processing*

2022   International Symposium on Software Testing and Analyses (ISSTA). Keynote

Microsoft Research. Host: Roshanak Zilouchian Moghaddam

PL South-West Workshop, Tübingen

National University of Singapore. Host: Umang Mathur

June meeting of the IFIP Working Group 2.4 (Software Implementation Technology)

ASA Workshop at PLDI'22. Invited talk

New Faculty Symposium at ICSE'22. Invited talk

ETH Zurich. Host: Zhendong Su

University of Lugano (USI). Host: Mauro Pezze

ML4Code@Montreal. Host: Jin Guo

2021   Massachusetts Institute of Technology (MIT). Host: Niko Vasilakis

Northeastern University. Host: Frank Tip

Columbia University. Host: Baishakhi Ray

Stevens Institute of Technology. Host: Michael Greenberg

May meeting of the IFIP Working Group 2.4 (Software Implementation Technology)

New Faculty Symposium at ISSRE'22. Invited talk

November meeting of the IFIP Working Group 2.4 (Software Implementation Technology)

Workshop on Product Security at Bosch. Host: Christopher Huth

2020   Belgium-Netherlands Software Evolution Workshop (BENEVOL). Keynote

October meeting of the IFIP Working Group 2.4 (Software Implementation Technology)

January meeting of the IFIP Working Group 2.4 (Software Implementation Technology)

2019   Shonan seminar on *Fuzzing and Symbolic Execution*

University of California, Berkeley. Host: Koushik Sen

Workshop at PLDI'19 program committee meeting

2018   Dagstuhl seminar on *Genetic Improvement of Software*

Dagstuhl event on *Research Methods in Software Engineering*

Paderborn University. Host: Eric Bodden

Saarland University. Host: Holger Hermanns

ML4P Workshop at CAV. Invited talk

SOAP Workshop at ECOOP and ISSTA. Invited talk

Meeting of the IFIP Working Group 2.4 (Software Implementation Technology)

University of Maryland. Host: Michael Hicks

Facebook Big Code Summit. Host: Satish Chandra

2017   Dagstuhl seminar on *Testing and Verification of Compilers*

Imperial College London. Hosts: Ben Livshits and Alastair Donaldson

CREST workshop on *Bimodal Program Analysis* at University College London

University of Edinburgh. Host: Paul Jackson

CISPA, Saarbrücken. Host: Michael Backes

Meeting of the IFIP Working Group 2.4 (Software Implementation Technology)

University of Lugano (USI). Host: Mauro Pezze

Karlsruhe Institute of Technology. Host: Ralf Reussner

Stanford University. Host: Alex Aiken

Google, Mountain View. Host: Omer Tripp

Dagstuhl seminar on *Automated Program Repair*

University of Passau. Host: Christian Lengauer

SE 2017

2016 Meeting of the IFIP Working Ggroup 2.4 (Software Implementation Technology)

IMDEA Software Institute, Madrid. Host: Alessandra Gorla

Massachusetts Institute of Technology (MIT). Host: Martin Rinard

Harvard University. Host: Stephen Chong

Workshop at the ECOOP program committee meeting.

University of Stuttgart. Host: Daniel Weiskopf

TU Dresden. Host: Ivo F. Sbalzarini

2015 ETH Zurich. Host: Thomas R. Gross

Purdue University. Host: Mathias Payer

Aarhus University. Host: Anders Møller

Workshop on Programming Language Evolution. Invited speaker

Advisory Council of University Professors for the German Informatics Society (GIBU), Invited speaker

SE 2015. Two talks

Max Planck Institute for Software Systems, Host: Viktor Vafeiadis

2014 Workshop on Software Engineering for Parallel Systems. Invited speaker

Mozilla Research, San Francisco. Host: Michael Bebenita

University of California, Davis. Host: Zhendong Su

Google, Mountain View. Host: Ciera Jaspan

Samsung Research, San Jose. Host: Satish Chandra

TU Darmstadt. Hosts: Mira Mezini and Eric Bodden

SE 2014, Kiel. Award talk on the occasion of receiving the Software Engineering award of the Ernst-Denert-Foundation for the best dissertation

Meeting of the IFIP Working Group 2.4 (Software Implementation Technology)

2013 University of Lugano (USI). Host: Matthias Hauswirth

TU München. Host: Alexander Pretschner

TU Kaiserslautern. Host: Arnd Poetzsch-Heffter

TU Berlin. Host: Jean-Pierre Seifert

TU Dresden. Host: Uwe Assmann

Saarland University. Host: Andreas Zeller

University of Bern. Host: Oscar Nierstrasz

University of Zurich. Host: Harald Gall

Karlsruhe Institute of Technology. Host: Walter Tichy

TU Darmstadt. Hosts: Mira Mezini and Eric Bodden

2012 Coverity, San Francisco. Host: Murali Krishna Ramanathan

University of California, Berkeley. Host: Koushik Sen

University of Washington. Host: Michael Ernst

Google, Zurich. Host: Andreas Leitner

2011 Google, Zurich. Hosts: Jürgen Allgayer and Andreas Leitner

University of Waterloo. Hosts: Ondrej Lhotak and Patrick Lam

Carnegie Mellon University. Host: Jonathan Aldrich

2010 Dagstuhl seminar on *Relationships, Objects, Roles, and Queries in Modern Programming Languages*

Saarland University. Hosts: Sebastian Hack and Andreas Zeller

2009 Victoria University of Wellington. Host: David J. Pearce

Teaching Experience

Lecturer

Winter 2023/24	**Program Analysis**
	Lecture and project at University of Stuttgart. About 60 students.
	Machine Learning for Programming
	Seminar at University of Stuttgart. About 10 students.
Summer 2023	**Analyzing Software using Deep Learning**
	Lecture and project at University of Stuttgart. About 40 students.
	Programming Paradigms
	Lecture and exercise at University of Stuttgart. About 170 students.
Winter 2022/23	**Machine Learning for Programming**
	Seminar at University of Stuttgart. About 10 students.
Summer 2022	**Analyzing Software using Deep Learning**
	Lecture and project at University of Stuttgart. About 40 students.
	Programming Paradigms
	Lecture and exercise at University of Stuttgart. About 200 students.
Winter 2021/22	**Program Analysis**
	Lecture and project at University of Stuttgart. About 30 students.
	Machine Learning for Programming
	Seminar at University of Stuttgart. About 10 students.
Summer 2021	**Analyzing Software using Deep Learning**
	Lecture and project at University of Stuttgart. About 50 students.
	Programming Paradigms
	Lecture and exercise at University of Stuttgart. About 260 students.
Winter 2020/21	**Program Analysis**
	Lecture and project at University of Stuttgart. About 30 students.
	Machine Learning for Programming
	Seminar at University of Stuttgart. About 10 students.
Summer 2020	**Analyzing Software using Deep Learning**
	Lecture and project at University of Stuttgart. About 60 students.
	Programming Paradigms
	Lecture and exercise at University of Stuttgart. About 240 students.
Winter 2019/20	**Program Analysis**
	Lecture and project at University of Stuttgart. 20-30 students.
	Programming Paradigms
	Lecture and exercise at University of Stuttgart. About 200 students. Newly designed course.
	Practical Program Analysis
	Practical course at University of Stuttgart. About 10 students. Newly designed course.
	Machine Learning for Programming
	Seminar at University of Stuttgart. 10-15 students.
Winter 2018/19	**Machine Learning for Programming**
	Seminar at TU Darmstadt. About 15 students.
Summer 2018	**Analyzing Software using Deep Learning**
	Integrated course at TU Darmstadt. About 180 students.
Winter 2017/18	**Program Testing and Analysis**
	Integrated course at TU Darmstadt. About 100 students.
Summer 2017	**Analyzing Software using Deep Learning**
	Integrated course at TU Darmstadt. About 300 students. Newly designed course. In addition to a final exam, students work on a larger coding project.
Winter 2016/17	**Program Testing and Analysis**
	Integrated course at TU Darmstadt. About 80 students.
Winter 2015/16	**Program Testing and Analysis**
	Integrated course at TU Darmstadt. About 60 students. Newly designed course (13 lectures of 90 minutes). In addition to a final exam, students work on a larger coding project and write a term paper.

Winter 2014/15	**Program Analysis** Seminar at TU Darmstadt. 10-20 students. Newly designed course.
Spring 2013	**Software Architecture and Engineering** Core undergraduate course at ETH Zurich. About 100 students. Co-taught with Martin Vechev. Re-designed and extended existing course. Full responsibility for 13 lectures of 90 minutes, exercise sessions, a larger coding project, and for managing a group of teaching assistants.
Fall 2012	**Compiler Design** Replacement lecturer for one lecture of 90 minutes, at ETH Zurich.

Teaching Assistant

Teaching assistantships involve preparing and presenting exercises, preparing and grading exams, organizing office hours, and organizing larger coding projects.

Fall 2012	**Compiler Design**
Fall 2011	**Compiler Design**
Fall 2009	**System Programming and Computer Architecture**
Fall 2008	**Computer Architecture**
Fall 2008	**System Programming**

Mentor

Spring 2011	**Software Engineering seminar**
Fall 2008	**Software Engineering seminar**

Advising and Mentoring

PhD students	Beatriz Souza. Since April 2023
	Huimin Hu. Since October 2022
	Islem Bouzenia. Since September 2021
	Matteo Paltenghi. Since December 2020
	Aryaz Eghbali. Since October 2020
	Luca Di Grazia. Since September 2019
	Daniel Lehmann. Since December 2017 – August 2022
	Andrew Habib. October 2015 – February 2021
	Jibesh Patra. Since March 2015 – April 2021
	Cristian-Alexandru Staicu. October 2014 – May 2020
	Marija Selakovic. Since October 2014 – June 2019
Master theses	Piyush Krishan Bajaj. *DyPyBench: A Benchmark of Executable Python Software*. 2023
	Valentin Knappich. *Tests4J Benchmark: Execution-based Evaluation of Context-Aware Language Models for Test Case Generation*. 2023
	Felix Burk. *A Dynamic Analysis-Based Linter for Python*. 2023
	Yiu Wai Chow. *Bimodal Taint Analysis for Detecting Unusual Parameter-Sink Flows*. Co-advised with Max Schäfer. 2022. See paper at ISSTA'23
	Maximilian Reichel. *Metamorphic Testing of Version Control Systems*. Co-advised with Maria Christakis. 2022
	Dominik Huber. *Neural Models for Automatic Program Repair vs. Human Developers*. 2022
	Koushik Ragavendran. *NullnessGraphSeq: Learning-based Java Nullness Inference*. 2022
	Ya-Jen Hsu. *Learning to Identify Equivalent Code*. Co-advised with Andreas Bulling. 2021
	Sebastian Harner. *Automated Test Generation for Asynchronous, Higher-Order JavaScript Functions*. Co-advised with Frank Tip. 2020. See paper at ICSE'22
	Fahad Ghouri. *Learning to Profile: Finding Optimization Opportunities through Machine Learning*. 2020
	Yaza Wainakh. *A Benchmark for Evaluating and Improving Word Embeddings for Identifier Names*. 2019. See paper at ICSE'21
	Markus Zimmermann. *An Empirical Study of the npm Ecosystem*. 2018. See paper at USENIX Security'19

Sandro Tolksdorf. *Metamorphic Testing of Interactive JavaScript Debuggers*. 2018. See paper at ISSTA'19

Giacomo Iadarola. *Graph-based Classification for Detecting Instances of Bug Patterns*. 2018

Rabee Sohail Malik. *DeepTypes: a Probabilistic Approach to Inferring JavaScript Function Type Signatures*. 2018. See paper at ICSE'19

Prabhjot Singh. *Deep Assist: Contextual Code Assistance using Deep Learning*. 2018

Talal Ahmed. *VFix: Fixing Semantic Errors by Deep Learning*. 2018

Philippe Skolka. *An Empirical Study of Obfuscation and Minification of Client-Side Web Code*. 2018. See paper at WWW'19

Saeed Ehteshamifar. *Chameleon: A Benchmark for Analyzers of Malicious PDF Documents and Anti-Evasion Techniques*. 2017

Daniel Lehmann. *Automatic Testing of Interactive JavaScript Debuggers*. 2017. See paper at FSE'18

Sebastian Ruhleder. *Automatic Generation of Performance Benchmarks for JavaScript Libraries*. 2017

Dileep R. K. Murthy. *Change-aware Dynamic Program Analysis*. 2016. See paper at ICSME'18

Pooja Dixit. *Detecting Unexpected Interferences between Scripts in JavaScript Applications*. 2016. See paper at ICSE'18

Markus Ermuth. *Effective UI-Level Test Generation for Web Applications through Inferred Macro Events*. 2015. See paper at ISSTA'16

Ankit Choudhary. *Coverage-driven Generation of Concurrent Tests*. 2015. See paper at ICSE'17

Michael Fäs. *Automatic and Precise Detection of Deadlocks in Libraries*. 2013

Markus Huggler. *Performance Regression Testing for Thread-safe Classes*. 2013. See paper at ISSTA'14

Jérémie Bresson. *Finding API Usage Bugs with Runtime Monitoring*. 2010

Philipp Bichsel. *Inference of API Usage Documentation*. 2010. See paper at ICSM'10

Sebastian Grössl. *Finding Implicit Programming Rules and their Violations in Java Programs*. 2009

Bachelor theses	Patrick Bareiß. *Extracting Metamorphic Test Oracles from Natural Language Documentation*. 2021

Paul Bredl. *Improving the Recall of Searching for Code Changes*. 2021. See paper in IEEE TSE, 2022

Lars Gröninger. *Building an Extensible Dataset of Code Reviews*. 2020

Aaron Hilbig. *A Benchmark of WebAssembly Programs*. 2020. See paper at WWW'21

Patrick Mell. *Detecting Parallelization Opportunities in JavaScript Programs*. 2016

Thomas Glaser. *A Dynamic Analysis to Help Refactoring Complex Conditions for Improved Performance*. 2015. See paper at ISSTA'17

Pascal Zimmermann. *Name-based Type Inference*. 2012

Christine Zeller. *Software Anomaly Detection in a Real-world Setting*. Collaboration with Google, Zurich. 2012

Severin Heiniger. *API Usage Anomaly Detection Based on Points-to Analysis*. 2011. See paper at ISSTA'12

Claudio Corrodi. *Detecting Library Usage Anomalies*. 2011

Undergraduate supervision	Yiu Wai Chow. 2021–2022. See paper at ICSE'24

Satia Herfert. 2016–2017. See paper at ASE'17

Abhijit Singh. 2015–2016.

Hosam Nima. 2015.

Parker Schuh. 2013–2014. See papers at OOPSLA'14 and ICSE'15

▬▬▬▬▬ Reviewing and Service

Steering Committee	International Symposium on Software Testing and Analysis (ISSTA), 2022–now
Organizer/Chair	Program Committee Chair of International Symposium on Software Testing and Analysis (ISSTA), 2024
	Dagstuhl seminar on Code Search, 2024
	Dagstuhl seminar on Programming Language Processing, 2023
	Chair of Doctoral Symposium at Symposium on the Foundations of Software Engineering (ESEC/FSE), 2022
	Chair of Tool Demonstrations at International Symposium on Software Testing and Analysis (ISSTA), 2021
	Chair of Artifact Evaluation at International Symposium on Software Testing and Analysis (ISSTA), 2019
	Chair of Artifact Evaluation at European Conference on Object-Oriented Programming (ECOOP), 2017
	Dagstuhl seminar on Automated Program Repair, 2017
	Workshop on Dynamic Analysis (WODA), 2016
	Workshop on Tools for JavaScript Analysis (JSTools) at ECOOP, 2016
	Workshop on Tools for JavaScript Analysis (JSTools) at ECOOP, 2015
Area chair	Conference on Automated Software Engineering (ASE), 2024
Editor	IEEE Transactions on Software Engineering, 2020–now, Associate editor
	IEEE Software, 2020, Guest editor of special issue on "Automatic program repair"
Program committees	International Conference on Software Engineering (ICSE), 2025
	LLM4Code workshop at ICSE, 2024
	International Conference on Software Engineering (ICSE), 2023
	Symposium on the Foundations of Software Engineering (ESEC/FSE), 2023
	Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA), 2023
	International Symposium on Software Testing and Analysis (ISSTA), 2023
	Conference on Automated Software Engineering (ASE), 2023
	Software Engineering (SE), 2023
	International Conference on Software Engineering (ICSE), 2022
	Symposium on the Foundations of Software Engineering (ESEC/FSE), 2022
	International Symposium on Software Testing and Analysis (ISSTA), 2022
	Conference on Automated Software Engineering (ASE), 2022
	Workshop on Automated Program Repair at ICSE, 2022
	Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA), Extended review committee, 2021
	Conference on Automated Software Engineering (ASE), 2021
	Conference on Programming Language Design and Implementation (PLDI), 2021
	International Conference on Software Engineering (ICSE), 2021
	Symposium on the Foundations of Software Engineering (ESEC/FSE), 2021
	International Symposium on Software Testing and Analysis (ISSTA), 2021
	European Conference on Object-Oriented Programming (ECOOP), 2021
	Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA), External review committee, 2020
	Conference on Automated Software Engineering (ASE), 2020
	IEEE Transactions on Software Engineering, Review board, 2019–2020
	TheWebConf (WWW), Security track, 2020
	Doctoral Symposium at SPLASH, 2019
	Journal First Presentations at Conference on Automated Software Engineering (ASE), 2019
	Conference on Programming Language Design and Implementation (PLDI), 2019

International Conference on Software Engineering (ICSE), Program board, 2019

Conference on Automated Software Engineering (ASE), 2018

European Conference on Object-Oriented Programming (ECOOP), 2018

International Symposium on Engineering Secure Software and Systems (ESSoS), 2018

Workshop on API Usage and Evolution (WAPI) at ICSE, 2018

Workshop on Programming Technology for the Future Web (ProWeb), 2018

Software Engineering (SE), 2018

IEEE Transactions on Software Engineering, Review board, 2017–2018

Conference on Programming Language Design and Implementation (PLDI), 2017

International Conference on Software Engineering (ICSE), 2017

International Symposium on Software Testing and Analysis (ISSTA), 2017

Workshops at SPLASH, Program Committee, 2017

ACM Student Research Competition at ESEC/FSE, 2017

ProWeb workshop on programming methodology for the future web, Program Committee, 2017

Conference on Programming Language Design and Implementation (PLDI), External review committee, 2016

European Conference on Object-Oriented Programming (ECOOP), 2016

International Symposium on Software Testing and Analysis (ISSTA), 2016

International Symposium on the Foundations of Software Engineering (FSE), Demonstrations Track, 2016

Student Contest on Software Engineering (SCORE) at ICSE, 2016

Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA), 2015

ACM SIGPLAN Student Research Competition at SPLASH, 2015

Conference on Automated Software Engineering (ASE), Tool Demonstration Track, 2015

Workshop on Software Engineering for Parallel Systems at OOPSLA, 2015

Software Engineering (SE), 2015

Workshop on Software Engineering for Parallel Systems at OOPSLA, 2014

ACM Student Research Competition at International Conference on Software Engineering (ICSE), 2014

International Conference on Software Engineering (ICSE), poster track, 2014

Journal reviewer	IEEE Transactions on Software Engineering, 2014–2022
	Journal of Systems and Software, 2019
	Journal on Empirical Software Engineering, 2016
	ACM Transactions on Software Engineering and Methodology (TOSEM), 2015–2023
	IEEE Transactions on Parallel and Distributed Systems, 2014
	Science of Computer Programming, 2013, 2014
	Information and Software Technology, 2013
	IEEE Transactions on Information Forensics and Security, 2012
	Journal of Computer Science and Technology (JCST), 2011
External reviewer	International Symposium on Software Testing and Analysis (ISSTA), 2019
	Symposium on the Foundations of Software Engineering (FSE), 2016
	Symposium on Principles of Programming Languages (POPL), 2016
	European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE), 2015
	Conference on Computer Aided Verification (CAV), 2014
	Conference on Programming Language Design and Implementation (PLDI), 2014
	Principles and Practice of Parallel Programming (PPoPP), 2014
	European Conference on Object-Oriented Programming (ECOOP), 2013

	USENIX Workshop on Hot Topics in Parallelism (HotPar), 2012
	Conference on Programming Language Design and Implementation (PLDI), 2011
	Workshop on Relationships and Associations in Object-Oriented Languages (RAOOL) at ECOOP 2009
Other committees	IEEE Technical Council on Software Engineering Rising Star Award, 2023
	ACM SIGSOFT Research Highlights Committee (2020-2022)
Grant reviewing	German Research Foundation (DFG)
	European Research Council (ERC)
	Fonds National de la Recherche Luxembourg (FNR)
	Austrian Science Fund (FWF)
	Research Grants Council, Hong Kong (RGC)
	Alexander von Humboldt Foundation
	Dutch Research Council (NWO)
	National Research Foundation, Singapore (NRF)
PhD thesis committee	Ellen Arteca (Northeastern University, advisor: Frank Tip), 2022–2023
	Muhammad Numair Mansur (TU Kaiserslautern, advisor: Maria Christakis), 2023
	Mohammad Bajammal (University of British Columbia, advisor: Ali Mesbah), 2022
	Arianna Blasi (USI Lugano, advisor: Mauro Pezzè), 2020–2022
	Sven Keidel (Johannes Gutenberg-University Mainz, advisor: Sebastian Erdweg), 2021
	Anil Koyuncu (University of Luxembourg, advisor: Yves Le Traon), 2020
	Profir-Petru Partachi (University College London, advisor: Earl Barr), 2020
	Rafael-Michael Karampatsis (University of Edinburgh, advisor: Charles Sutton), 2020
	Luca Della Toffola (ETH Zurich, advisor: Thomas R. Gross), 2018
	Francesco Bianchi (USI Lugano, advisor: Mauro Pezzè), 2018
	Matthias Keil (University of Freiburg, advisor: Peter Thiemann), 2018
	I also served on 15+ Ph.D. examination committees at TU Darmstadt and University of Stuttgart

References

Available on request

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