# Tobias **Dürschmid**

PH.D. CANDIDATE IN SOFTWARE ENGINEERING AT CARNEGIE MELLON UNIVERSITY

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## Education

### PhD Student in Software Engineering
*Pittsburgh, PA, USA*

CARNEGIE MELLON UNIVERSITY, SCHOOL OF COMPUTER SCIENCE
*Since Aug. 2018*

- Advisors: David Garlan and Claire Le Goues
- Research Areas: Software Architecture, Program Analysis, Model-based Analysis, Software Engineering for Robotics
- Thesis: Automatic Inference of Behavioral Component Models for ROS-Based Robotics Systems
- Expected Graduation: Summer 2025

### Master of Science in Software Engineering
*Pittsburgh, PA, USA*

CARNEGIE MELLON UNIVERSITY, SCHOOL OF COMPUTER SCIENCE
*Aug. 2023*

- Coursework: Software Engineering Research; Empirical Methods in Software Engineering; Architectures for Software Systems; Program Analysis; Mobile and IoT Computing Services; CS Pedagody; Privacy Policy, Law, and Technology

### Master Student in IT-Systems Engineering
*Potsdam, Germany*

HASSO PLATTNER INSTITUTE, UNIVERSITY OF POTSDAM
*Oct. 2017 – Jul. 2018*

- Specialization in Software Engineering
- Coursework: Mining Software Repositories; Software Testing, Verification, and Analysis; Software Engineering for Self-adaptive Systems

### Bachelor of Science in IT-Systems Engineering
*Potsdam, Germany*

HASSO PLATTNER INSTITUTE, UNIVERSITY OF POTSDAM
*Oct. 2014 – Sep. 2017*

- Specialization in Software Architecture & Modeling Technology
- Selected Coursework: Modeling I + II; Software Architecture; Software Engineering I+II; Math I+II; Computer Graphics I+II; Mobile Image Processing; Human Computer Interaction; Modeling Process-oriented Systems, Design Thinking, Introduction to Programming I+II; Database Systems
- Grade: "1.1 (with distinction)" equals GPA 3.9–4.0 / 4.0

## Teaching

### Instructor – Designing Large-scale Software Systems (17-423 / 17-723)
*Pittsburgh, PA, USA*

CARNEGIE MELLON UNIVERSITY, SCHOOL OF COMPUTER SCIENCE
*Spring 2024*

- 17 students, first time offered, elective for graduate and undergraduate students across CMU
- Designed a new course from the ground up & taught as one of the instructors (co-taught with Prof. Eunsuk Kang)
- Designed learning objectives, designed a multi-team project, created and gave lectures, office hours, and recitations, designed and graded assignments and exams, handled potential academic integrity violations
- Topics covered: Quality attributes & trade-offs, Design Interoperability, Design for Testability, Design for & with Reuse, Design Processes
- Experience Report: [1]
- Course Website: `https://cmu-swdesign.github.io/`

### Instructor – Design Patterns & API Design (17-625)
*Remote Instruction*

CARNEGIE MELLON UNIVERSITY, SCHOOL OF COMPUTER SCIENCE
*Fall 2020*

- 29 students, first time offered, mandatory course in the Masters in Software Engineering (MSE) program
- Designed a new course from the ground up & taught as one of the instructors (co-taught with Prof. Matthew Bass)
- Created a new course, created and gave lectures, office hours, and recitations, designed assignments and exams
- Topics covered: GoF patterns, pattern variants & context tailoring, pattern composites, pattern languages

### Teaching Assistant – Software Architecture
*Remote Instruction*

CARNEGIE MELLON UNIVERSITY, SCHOOL OF COMPUTER SCIENCE
*Spring 2024*

- 29 students (professional software engineers), executive education course in collaboration with TalentSprint
- Instructors: Prof. David Garlan, Dr. Bradley Schmerl
- Planned & conducted 90 min hands-on mentoring sessions twice per week
- Topics covered: Quality attributes & architectural drivers, architectural styles, architectural tactics, modeling and analysis, architecture documentation, architecture evaluation, agile architecture
- Course Website: `https://talentsprint.com/course/software-architecture-carnegie-mellon-university`

### Teaching Assistant – Models of Software Systems (17-651)

*Pittsburgh, PA, USA*

CARNEGIE MELLON UNIVERSITY, SCHOOL OF COMPUTER SCIENCE

*Fall 2019*

- 46 students, mandatory course in the Masters in Software Engineering (MSE) program
- Instructors: Prof. David Garlan, Prof. Eunsuk Kang
- Graded homework and gave office hours, recitations, and lectures
- Topics covered: logic & sets, state machines & FSP, Markov chains & PRISM, structural modeling & Alloy

### Teaching Assistant – Software Engineering II – Agile Software Development in Large Teams

*Potsdam, Germany*

HASSO PLATTNER INSTITUTE, ENTERPRISE PLATFORMS AND INTEGRATION CONCEPTS RESEARCH GROUP

*Oct. 2017 – Mar. 2018*

- 42 students, elective for undergraduates in IT-Systems Engineering
- Instructor: Dr. Matthias Uflacker
- Tutored students in agile large-scale software engineering projects and overhauled the lecture on code review
- Topics covered: Scaling Scrum, requirements engineering, team work, code reviews, estimation
- Education Paper: [2]

### Teaching Assistent – Modeling I

*Potsdam, Germany*

HASSO PLATTNER INSTITUTE, SYSTEM ANALYSIS AND MODELING RESEARCH GROUP

*Oct. 2015 – Feb. 2016*

- 90 students, mandatory course for undergraduates in IT-Systems Engineering
- Instructor: Prof. Holger Giese
- Graded homework and gave office hours and recitations
- Topics covered: class & object modeling, sequence diagrams, state charts, mathematical modeling

### Guest Lectures

*Pittsburgh, PA, USA*

CARNEGIE MELLON UNIVERSITY, SCHOOL OF COMPUTER SCIENCE

*Spring 2024, Spring 2023, Spring 2022, Spring 2021*

- Course: Software Architecture (17-755 / 17-633) within CMU's Master Program in Software Engineering for Professionals
- Topics covered in guest lectures: Analyzing Quality Attributes, Model-based analysis of spacecraft & robotics architectures
- Instructors: David Garlan, Bradley Schmerl

### Guest Lectures

*Remote Instruction*

CARNEGIE MELLON UNIVERSITY, SCHOOL OF COMPUTER SCIENCE

*Spring 2023, Spring 2022, Spring 2021*

- Software Architecture Workshop for NASA Jet Propulsion Laboratory
- Topics covered in guest lectures: Analyzing Quality Attributes, Model-based analysis with F' and F"
- Instructor: David Garlan

## Mentorship Experience

### Graduate Research Assistant Mentor

*Pittsburgh, PA, USA*

CARNEGIE MELLON UNIVERSITY, SCHOOL OF COMPUTER SCIENCE

*Summer & Fall 2024*

- Advised one master student (Siyan Wu) on a full-time summer research project on a bug data set collection that was continued part-time during the fall

### Research Experience for Undergraduates in Software Engineering (REUSE) Mentor

*Pittsburgh, PA, USA*

CARNEGIE MELLON UNIVERSITY, SCHOOL OF COMPUTER SCIENCE

*Summer 2024*

- Advised two undergraduate students on full-time summer research projects
- Students: Mohamed Radalla, Levi Bushing
- Research Outcomes: Both students are currently working on publications of their research findings.

### Graduate Research Assistant Mentor

*Pittsburgh, PA, USA*

CARNEGIE MELLON UNIVERSITY, SCHOOL OF COMPUTER SCIENCE

*Spring 2024*

- Advised one software engineering master student (Jihun Choi) on a research project on a large-scale empirical study of the ROS ecosystem

### Research Experience for Undergraduates in Software Engineering (REUSE) Mentor

*Pittsburgh, PA, USA*

CARNEGIE MELLON UNIVERSITY, SCHOOL OF COMPUTER SCIENCE

*Summer 2019*

- Advised three undergraduate students on full-time summer research projects
- Students: Benjamin Gafford (went on to become a PhD student at CMU afterwards), Jeanie Chen (went on to become a software engineer at Apple Inc. afterwards), and Joseph Worku)
- Research Outcomes: One student (Benjamin Gafford) published an ASE paper about his research

### Undergraduate Research Assistant Mentor

*Potsdam, Germany*

Hasso Plattner Institute, Enterprise Platforms and Integration Concepts Research Group

*Mar 2017 – Jul. 2018*

- Advised one undergraduate student (Milan Proell, went on to become a software engineer at SAP SE afterwards) on developing a mobile graphics app

# Pedagodical Training

### Future Faculty Program

*Pittsburgh, USA*

CMU's Eberly Center for Teaching Excellence and Educational Innovation

*Sep. 2020 - May 2024*

- Selected Seminars: Course and Syllabus Design, Teaching Metacognitive Skills, Preparing and Delivering Effective Lectures, Helping Students Develop Mastery and Critical Thinking, Guiding Attention and Memory to Build Knowledge, Teaching Inclusively, Informing Your Teaching with Classroom Assessment Techniques (CATs), Generative AI: Spotlight on Strategies and Policy for Teaching, Conducting Productive and Engaging Discussions, Grading and Delivering Feedback on Quantitative Assignments (Code, Problem sets, etc.), Working Well One on One with Students, Teaching Problem Solving in Recitation
- Projects: Course & Syllabus Design Project (improved version of 17-423: Designing Large-scale Software Systems), Teaching Statement Project
- Teaching Feedback Consultations: Two Teaching Observations, two Early Course Feedback/Focus Group Sessions

# Employment & Practical Software Engineering Experience

### Software Engineering Intern

*remote, USA*

NASA Jet Propulsion Laboratory

*Jun. 2020 – Aug. 2020*

- Developed a modeling and analysis technique for quality attributes of small scale flight software systems in F' and F" using Python
- Gained insights into the unique challenges and solutions for developing space craft software

### Software Engineer for Mobile Graphics

*Potsdam, Germany*

Hasso Plattner Institute / University of Potsdam, Computergraphics Systems Research Group

*Mar. 2016 – Jul. 2018*

- Designed, implemented, and evaluated a software product line of image processing apps for Android
- Worked in a software team with more than 30 contributing developers
- Supervised and mentored junior developers
- Created a Jenkins continuous integration infrastructure for automated testing of Android apps
- Introduced architectural rule checking into the project
- Worked with Java, OpenGL ES, and Android Studio

### Student Research Assistent

*Potsdam, Germany*

Hasso Plattner Institute / University of Potsdam, System Analysis and Modeling Research Group

*Dec. 2014 – Mar. 2015*

- Model-driven description of refactorings for an incremental recovery engine
- Worked with the Eclipse Modeling Framework

# Software Engineering Experience in Course & Research Projects

### Product Owner Role

*Potsdam, Germany*

Hasso Plattner Institute, Course "Software Engineering II - Agile Development in Large Teams"

*Oct. 2016 – Feb. 2017*

- Gained experience with scaling Scrum in a multi-team web application project
- 40 Students working one project
- Created user stories based on customer interviews
- Evaluated user stories & presented development progress to customers

### Software Engineer

*Potsdam, Germany*

Hasso Plattner Institute, Course "Software Engineering I"

*March. 2016 – Jul. 2017*

- Developed a search bar similar to Apple's Spotlight
- Gained practical experience with test-driven development, small releases, and pair-programming
- Team of 5 students

### Software Engineer

*Potsdam, Germany*

Hasso Plattner Institute, Course "Software Architecture"

*Oct. 2015 – Feb. 2016*

- Developed a digital version of the game "Monopoly"
- Gained experience with design patterns, design decision making, and software testing
- Team of 5 students

# Software Development Skills

| | |
|---:|:---|
| **Software Design** | Design Patterns (advanced), Software Design Principles (advanced), API Design (intermediate) |
| **Software Modeling** | UML (advanced), TLA+/PlusCal (intermediate), PRISM (intermediate), Acme (intermediate), Alloy (intermediate) |
| **Software Processes** | Scrum (advanced), Extreme Programming (advanced), Kanban (intermediate), RUP (basic) |
| **Software Testing** | TDD (advanced), Mock Objects (advanced), BDD (intermediate) |
| **Technologies** | Android App Development (advanced), OpenGL (intermediate), Robot Operating System (intermediate) |
| **Certificates** | OMG Certified UML Professional 2 |

# Honors & Awards

Nov. 2017 **Best Paper Award**, SIGGRAPH ASIA Mobile Graphics and Interactive Applications *Bangkok, Thailand*

Apr. 2017 **1. Place in the ACM Student Research Competition**, International Conference on the Art, Science and Engineering of Programming *Brussels, Belgium*

2014 – Sep. 2019 **Scholarship of the "Studienstiftung des deutschen Volkes" (German Academic Scholarship Foundation)**, Largest scholarship in Germany, given to less than 0.5% of all students in Germany *Germany*

# Service & Volunteering

**Co-Director / Member of the SCS4All PhD Initiative / Dean's PhD Student Advisory Committee** *Pittsburgh, PA, USA*

Carnegie Mellon University, School of Computer Science *since Mar. 2019*

- Led the committee as a co-director Aug 2019 – Jan 2020
- Provided support to overcome the issues that PhD students experience at the School of Computer Science at CMU
- Organized welcome events for incoming PhD students
- Organized the "Coffee-Chat" program, which increases social connectedness between different departments and within underrepresented groups in SCS

**Co-Director / Member of Student Society for Teaching High-School Students** *Potsdam, Germany*

Hasso Plattner Institute *Oct. 2014 - Jul. 2018*

- Led the group as a co-director Mar 2015 – Mar 2016
- Organized and taught during the "Girls Day", which is an educational event designed to encourage female high school students to pursue a career in computer science.
- Organized multiple multi-day computer science educational camps for high school students with team-based software development projects, team-building events, and short introductory lectures on software development topics

**Member of the SSSG Steering Committee** *Pittsburgh, PA, USA*

Carnegie Mellon University, School of Computer Science, Software & Societal Systems Department *Summer 2022 – Spring 2023*

- Orgainized a weekly presentation series for software engineering PhD students
- Improved the structure of the venue based on previous student feedback

**Member of the Software Engineering Teaching Track Hiring Committee** *Pittsburgh, PA, USA*

Carnegie Mellon University, School of Computer Science, Software & Societal Systems Department *Fall 2023 – Spring 2024*

**Member of the Software Engineering PhD Student Admission's Committee** *Pittsburgh, PA, USA*

Carnegie Mellon University, School of Computer Science *Fall 2019*

**Member of the Artifact Evaluation Committee** *Pittsburgh, PA, USA*

Programming Journal (The Art, Science, and Engineering of Programming) *Summer 2022 – Spring 2023*

**Sub-Reviewer for Conferences** *Pittsburgh, PA, USA*

CARNEGIE MELLON UNIVERSITY, SCHOOL OF COMPUTER SCIENCE *Since 2018*

- Sub-Reviewer for the Technical Track of the International Conference on Software Engineering (ICSE) 2019 and 2022
- Sub-Reviewer for the Technical Track of the International Conference on Automated Software Engineering (ASE) 2021 and 2022
- Sub-Reviewer for the Technical Track of the International Conference on Software Architecture (ICSA) 2020 and 2022
- Sub-Reviewer for the Technical Track of the European Conference on Software Architecture (ECSA) 2019
- Sub-Reviewer for the Symposium on Software Engineering for Adaptive and Self-Managing System (SEAMS) 2021 and 2022

**Student Volunteer at Conferences**

VARIOUS CONFERENCES

- International Conference on Software Engineering (ICSE) 2019
- SEI Architecture Technology User Network Conference (SATURN) 2019
- International Conference on Software Architecture (ICSA) 2019
- International Conference on the Art, Science, and Engineering of Programming (‹Programming›) 2017
- Conference on Systems, Programming, Languages, and Applications: Software for Humanity (SPLASH) 2016

# Talks & Presentations

**Presenter for "ROSInfer: Statically Inferring Behavioral Component Models for ROS-based Robotics Systems"** *Lisbon, Portugal*

INTERNATIONAL CONFERENCE ON SOFTWARE ENGINEERING (ICSE) *Apr. 2024*

**Lightning Talk on "Automatically Finding Architectural Composition Bugs"** *New Orleans, USA*

ROSCON *Oct. 2023*

**Presenter for "Architectural Model Inference From Code For ROS-Based Robotics Systems."** *London, UK*

IEEE INTERNATIONAL CONFERENCE ON ROBOTICS AND AUTOMATION (ICRA) *May. 2023*

**Presenter for "ROSDiscover: Statically Detecting Run-Time Architecture Misconfigurations in Robotics Systems"** *Virtual*

IEEE INTERNATIONAL CONFERENCE ON SOFTWARE ARCHITECTURE (ICSA) *Mar. 2022*

**Presenter for "Trade-off-Oriented Development - Making Quality Attribute Trade-offs First-Class"** *Montreal, Canada*

ACM/IEEE INTERNATIONAL CONFERENCE ON SOFTWARE ENGINEERING (ICSE) *May. 2019*

**Presenter for "ProsumerFX: Mobile Design of Image Stylization Components"** *Bangkok, Thailand*

ACM SIGGRAPH ASIA SYMPOSIUM ON MOBILE GRAPHICS AND INTERACTIVE APPLICATIONS (MGIA) *Nov. 2017*

**Presenter for "Towards Architectural Styles for Android App Software Product Lines"** *Buenos Aires, Argentina*

IEEE/ACM INTERNATIONAL CONFERENCE ON MOBILE SOFTWARE ENGINEERING AND SYSTEMS (MOBILESOFT) *May 2017*

**Poster presentation and research talk of "Continuous Code Reviews: A Social Coding tool for Code Reviews inside the IDE"** *Bruessels, Belgium*

ACM STUDENT RESEARCH COMPETITION AT ‹PROGRAMMING› *Apr. 2017*

**Poster presentation of "Design Pattern Builder: A Concept for Refinable Reusable Design Pattern Libraries"** *Amsterdam, Nederlands*

ACM STUDENT RESEARCH COMPETITION AT SPLASH *Nov. 2016*

# Publications

## Education Papers

[1]    Tobias Dürschmid and Eunsuk Kang. "Experience Report on Teaching 'Designing Large-scale Software Systems (17-423 / 17-723)', actual title blinded for submission to CSEE&T '25". In: *Submitted to CSEE&T '25*. Draft available at `https://tobiasduerschmid.github.io/files/cseet25-software-design-course.pdf`. 2025.

[2]    Christoph Matthies, Johannes Huegle, Tobias Dürschmid, and Ralf Teusner. "Attitudes, Beliefs, and Development Data Concerning Agile Software Development Practices". In: *Proceedings of the 41th International Conference on Software Engineering: Software Engineering Education and Training Track*. ICSE-SEET '19. 2019, pp. 158–169. DOI: `10.1109/ICSE-SEET.2019.00025`.

[3]    Matthias Trapp, Sebastian Pasewaldt, Tobias Dürschmid, Amir Semmo, and Jürgen Döllner. "Teaching Image-Processing Programming for Mobile Devices: A Software Development Perspective". In: *EG 2018 - Education Papers*. 2018. DOI: `10.2312/eged.20181002`.

## Research Papers

[4]    Tobias Dürschmid, Christopher S. Timperley, David Garlan, and Claire Le Goues. "ROSInfer: Statically Inferring Behavioral Component Models for ROS-based Robotics Systems". In: *Proceedings of the 46th International Conference on Software Engineering.* ICSE '24. 2024. DOI: `10.1145/3597503.3639206`.

[5]    Christopher S. Timperley, Tobias Dürschmid, Bradley Schmerl, David Garlan, and Claire Le Goues. "ROSDiscover: Statically Detecting Run-Time Architecture Misconfigurations in Robotics Systems". In: *Proceedings of the 19th IEEE International Conference on Software Architecture.* ICSA '22. 2022, pp. 112–123. DOI: `10.1109/ICSA53651.2022.00019`.

[6]    Benjamin Gafford, Tobias Dürschmid, Gabriel A. Moreno, and Eunsuk Kang. "Synthesis-Based Resolution of Feature Interactions in Cyber-Physical Systems". In: *Proceedings of the 35th IEEE/ACM International Conference on Automated Software Engineering.* ASE '20. 2020, pp. 1090–1102. DOI: `10.1145/3324884.3416630`.

[7]    Tobias Dürschmid, Eunsuk Kang, and David Garlan. "Trade-off-Oriented Development – Making Quality Attribute Trade-offs First-Class". In: *Proceedings of the 41th International Conference on Software Engineering: New Ideas and Emerging Results Track*. ICSE-NIER '19. 2019, pp. 109–112. DOI: `10.1109/ICSE-NIER.2019.00036`.

[8]    Robert Hirschfeld, Tobias Dürschmid, Patrick Rein, and Marcel Taeumel. "Cross-cutting Commentary: Narratives for Multi-party Mechanisms and Concerns". In: *Proceedings of the 10th International Workshop on Context-Oriented Programming: Advanced Modularity for Run-time Composition*. COP '18. 2018, pp. 39–47. DOI: `10.1145/3242921.3242927`.

[9]    Tobias Dürschmid, Maximilian Söchting, Amir Semmo, Matthias Trapp, and Jürgen Döllner. "ProsumerFX: Mobile Design of Image Stylization Components". In: *SIGGRAPH ASIA 2017 Mobile Graphics and Interactive Applications*. SA'17. Bangkok, Thailand, 2017. DOI: `10.1145/3132787.3139208`.

[10]   Tobias Dürschmid, Matthias Trapp, and Jürgen Döllner. "Towards Architectural Styles for Android App Software Product Lines". In: *Proceedings of the IEEE/ACM International Conference on Mobile Software Engineering and Systems*. MOBILESoft '17. 2017, pp. 58–62. DOI: `10.1145/3132787.3139208`.

[11]   Tobias Dürschmid. "Continuous Code Reviews: A Social Coding Tool for Code Reviews Inside the IDE". In: *Companion to the International Conference on the Art, Science and Engineering of Programming*. Programming '17. 2017, 41:1–41:3. DOI: `10.1145/3079368.3079374`.

[12]   Amir Semmo, Tobias Dürschmid, Matthias Trapp, Mandy Klingbeil, Jürgen Döllner, and Sebastian Pasewaldt. "Interactive Image Filtering with Multiple Levels-of-control on Mobile Devices". In: *SIGGRAPH ASIA 2016 Mobile Graphics and Interactive Applications*. SA '16. 2016, 2:1–2:8. DOI: `10.1145/2999508.2999521`.

[13]   Tobias Dürschmid. "Design Pattern Builder: A Concept for Refinable Reusable Design Pattern Libraries". In: *Companion Proceedings of the 2016 ACM SIGPLAN International Conference on Systems, Programming, Languages and Applications: Software for Humanity*. SPLASH Companion '16. 2016, pp. 45–46. DOI: `10.1145/2999508.2999521`.

[14]   Thijs Roumen, Bastian Kruck, Tobias Dürschmid, Tobias Nack, and Patrick Baudisch. "Mobile Fabrication". In: *Proceedings of the 29th Annual Symposium on User Interface Software and Technology*. UIST '16. 2016, pp. 3–14. DOI: `10.1145/2984511.2984586`.