

CURRICULUM VITAE

DR. **STEFAN MITSCH**

DePaul University
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PERSONAL RECORD

Citizenship:	Austrian	Date of Birth:	October 18 th , 1979
	US Permanent Resident	Birth name:	Stefan Schmid

EDUCATIONAL RECORD

SCHOOL EDUCATION

09/1986–07/1990	Primary Level:	Volksschule Frankenmarkt, Austria
09/1990–07/1994	Secondary Level:	Realgymnasium Vöcklabruck, Austria
09/1994–07/1999	Third Level:	Secondary Technical College Braunau, Osternbergerstraße 55 A-5280 Braunau am Inn, Austria
1999 June	Graduation Diploma:	Electronics, communications engineering and computer science WITH DISTINCTION

ACADEMIC EDUCATION

Doctoral Studies

10/2006–12/2011	PHD COMPUTER SCIENCE	Johannes Kepler University Linz, Austria
		TOWARDS QUALITATIVE PREDICTION OF SITUATION EVOLUTION IN DYNAMIC SPATIAL SYSTEMS
		ADVISERS: a.Univ.-Prof. Mag. Dr. Werner Retschitzegger Assoc.-Prof. Mag. Dr. Wieland Schwinger, MSc
		WITH DISTINCTION
		PROMOTIO SUB AUSPICIIS PRAESIDENTIS REI PUBLICAE

Diploma Studies

10/2000–07/2004	DI (FH) SOFTWARE ENGINEERING	Upper Austria University of Applied Sciences, Hagenberg Campus WITH DISTINCTION
		THESIS: REALTIME REMOTE PROFILING JAVA APPLICATIONS ON MOBILE DEVICES
		ADVISER: FH-Prof. DI Dr. Werner Christian Kurschl

EMPLOYMENT RECORD

ASSOCIATE PROFESSOR	9/2023-present	School of Computing DePaul University 243 S. Wabash Avenue Chicago, IL 60604-2301, USA
SENIOR SYSTEMS SCIENTIST (RANK OF ASSOCIATE PROFESSOR)	7/2022-7/2023	Computer Science Department Carnegie Mellon University 5000 Forbes Ave Pittsburgh, PA 15213, USA
SYSTEMS SCIENTIST (RANK OF ASSISTANT PROFESSOR)	5/2016-6/2022	Computer Science Department Carnegie Mellon University 5000 Forbes Ave Pittsburgh, PA 15213, USA
MARIE CURIE FELLOW	2/2014-1/2015 5/2015-4/2016	Computer Science Department, Carnegie Mellon University, and Institute of Telecooperation, Dep. of Cooperative Information Systems, Johannes Kepler University
POSTDOCTORAL FELLOW	11/2012-1/2014 2/2015-4/2015	Computer Science Department Carnegie Mellon University 5000 Forbes Avenue Pittsburgh, PA 15213, USA
POSTDOCTORAL FELLOW	1/2012–10/2012	Institute of Telecooperation, Dep. of Cooperative Information Systems, Johannes Kepler University Linz Altenberger Straße 69 4040 Linz, AUSTRIA
PHD CANDIDATE	4/2009–12/2011	Institute of Telecooperation, Dep. of Cooperative Information Systems, Johannes Kepler University Linz Altenberger Straße 69, 4040 Linz, AUSTRIA
MARSHALL PLAN SCHOLAR	7/2011–10/2011	Computer Science Department Carnegie Mellon University 5000 Forbes Avenue, Pittsburgh, PA 15213, USA
LECTURER	3/2005–6/2012	Upper Austria University of Applied Sciences, Hagenberg Campus Softwarepark 11, 4232 Hagenberg, AUSTRIA
RESEARCHER	8/2004–3/2009	Upper Austria University of Applied Sciences R&D, Hagenberg Campus Softwarepark 11, 4232 Hagenberg, AUSTRIA
INTERN	12/2003–6/2004	Siemens AG Corporate Technology—Software and Engineering II Otto-Hahn-Ring 6, Munich, GERMANY
INTERN	8/2003–11/2003	S.C. Art-Net SRL Cluj Napoca, ROMANIA
SOCIAL SERVICE	9/1999-9/2000	Lebenshilfe OÖ, Werkstätte Vöcklamarkt

TEACHING RECORD

UNIVERSITY LECTURES

CONCEPTS OF PROGRAMMING LANGUAGES Functional programming, algebraic datatypes, object-oriented programming		DePaul University 2023 fall	CSC347, CSC447
LOGICAL FOUNDATIONS OF CYBER-PHYSICAL SYSTEMS Logical foundations, hybrid systems, hybrid games, theorem proving	12 credits	Carnegie Mellon University 2022 fall	LCFCS 15-424/624/824
SPECIAL TOPICS IN COMPUTER SCIENCE: SEMANTIC TECHNOLOGIES IN SITUATION AWARENESS APPLICATIONS Situation Awareness, Qualitative Reasoning, Planning, and Verification in Dynamic Spatial Systems	3 ECTS	Johannes Kepler University Linz 2011/12 winter	1 group
SOFTWARE ENGINEERING 5 Java Web application development, J2EE design patterns, database access	5 ECTS	Upper Austria University of Applied Sciences, Hagenberg Campus, degree program Bioinformatics 2011/12 winter 2010/11 winter 2009/10 winter 2008/09 winter	2 groups 1 group 1 group 1 group
MOBILE AND UBIQUITOUS SYSTEMS Speech synthesis and recognition, wireless sensor networks (nesC, Sentilla JCreate), gesture control (Kinect)	1.5 ECTS	Upper Austria University of Applied Sciences, Hagenberg Campus, degree program Software Engineering, and Information Engineering & Management 2012 summer 2011 summer 2010 summer 2009 summer 2008 summer 2007 summer	2 groups 1 group 2 groups 2 groups 2 groups 2 groups
SOFTWARE ENGINEERING 4 Programming in Java, design patterns	3 ECTS	Upper Austria University of Applied Sciences, Hagenberg Campus, degree program Bioinformatics (since 2011: Medical and Bioinformatics) 2012 summer 2011 summer 2010 summer 2009 summer 2008 summer 2007 summer 2006 summer	2 groups 2 groups 1 group 1 group 1 group 1 group 1 group
SOFTWARE ENGINEERING 3 Programming in C++, object-oriented programming	3 ECTS	Upper Austria University of Applied Sciences, Hagenberg Campus, degree program Bioinformatics 2009/10 winter 2008/09 winter 2007/08 winter 2006/07 winter 2005/06 winter	1 group 1 group 1 group 1 group 1 group
PROJECT ENGINEERING STUDENT PROJECT (MENTOR)	2 ECTS	Upper Austria University of Applied Sciences, Hagenberg Campus, degree program Software Engineering 2008 summer 2007/08 winter	1 group 1 group
DATA ENGINEERING UML 2.0 and XML	2 ECTS	Upper Austria University of Applied Sciences, Hagenberg Campus, degree program Bioinformatics 2005 summer	2 groups

SUMMER SCHOOLS

- Foundations of Cyber-Physical Systems (Summer School on Formal Methods) 2019 Institute of Software, Chinese Academy of Sciences, Beijing, China
- Foundations of Cyber-Physical Systems (Summer School on Formal Methods) 2018 Institute of Software, Chinese Academy of Sciences, Beijing, China

PHD THESES COMMITTEE SERVICE AND MENTORING

- Deductive Verification for Ordinary Differential Equations: Safety, Liveness, and Stability 2022 Yong Kiam Tan
- Practical end-to-end Verification of Cyber-physical Systems 2021 Rose Bohrer
- Verifiably Safe Autonomy for Cyber-physical Systems 2018 Nathan Fulton
- Component-based Deductive Verification of Cyber-physical Systems 2017 Andreas Müller
- Differential Refinement Logic 2016 Sarah Loos

BACHELOR AND MASTERS THESES MENTORING

- Formal Verification of the Winning Strategies of Pursuit-Evasion Games (Master thesis, ongoing collaboration) 5/2022-present Weihan Li
- Transfer of Safety Guarantees from Differential Dynamic Logic Proofs to Neural Network based Controller Systems (Master thesis) 1/2022-7/2022 Samuel Teuber
- Safety Analysis of Communicating Hybrid Components (Master thesis, ongoing collaboration) 2/2021-present Marvin Brieger
- Formal Verification of Collision Avoidance for Controllers of Robotic Ground Vehicles (Bachelor thesis) 5/2014-8/2014 David Vogelbacher
- Profiling Users in Social Networks (Master thesis) 10/2011 - 06/2012 Martin Fleck
- Conceptualization, Software Design, and Automated Testing of an Eclipse-based Modeling Environment for Hybrid Systems (Master thesis) 10/2012 – 06/2013 Ralph Mayr
- Information Extraction from Social Web Sites (Master thesis) 10/2011 – 06/2012 Matthias Popp
- Floating Car Data (Bachelor thesis) 10/2011-3/2012 Harald Weiner/Markus Niederkofler
- Action planning within the scope of the CSI project (Bachelor thesis) 10/2011-3/2012 Gerald Madlspurger
- Ereignisvorhersage im Verkehrsmanagement (Masters thesis) 10/2011-8/2012 Christoph Hubl
- Textual and Graphical Multi-View Modeling of Critical Situation Types (Bachelor thesis) 10/2010 - 06/2011 Ralph Mayr

UNDERGRADUATE AND MASTERS RESEARCH MENTORING

- Compositional verification of industrial control systems 1/2023-7/2023 Cynthia Wang
- Translate proof terms to KeYmaera X proof tactics 5/2022-8/2022 Emily Song
- Quantitative ModelPlex semantics for reinforcement learning, practical verified virtual substitution for real arithmetic 5/2022-5/2023 Qianfan Luo
- Safety proofs as control boundaries for learning recovery control, formal methods assisted reward shaping 5/2022-7/2023 Marian Qian
- Replay SMT proofs in KeYmaera X 5/2022-7/2023 Liam Hower

▪ Performance optimization of verified virtual substitution	5/2022-8/2022	Ziqi Liu
▪ Minimizing Sequents to Find Modeling Errors	1/2022-present	Myra Dotzel
▪ Formal verification of the responsibility-sensitive safety model for self-driving cars, tests and proofs	09/2021-7/2023	Megan Strauss
▪ Implicit definitions in KeYmaera X	02/2021-6/2022	James Gallicchio
▪ Abstraction and CEGAR for verification and explanations of neural networks	01/2019-1/2022	David Bayani
▪ Hybrid program falsification	09/2021-12/2021	Zhongyi Cao
▪ Modeling and verification of ground robots with learned controllers	01/2020-05/2020	Naveen Pai
▪ Unit measures and unit conversion in KeYmaera X models, Airborne collision avoidance proofs in KeYmaera X game logic (CMU SCS Alumni Award for Undergraduate Excellence 2021, CRA Outstanding Researcher Award Honorable Mention 2021)	09/2018-05/2021	Rachel Cleaveland (now CS PhD Stanford)
▪ Formal modeling of train controllers, generation, and verification of robust invariants for differential equations	01/2018 – 08/2018	Yiyang Guo (now CS Masters CMU)
▪ Simulation of cyber-physical systems models and train braking controllers	08/2017 – 04/2018	Vaidehi Srinivas (now CS PhD Northwestern University)
▪ Simulation of hybrid programs in Mathematica	10/2012 - 06/2013	Il Suk Lyu

HONORS

- EMSOFT 2022 Best Paper Award Finalist
- HSCC 2022 Best Paper Award and Best Repeatability Evaluation Award
- ARCH 2021 Competition Best Result Award
- FM 2019 Best Tool Paper Award
- ICCPS 2019 Best Paper Award Finalist
- RV 2014 Best Paper Award Finalist
- MARIE CURIE INTERNATIONAL OUTGOING FELLOWSHIP 2013
- RESEARCH AWARD OF THE AUSTRIAN FEDERAL MINISTRY OF SCIENCE AND RESEARCH 2012
- PROMOTIO SUB AUSPICIIS PRAESIDENTIS REI PUBLICAE 2012
- BEST ACADEMIC TEACHER AWARD (2008/09), 2nd Place, Upper Austria University of Applied Sciences, Hagenberg Campus (Bioinformatics department)

COMMUNITY SERVICE

- JOURNAL EDITORIAL BOARD MEMBERSHIP:
 - Science of Computer Programming (SCP)
 - IEEE Transactions on Dependable and Secure Computing (TDSC)
- DEPARTMENT SERVICE
 - CMU PhD Admissions 2021, 2022
- PROPOSAL PANELS/REVIEWS:
 - Dutch Research Council
 - Deutsche Forschungsgemeinschaft (DFG, German Research Foundation)
 - Agence National de la Recherche (ANR, French National Research Agency)
 - NSF CPS, SAS
 - European Research Council ERC
 - Israel Science Foundation
- PROGRAM COMMITTEE MEMBER:
 - International Conference on Hybrid Systems: Computation and Control (HSCC 2023-2024)
 - International Conference on Embedded Software (EMSOFT 2023)
 - International Conference on Runtime Verification (RV 2023)
 - International Colloquium on Theoretical Aspects of Computing (ICTAC 2023)
 - International Conference on Engineering of Complex Computer Systems (ICECCS 2023)
 - International Conference on Formal Methods for Industrial Critical Systems (FMICS 2020,2023)
 - International Conference on Rigorous State-Based Methods (ABZ 2020-2021,2023)
 - Symposium on Dependable Software Engineering (SETTA 2020-2022)
 - NASA Formal Methods Symposium (NFM 2019-2021,2023)
 - International Conf. on Formal Methods and Models for System Design (MEMOCODE 2021-2023)
 - Workshop on Formal Integrated Development Environment (F-IDE 2015-2022)
 - Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH 2019-2022)
 - Workshop on Models for Formal Analysis of Real Systems (MARS 2022)
 - Workshop on Explainability of Real-Time Systems and their Analysis (ERSA 2022)
 - International Conference on Formal Aspects of Software Engineering (FASE 2020-2021)
 - Topics in Theoretical Computer Science (TTCS 2020)

- 3rd Workshop on Automated Reasoning: Challenges, Applications, Directions, Exemplary Achievements (ARCADE 2021)
- International Workshop on Dynamic Logic: New Trends and Applications (DaLi 2019-2020)
- 5th Workshop on Symbolic-Numeric Methods for Reasoning about CPS and IoT (SNR 2019)
- 12th International Symposium on Frontiers of Combining Systems (FroCoS 2019)
- Workshop on Model-Based Design of Cyber Physical Systems (CyPhy 2018-2019)
- 2nd Workshop on Safe Control of Connected & Autonomous Vehicles (SCAV 2018)
- 13th International Conference on integrated Formal Methods (iFM 2017)
- Invited Seminars and Summer Schools
 - Dagstuhl Seminar Specification Formalisms for Modern Cyber-Physical Systems (2019)
 - Dagstuhl Seminar Analysis of Auton. Mobile Collectives in Complex Physical Environments (2019)
 - Summer School on Formal Methods (2018, 2019, course: Foundations of Cyber-Physical Systems)
- JOURNAL REVIEWS:
 - Formal Aspects of Computing (FAOC)
 - Software Tools for Technology Transfer (STTT)
 - Science of Computer Programming (SCP)
 - Embedded Systems Letters
 - Robotics and Autonomous Systems
 - Systems and Software
 - Transactions on Automatic Control (TAC)
 - Transactions on Cyber-physical Systems (TCPS)
 - Transactions on Cybernetics
 - Logical and Algebraic Methods in Programming
 - Internet Services and Applications
 - Computer Science and Technology (JCST)
 - Software: Practice and Experience (SPE)
 - ACM Computing Surveys
- CONFERENCE REVIEWS (IN ADDITION TO PC SERVICE):
 - 38th Annual ACM/IEEE Symposium on Logic in Computer Science (LICS 2023)
 - 25th Symposium on Formal Methods (FM 2023)
 - 2021 International Conference on Robotics and Automation (ICRA 2021)
 - IEEE Computer Security Foundations Symposium (CSF 2020)
 - 2020 International Conference on Cyber-Physical Systems (ICCPS 2020)
 - 2020 Tools and Algorithms for the Construction and Analysis of Systems (TACAS 2020)
 - 2019 Symposium on Principles of Programming Languages (POPL 2019)
 - 2019 International Conference on Robotics and Automation (ICRA 2019)
 - 2018 International Joint Conference on Artificial Intelligence and European Conference on Artificial Intelligence (IJCAI-ECAI 2018)
 - 2018 Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH 2018)
 - 2018 American Control Conference (ACC 2018)
 - International Conference on Intelligent Robots (IROS 2017)
 - 2017 Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH 2017)
 - 13th International Symposium on Automated Technology for Verification and Analysis (ATVA 2015)
 - International Conference on Robotics and Automation (ICRA 2014, 2015, 2021)
 - 6th International NASA Formal Methods Symposium (NFM 2014)
 - 40th International Colloquium on Automata, Languages and Programming (ICALP 2013)
 - 4th Analytic Virtual Integration of Cyber-Physical Systems Workshop (AVICPS 2013)
 - International Conference on Information Technology: New Generations (ITNG 2013)

PROJECT RECORD

FORMAL STACK FOR PLCs (PI)	10/2022-present (NSF FMITF)	Formal verification and implementation stack for programmable logic controllers RESEARCH FOCUS: <ul style="list-style-type: none"> • Verified (de-)compilation between PLC code and hybrid programs • Formal CPS security analysis
ENSURING SAFETY IN AI-ENHANCED PTC SYSTEMS (PI)	09/2020-present (FRA)	Formal guarantees for learning-enabled railroad safety control RESEARCH FOCUS: <ul style="list-style-type: none"> • Automation for verified monitoring and model validation • Verification of machine learning in railroad control
HOLONIC MANUFACTURING (SYSTEMS SCIENTIST)	06/2019–12/2020 (Industry)	Formal guarantees for learning-enabled industrial automation
AA-EXACT (SYSTEMS SCIENTIST)	07/2018–01/2023 (DARPA)	Formal guarantees for AI-enabled cyber-physical systems and control RESEARCH FOCUS: <ul style="list-style-type: none"> • Monitoring of and constraints for learning algorithms • Safety metrics for dynamic assurance case assessment
FORMAL METHODS IN ANALYSIS (CO-PI)	2/2018–7/2022 (AFOSR)	Formal methods in analysis, real arithmetic, theorem prover integration RESEARCH FOCUS: <ul style="list-style-type: none"> • Formalization of dL in Lean • Sound real arithmetic in the KeYmaera X core
PROVABLY SECURE CPS (CO-PI)	2/2017–present (AFOSR)	Differential dynamic game logic for adversarial behavior analysis RESEARCH FOCUS: <ul style="list-style-type: none"> • Safety in adversarial settings, attacks with physical consequences • Develop uniform substitution calculus of hybrid games
PROOF-AWARE ^{CPS} (PI)	8/2015–7/2020 (Austrian Science Fund FWF)	Component-based, incremental development and verification of cyber-physical systems [FWF P28187-N31] RESEARCH FOCUS: <ul style="list-style-type: none"> • Component-based development of hybrid system models and proofs • Refactoring and refinement of hybrid system models and proofs • Code synthesis and runtime verification
PTC (SYSTEMS SCIENTIST)	2/2017–12/2017, 5/2018–11/2018, 1/2019–12/2019 (Industry)	Train control and safety of braking maneuvers RESEARCH FOCUS: <ul style="list-style-type: none"> • Models and proofs of train braking maneuvers • Verified runtime model validation and its application to testing
SPHINX (PI)	2/2014–1/2015, 5/2015–4/2016 (European Research Council ERC)	Marie Curie International Outgoing Fellowship [PIOF-GA-2012-328378-Sphinx] RESEARCH FOCUS: <ul style="list-style-type: none"> • Refactoring and refinement of hybrid system models and proofs • Model-driven development environment for cyber-physical systems
LFCPS (POSTDOC)	2/2015–4/2015 (NSF)	Logical Foundations of cyber-physical systems [NSF CNS-1054246] RESEARCH FOCUS: <ul style="list-style-type: none"> • Hybrid system theorem proving (KeYmaera X)
HACMS (POSTDOC)	11/2012–1/2014, 5/2016–1/2017 (DARPA)	Construction of high-assurance cyber-physical systems [DARPA HACMS AFRL FA8750-12-2-0291] RESEARCH FOCUS: <ul style="list-style-type: none"> • Safe collision avoidance for autonomous robotic ground vehicles • Hybrid system runtime verification • Hybrid system theorem proving
GOALI ARCHCPS	11/2012–4/2015 (NSF)	Collaboration on architectural considerations in formal verification techniques for cyber-physical systems [NSF CNS-1035800] RESEARCH FOCUS:

(POSTDOC)		<ul style="list-style-type: none"> • Architecture and modeling of cyber-physical systems
UTC T-SET (POSTDOC)	11/2012–4/2015	<p>Collaboration on modeling and verification techniques for smart transportation systems (vehicle-to-infrastructure communication, autonomous ground vehicles)</p> <p>RESEARCH FOCUS:</p> <ul style="list-style-type: none"> • Formal verification of smart transportation systems
CSI (POSTDOC)	10/2011–1/2014 (Austrian Research Promotion Agency FFG)	<p>Collaborative situation awareness for multi-modal traffic management [FFG FIT-IT 829598], http://www.situation-awareness.net</p> <p>RESEARCH FOCUS:</p> <ul style="list-style-type: none"> ▪ Collaborative situation awareness with a focus on qualitative traffic models and situation projection
PROFLOW (POSTDOC)	1/2011–12/2012 (Austrian Research Promotion Agency FFG)	<p>Detection of and adaptation to critical situations that arise during the execution of multiple parallel workflows.</p> <p>RESEARCH FOCUS:</p> <ul style="list-style-type: none"> ▪ Semantic and situation-aware workflow adaptation
THEHIDDENU (PHD CANDIDATE)	9/2010–12/2012 (Austrian Research Promotion Agency FFG)	<p>Uniform integrated view of social media profiles with demonstration of data and behavior profiling [FFG FIT-IT 825070], http://www.social-nexus.net</p> <p>RESEARCH FOCUS:</p> <ul style="list-style-type: none"> ▪ Social content integration and profiling with semantic technology
BEAWARE! (PHD CANDIDATE)	4/2009–3/2011 (Austrian Research Promotion Agency FFG)	<p>Situation awareness for road traffic management [FFG FIT-IT 819577], http://www.situation-awareness.net</p> <p>RESEARCH FOCUS:</p> <ul style="list-style-type: none"> ▪ Situation awareness with a focus on situation projection using Colored Petri nets, development of a situation awareness prototype back-end (Lisp, Prolog, OWL)
TELE- HOMECARE (RESEARCH ASSOCIATE)	1/2008–3/2009 (Upper Austria Local Fund)	<p>Telepresence and signal processing for assisted living</p> <p>RESEARCH FOCUS:</p> <ul style="list-style-type: none"> ▪ Evaluation of pervasive healthcare approaches, development of wireless-sensor-network-based signal processing components (nesc, Java JCreate, Java SE), development of a platform-independent modeling tool for pervasive healthcare applications (Eclipse Modeling)
PLANT SAFETY SYSTEM (RESEARCH ASSOCIATE)	3/2007–12/2007 (Austrian K-plus)	<p>Personnel and asset tracking during safety incidents in industrial environments http://forte.fh-hagenberg.at/project-homepages/pss</p> <p>RESEARCH FOCUS:</p> <ul style="list-style-type: none"> ▪ Positioning systems in industrial environments based on wireless sensor networks (nesc, TinyOS)
GULLIVER (RESEARCH ASSOCIATE)	9/2005–9/2007 (Austrian FHplus)	<p>Multi-modal user interfaces for TV broadcasting journalists (search while commenting during sports broadcasts)</p> <p>http://forte.fh-hagenberg.at/project-homepages/gulliver/index.shtml</p> <p>RESEARCH FOCUS:</p> <ul style="list-style-type: none"> ▪ Speech recognition on mobile devices, multi-modal user interface components, speech-based article search system (MS Speech Server)
MOSES (RESEARCH ASSOCIATE)	8/2004–8/2005 (Austrian FHplus)	<p>Safety of industry maintenance personnel with a ubiquitous maintenance tracking system</p> <p>RESEARCH FOCUS:</p> <ul style="list-style-type: none"> ▪ Ubiquitous plant component identification, industrial maintenance enforcement (planning, guidance, and progress tracking)

PUBLICATION RECORD

BOOK CHAPTERS

- [1] Stefan Mitsch, André Platzer. *A Retrospective on Developing Hybrid System Provers in the KeYmaera Family - A Tale of Three Provers*. In Wolfgang Ahrendt et al., editors, *Deductive Software Verification: Future Perspectives*, volume 12345 of LNCS: pp. 21-64, Springer 2020.
- [2] Werner Kurschl, Stefan Mitsch, and Johannes Schönböck. *Model-Driven Prototyping Support for Pervasive Healthcare Applications, in Pervasive and Smart Technologies for Healthcare*, IGI Global, 2010.
- [3] Wolfgang Beer, Bernhard Moser, Werner Kurschl, Stefan Mitsch, Florian Matusek, and Stephan Sutor. *Application Development and Management of Smart Camera Networks*, in *Smart Cameras*. SPRINGER, 2009.

JOURNAL PUBLICATIONS

- [4] Rachel Cleaveland, Stefan Mitsch, André Platzer. *Formally Verified Next-Generation Airborne Collision Avoidance Games in ACAS X*. *ACM Transactions on Embedded Computing Systems*, 2023.
- [5] Aditi Kabra, Stefan Mitsch, André Platzer. *Verified train controllers for the Federal Railroad Administration train kinematics model: Balancing competing brake and track forces*. *IEEE Trans. Comput. Aided Des. Integr. Circuits Syst.* Special issue for EMSOFT 2022. **Best paper finalist**
- [6] Eduard Kamburjan, Stefan Mitsch, Reiner Hähnle. *A Hybrid Programming Language for Formal Modeling and Verification of Hybrid Systems*. *Leibniz Transactions on Embedded Systems* (to appear).
- [7] Qin Lin, Stefan Mitsch, André Platzer, John Dolan. *Safe and Resilient Practical Waypoint-following for Autonomous Vehicles*. *IEEE Control Systems Letters*, pp. 1574-1579, 2021.
- [8] Andrew Sogokon, Stefan Mitsch, Yong Kiam Tan, Katherine Cordwell, André Platzer. *Pegasus: Sound continuous invariant generation*. *FMSD*, 2021. Special issue for selected papers from FM'19.
- [9] Rose Bohrer, Yong Kiam Tan, Stefan Mitsch, Andrew Sogokon, André Platzer. *A formal safety net for waypoint following in ground robots*. *IEEE Robotics and Automation Letters*. 4(3), pp. 2910-2917, 2019.
- [10] Andreas Müller, Stefan Mitsch, Werner Retschitzegger, Wieland Schwinger, and André Platzer. *Tactical Contract Composition for Hybrid System Component Verification*, *STTT*, 20(6), pp. 615-643, 2018 (special issue for selected papers from FASE'17).
- [11] Stefan Mitsch, Khalil Ghorbal, David Vogelbacher, and André Platzer. *Formal verification of obstacle avoidance and navigation of ground robots*. *International Journal of Robotics Research*, 36(12), pp. 1312-1340. 2017.
- [12] Franz Franchetti, Tze Meng Low, Stefan Mitsch, Juan Paolo Mendoza, Liangyan Gui, Amarin Phaosawasdi, David Padua, Soumya Kar, José M. F. Moura, Mike Franusich, Jeremy Johnson, André Platzer and Manuela Veloso. *High-Assurance SPIRAL: End-to-end guarantees for robot and car control*. *IEEE Control Systems Magazine*, 2017.
- [13] Jean-Baptiste Jeannin, Khalil Ghorbal, Yanni Kouskoulas, Aurora Schmidt, Ryan Gardner, Stefan Mitsch, and André Platzer. *A formally verified hybrid system for safe advisories in the next-generation airborne collision avoidance system*. *STTT*, 2016. Special issue for selected papers from TACAS'15.
- [14] Stefan Mitsch, André Platzer. *ModelPlex: Verified runtime validation of verified cyber-physical system models*. *FORMAL METHODS IN SYSTEM DESIGN*, 49(1), pp. 33-74. 2016. Special issue for selected papers from RV'14. Originally published at RV'14 and as tech report CMU-CS-14-121.
- [15] Stefan Mitsch, André Platzer, Werner Retschitzegger, and Wieland Schwinger. *Logic-Based Modeling Approaches for Qualitative and Hybrid Reasoning in Dynamic Spatial Systems*. *ACM COMPUTING SURVEYS*, 2015.
- [16] Jan-David Quesel, Stefan Mitsch, Sarah Loos, Nikos Aréchiga, and André Platzer. *How to model and prove hybrid systems with KeYmaera: A tutorial on safety*. *INTERNATIONAL JOURNAL ON SOFTWARE TOOLS FOR TECHNOLOGY TRANSFER*, Springer, 2015.
- [17] Norbert Baumgartner, Stefan Mitsch, Andreas Müller, Werner Retschitzegger, Andrea Salfinger, and Wieland Schwinger. *A Tour of BeAware! A Situation-Awareness Framework for Control Centers*. *JOURNAL OF INFORMATION FUSION*, Elsevier. 20:155-173, November, 2014.
- [18] Stefan Mitsch, Grant Olney Passmore, and André Platzer. *Collaborative Verification-Driven Engineering of Hybrid Systems*. *JOURNAL OF MATHEMATICS IN COMPUTER SCIENCE*. 8(1), March, 2014.
- [19] Norbert Baumgartner, Wolfgang Gottsheim, Stefan Mitsch, Werner Retschitzegger, and Wieland Schwinger. *BeAware!—Situation Awareness, the Ontology-Driven Way*. *INTERNATIONAL JOURNAL OF DATA AND KNOWLEDGE ENGINEERING*, ELSEVIER, 69(11), November 2010.

REFEREED CONFERENCE AND WORKSHOP PUBLICATIONS

- [20] Megan Strauss, Stefan Mitsch. *Slow Down, Move Over: A Case Study in Formal Verification, Refinement, and Testing of the Responsibility-Sensitive Safety Model for Self-Driving Cars*. *TAP 2023: 17th International Conference on Tests and Proofs*, pp. 149-167, 2023.

- [21] Marvin Brieger, Stefan Mitsch, André Platzer. *Uniform Substitution for Dynamic Logic with Communicating Hybrid Programs*. CADE-29: International Conference on Automated Deduction pp. 96-115, 2023.
- [22] Marian Qian, Stefan Mitsch. *Reward Shaping from Hybrid Systems Models in Reinforcement Learning*. NFM 2023: NASA Formal Methods, pp. 122-139, 2023.
- [23] Stefan Mitsch. *Formal Artifacts as Explanations for System Correctness in Cyber-Physical Systems*. ERSA 2022: 1st Workshop on Explainability of Real-Time Systems and their Analysis, 2022.
- [24] James Gallicchio, Yong Kiam Tan, Stefan Mitsch, André Platzer. *Implicit Definitions with Differential Equations for KeYmaera X*. In IJCAR 2022: International Joint Conference on Automated Reasoning. Springer, 2022.
- [25] Yong Kiam Tan, Stefan Mitsch, André Platzer. Verifying Switched Systems Stability with Logic. In HSCC 2022: Hybrid Systems Computation and Control. ACM, 2022. **Best paper, best repeatability evaluation**
- [26] David Bayani, Stefan Mitsch. *Fanoos: Multi-Resolution, Multi-Strength, Interactive Explanations for Learned Systems*. In VMCAI 2022: 23rd International Conference on Verification, Model Checking, and Abstract Interpretation, Springer, 2022.
- [27] Alexei Kopylov, Stefan Mitsch, Aleksey Nogin, Michael Warren. *A Formally Verified Safety Net for Waypoint Navigation Neural Network Controllers*. In Marieke Huisman, Corina Păsăreanu, Naijun Zhan, editors, FM 2021: 24th International Symposium on Formal Methods, Beijing, China, November 20-26, 2021, pp. 122-141, Springer, 2021.
- [28] Matias Scharager, Katherine Cordwell, Stefan Mitsch, André Platzer. *Verified Quadratic Virtual Substitution for Real Arithmetic*. In Marieke Huisman, Corina Păsăreanu, Naijun Zhan, editors, FM 2021: 24th International Symposium on Formal Methods, Beijing, China, November 20-26, 2021, pp. 200-217, Springer, 2021.
- [29] Stefan Mitsch. *Implicit and Explicit Proof Management in KeYmaera X*. In F-IDE 2021: 6th Workshop on Formal Integrated Development Environment, EPTCS 338, pp. 53-67, 2021.
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- [34] Luis Garcia, Stefan Mitsch, and André Platzer. *HyPLC: Hybrid programmable logic controller program translation for verification*. In Linda Bushnell and Miroslav Pajic, editors, 10th ACM/IEEE International Conference on Cyber-Physical Systems ICCPS. 2019. **Best paper finalist**
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MANUSCRIPTS AND OTHER PUBLICATIONS

- [84] Stefan Mitsch. *Logic-Based Safety of Cyber-Physical Systems: Simultaneous Model Validation and Proof Transfer*. In Symposium on Dependable Software Engineering: Theories, Tools and Applications (SETTA), Springer, 2022 (invited paper)
- [85] Weihai Li, Stefan Mitsch, André Platzer. *Verified Winning Strategies for Discrete and Continuous Pursuit-Evasion Games*.
- [86] Samuel Teuber, Stefan Mitsch, André Platzer. *Provably Safe Neural Network Controllers via Differential Dynamic Logic*.

- [87] Marvin Brieger, Stefan Mitsch, André Platzer. *Dynamic Logic of Communicating Hybrid Programs*. CoRR abs/2302.14546, 2023.
- [88] Luca Geretti, Julien Alexandre dit Sandretto, Matthias Althoff, Luis Benet, Pieter Collins, Parasara Sridhar Duggirala, Marcelo Forets, Edward Kim, Stefan Mitsch, Christian Schilling, Mark Wetzlinger. *ARCH-COMP22 Category Report: Continuous and Hybrid Systems with Nonlinear Dynamics*. In: Goran Frehse and Matthias Althoff (editors). ARCH22. 9th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH22).
- [89] Stefan Mitsch, Bohua Zhan, Huanhuan Sheng, Alexander Bentkamp, Shuling Wang Simon Foster, Christian Pardillo Laursen, Jonathan Julián Huerta y Munive. *ARCH-COMP22 Category Report: Hybrid Systems Theorem Proving*. In: Goran Frehse and Matthias Althoff (editors). ARCH22. 9th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH22).
- [90] James Gallicchio, Yong Kiam Tan, Stefan Mitsch, André Platzer. *Implicit Definitions with Differential Equations for KeYmaera X*. (CoRR abs/2203.01272)
- [91] Yong Kiam Tan, Stefan Mitsch, André Platzer. *Verifying Switched System Stability with Logic*. (CoRR abs/2111.01928)
- [92] Stefan Mitsch, Bohua Zhan, Shuling Wang and Naijun Zhan. *ARCH-COMP21 Category Report: Hybrid Systems Theorem Proving*. In: Goran Frehse and Matthias Althoff (editors). ARCH21. 8th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH21). **Best result award**
- [93] Rachel Cleaveland, Stefan Mitsch, André Platzer. *Formally Verified Next-Generation Airborne Collision Avoidance Games in ACAS X* (CoRR abs/2106.02030)
- [94] Matias Scharager, Katherine Cordwell, Stefan Mitsch, André Platzer. *Verified Quadratic Virtual Substitution for Real Arithmetic*. (CoRR abs/2105.14183)
- [95] David Bayani, Stefan Mitsch. *Fanoos: Multi-Resolution, Multi-Strength, Interactive Explanations for Learned Systems*. (CoRR abs/2006.12453)
- [96] Stefan Mitsch, Jonathan Julián Huerta Y Munive, Xiangyu Jin, Bohua Zhan, Shuling Wang and Naijun Zhan. *ARCH-COMP20 Category Report: Hybrid Systems Theorem Proving*. In: Goran Frehse and Matthias Althoff (editors). ARCH20. 7th International Workshop on Applied Verification of Continuous and Hybrid Systems (ARCH20), vol 74, pages 153-174.
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- [98] Stefan Mitsch, Andrew Sogokon, Yong Kiam Tan, Xiangyu Lin, Bohua Zhan, Shuling Wang, and Naijun Zhan. *ARCH-COMP 19 Category Report: Hybrid Systems Theorem Proving*. Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH 2019). April 2019.
- [99] Luis Garcia, Stefan Mitsch, and André Platzer. *Toward multi-task support and security analyses in PLC program translation for verification: poster abstract*. ICCPS. April 2019.
- [100] Andreas Müller, Stefan Mitsch, Wieland Schwinger, and André Platzer. *A Component-based Hybrid Systems Verification and Implementation Tool in KeYmaera X (Tool Demonstration)*. CyPhy@WESE 2018.
- [101] Stefan Mitsch, Andrew Sogokon, Yong Kiam Tan, André Platzer, Hengjun Zhao, Xiangyu Lin, Shuling Wang, and Naijun Zhan. *ARCH-COMP 18 Category Report: Hybrid Systems Theorem Proving*. Workshop on Applied Verification for Continuous and Hybrid Systems (ARCH 2018). July 2018.
- [102] Stefan Mitsch, Khalil Ghorbal, Sarah M. Loos, and André Platzer. *Safe Next-Generation Transportation Systems*. Demo at the ITS America Transportation Technology Showcase, June 2014.
- [103] Stefan Mitsch, Sarah M. Loos, and André Platzer. *KeYmaera and Sphinx for Hybrid System Modeling and Verification*. Poster at the 4th Workshop on Formal Methods for Robotics and Automation, Berlin, Germany, June 2013.
- [104] Stefan Mitsch, André Platzer. *Modeling and Verification of Hybrid Systems with Sphinx and KeYmaera*. Demo at the International Conference on Hybrid Systems: Communication and Control (HSCC), Philadelphia, PA, USA, April 2013.
- [105] Wolfgang Gottesheim, Stefan Mitsch, and Werner Retschitzegger. *Reasoning on Data Streams for Situation Awareness*, Poster at the International Conference on Knowledge Engineering and Ontology Development, Paris, France, October 2011.
- [106] Stefan Mitsch. *Towards Qualitative Prediction of Situation Evolution in Dynamic Spatial Systems*, PhD Thesis, Johannes Kepler University, Linz, December 2011.
- [107] Stefan Mitsch. *Modeling and Verification of Continuous Object Behavior and Discrete Control Actions in Situation Awareness Systems*, Technical Report, Marshall Plan Foundation, December 2011.
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- [113] Werner Kurschl, Stefan Mitsch, Rene Prokop, and Christian Domscha. *Work Clearance Process Management with a Mobile Safety System*. In Proceedings of FH Science Day, Shaker Verlag, Steyr, Austria, 2005.
- [114] Stefan Mitsch. *Realtime Remote Profiling Java Applications on Mobile Devices*, Diploma Thesis, Upper Austria University of Applied Sciences, Hagenberg Campus, June 2004.

INVITED TALKS AND TUTORIALS

- [1] Stefan Mitsch. Verification of ACAS X. National Robotics Engineering Center. Feb. 2023.
- [2] Stefan Mitsch. Logic-Based Safety of Cyber-Physical Systems: Simultaneous Model Validation and Proof Transfer. SETTA 2022, **Keynote**.
- [3] Stefan Mitsch. Real Proofs for Real Cyber-Physical Systems – Theorem Proving and Verified Runtime Monitoring. University of Thessaloniki, Mar. 2022.
- [4] Stefan Mitsch. Modular Verification of Cyber-Physical Systems in KeYmaera X: Theorem Proving and Verified Runtime Monitoring. Dagstuhl, Oct. 2019.
- [5] Andre Platzer, Stefan Mitsch. Modular Formal Verification of Cyber-Physical Systems with KeYmaera X. FM 2019
- [6] Stefan Mitsch. KeYmaera X. FM 2019 Tool Exhibition
- [7] Stefan Mitsch. *Foundations of Cyber-Physical Systems*. Summer School on Formal Methods, Institute of Software, Chinese Academy of Sciences, Beijing, China, Aug. 2019.
- [8] Stefan Mitsch. *Monitor Specification and Verified Runtime Monitoring of Component Models in Differential Dynamic Logic*. MT-CPS Workshop@CPSWeek 2019. April 2019.
- [9] Stefan Mitsch. *Formal Verification of Cyber-Physical Systems*. Research Overview for NSA. April 2019.
- [10] Stefan Mitsch. *Formal Verification of Cyber-Physical Systems*. Research Overview for Boeing. March 2019.
- [11] Stefan Mitsch, *KeYmaera X: Real Proofs for Real Systems*. Research Overview for Mitsubishi Heavy Industries, 2018.
- [12] Stefan Mitsch. *Foundations of Cyber-Physical Systems*. Summer School on Formal Methods, Institute of Software, Chinese Academy of Sciences, Beijing, China, Aug. 2018.
- [13] Stefan Mitsch. *KeYmaera X: Real Proofs for Real Systems*. Johns Hopkins University Applied Physics Lab, Laurel, MD, May 2018.
- [14] Stefan Mitsch. *The KeYmaera X Theorem Prover: Hybrid Systems Verification and Verified Runtime Validation*. High-Confidence Software and Systems Conference (HCSS 2018), Annapolis, MD, May 2018.
- [15] Stefan Mitsch. *Provable Runtime Safety through Formal Verification and Verified Model Validation*. Bosch, Schwieberdingen, Germany, December 2017.
- [16] Stefan Mitsch. *Formal Verification of Cyber-Physical Systems*. Research Overview for Qualcomm. July 2017.
- [17] Stefan Mitsch. *ModelPlex: Verified Runtime Monitors and Verified Test Oracles for Safety of Cyber-Physical Systems*. CPS V&V I&F Workshop 2017. May 2017.
- [18] Stefan Mitsch. *Formal Verification of Cyber-Physical Systems with KeYmaera X*. Tutorial at TARDEC as part of the HACMS technology transfer effort, May 2017.
- [19] Stefan Mitsch. *Formal Verification of Cyber-Physical Systems*. Research Overview for Northrop Grumman, April 2017.
- [20] Stefan Mitsch. *Hybrid Systems Model Validation*. MT-CPS Workshop@CPSWeek 2017, April 2017.
- [21] Stefan Mitsch. *Hybrid Systems Verification and Verified Runtime Validation with KeYmaera X*, Talk at Princeton University, Princeton, NJ, November 2016.
- [22] Stefan Mitsch. *Hybrid Systems Verification – Verified Runtime Validation and its Application to Test Design*, Siemens Test Engineering Conference 2016, Princeton, NJ, November 2016, **Keynote**.
- [23] Stefan Mitsch, Nathan Fulton, and André Platzer. *KeYmaera X – Tactics and Proofs for Cyber-Physical Systems*. Tutorial at FM 2016, Limassol, Cyprus, November 2016.
- [24] Stefan Mitsch. *Cyber-physical Systems: Differential Equations, Runtime Validation, and Refactoring*. Guest lecture at JKU, November 2016.
- [25] Stefan Mitsch. *KeYmaera X: Tactics and Proof-by-Pointing*, Talk at 15th KeY Symposium, Manigod, France, July 2016.
- [26] Nathan Fulton, Stefan Mitsch, and André Platzer. *From Idea to Provably Safe Implementation – Modeling, Proving, Simulation, and Synthesis in KeYmaera X*. Tutorial at CPSWeek 2016, Vienna, Austria, April 2016.
- [27] Stefan Mitsch. *Verified Runtime Validation and Proof-Aware Refactoring for Hybrid Systems*. Talk at 14th KeY Symposium, Gothenburg, July 2015.
- [28] Stefan Mitsch. *Theorem Proving for CPS*. Talk at the Toyota Summit on Industrial Cyber-Physical Systems. Los Angeles, CA, USA, December 2014.
- [29] Stefan Mitsch. *Hybrid Systems Engineering – Verified Runtime Validation and Proof-Aware Refactoring*, Talk at McMaster University, Hamilton, ON, Canada, September 2014.

PATENTS AND INVENTION DISCLOSURES

- [1] Verified Runtime Validation of Verified Cyber-Physical System Models (U.S. Patent No. 10,872,187)
- [2] Verified Runtime Model Validation for Partially Observable Hybrid Systems (U.S. Patent No. 11,204,838)
- [3] Systems and Methods for Verifying Train Controllers (U.S. PCT/US22/48651)
- [4] Verified Train Controllers for Track Grade and Curvature with the Davis Equation. CMU CTTEC No. 2022-089
- [5] Active Learning by Proof for Logical Foundations of Cyber-Physical Systems. CMU CTTEC No. 2021-084
- [6] Fanoos: Multi-Resolution, Multi-Strength, Interactive Explanations for Learned Systems. CMU CTTEC No. 2021-023
- [7] Pegasus: A framework for sound continuous invariant generation. CMU CTTEC No. 2020-107
- [8] Verified Runtime Model Validation for Partially Observable Hybrid Systems CMU CTTEC No. 2019-097
- [9] VeriPhy: Verified Controller Executables from Verified Cyber-Physical System Models. CMU CTTEC No. 2019-027
- [10] KeYmaera X Kernel – Hybrid System Theorem Prover Core. CMU CTTEC No. 2015-444
- [11] KeYmaera X – Hybrid System Theorem Prover. CMU CTTEC No. 2015-138
- [12] ModelPlex – High-Assurance Runtime Safety for Cyber-Physical Systems. CMU CTTEC No. 2014-029

SOFTWARE ARTIFACTS

- [13] KeYmaera X Hybrid Systems Theorem Prover (<https://keymaerax.org>)
- [14] Sphinx Eclipse Modeling Toolkit for Hybrid Systems Models (<http://www.cs.cmu.edu/~smitsch/tools.html#sphinx>)
- [15] Pegasus Continuous Invariant Generator (<http://pegasus.keymaerax.org/>)
- [16] VeriPhy Verified Compilation Pipeline (<https://www.ls.cs.cmu.edu/VeriPhy>)