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## Experience

- Aug 2023 - present** - **Assistant Professor - Chalmers University of Technology, Gothenburg, Sweden**  
Wallenberg AI, Autonomous Systems and Software Program (WASP)  
Head of the Lab for Safe and Trustworthy Autonomous Reasoning
- Jan 2020 - July 2023** - **Postdoctoral Researcher - University of California at Berkeley, CA, USA**  
Advisor: Prof. Sanjit A. Seshia, Ph.D.  
Projects: DARPA Assured Autonomy (Project partner: Boeing)
- Oct 2012- Dec 2019** - **Research Assistant - Saarland University, Saarbrücken, Germany**  
Advisor: Prof. Bernd Finkbeiner, Ph.D.  
Projects: OSARES (Output Sensitive Algorithms for Reactive Synthesis)  
AVACS (Automatic Verification and Analysis of Complex Systems)

## Education

- Jul 2013 - Dec 2019** - **Dr. rer. nat. in Computer Science - Saarland University, Saarbrücken, Germany**  
Thesis: Model Counting for Reactive Systems  
Grade: Summa cum laude  
Advisor: Prof. Bernd Finkbeiner, Ph.D.
- Apr 2011 - Mar 2013** - **Master of Science (Computer Science) - Saarland University, Saarbrücken, Germany**  
Master's Thesis: Concept Learning for Reactive Synthesis  
Advisor: Prof. Bernd Finkbeiner, Ph.D.
- Oct 2007 - Mar 2011** - **Bachelor of Science (Computer Science) - Saarland University, Saarbrücken, Germany**  
Bachelor's Thesis: Sound Logics for Weak Bisimulation Semantics  
Advisor: Prof. Dr.-Ing. Holger Hermanns

## Scholarships and Honors

- Oct. 2020** - **Award - Dr.-Eduard Martin Award**  
Granted annually by the Saarland University Society for the best doctoral dissertation of each Faculty.

- May 2014- Apr. 2017**    **Scholarship - Deutsche Telekom Foundation**  
 A three-year doctoral grant. Monthly stipend: 1800€.  
 Annual travel and literature budget: 3000€.
- Apr. 2011- Sep. 2012**    **Scholarship - Saarbrücken Graduate School of Computer Science**  
 A three-semester scholarship. Monthly stipend 800€.
- Jun. 2008- Sep. 2010**    **Bachelor's Honor Program - Department of Computer Science, Saarland University**  
 The top 10 students of the class were admitted to the Honors Program yearly.

## Academic Service

### 2024            **Organization**

- Third Workshop on Hyperproperties (Hyper 2024)  
<https://hyperworkshop24.cispa.io>  
 Co-organized with Hadar Frenkel and Niklas Metzger
- AAAI 2024 Spring Symposium - User-Aligned Assessment of Adaptive AI Systems  
<https://aaair-lab.github.io/aia2024/>  
 Co-organized with Pulkit Verma, Rohan Chitnis, Georgios Fainekos and Siddharth Srivastava

### 2023

- Second Workshop on Hyperproperties (Hyper 2023)  
<https://hyperworkshop23.github.io>  
 Co-organized with Rayna Dimitrova and Daniel Fremont

### 2021

- First Workshop on Hyperproperties (Hyper 2021)  
<https://hyperproperties.soe.ucsc.edu>  
 Co-organized with Daniel Fremont

### 2020 - present

#### **Program Committee**

- 23rd Conference on Runtime Verification, 2024
- 22nd International Symposium on Automated Technology for Verification and Analysis, 2024
- 16th NASA Formal Methods Symposium 2024
- 25th International Conference on Verification, Model Checking, and Abstract Interpretation, 2024
- 38th AAAI Conference on Artificial Intelligence, 2024
- 23rd Conference on Runtime Verification, 2023
- 37th AAAI Conference on Artificial Intelligence, 2023
- 22nd Conference on Runtime Verification, 2022
- 21st Conference on Runtime Verification, 2021
- 33rd International Conference on Computer-Aided Verification (AE Committee) 2021
- 35th AAAI Conference on Artificial Intelligence, 2021
- 20th Conference on Runtime Verification, 2020

### 2020 - present

#### **Editorial Board**

- Editor for the Journal of Software Engineering for Autonomous Systems
- Review editor for the Theoretical Computer Science section of Frontiers in Computer Science

### 2012- present

#### **Reviewing**

- RV 24, ATVA 24, NFM 24, VMCAI 2024, AAAI 2024, LICS 2023, RV 2023, TIME 2023, CONCUR 2023, AAAI 2023, SETTA 2022, FMCAD 2022, RV 2022, Acta Informatica 2022, STTT 2021, RV 2021, CONCUR 2021, ICALP 2021, CAV 2021, AAAI 2021, Acta Informatica 2020, RV 2020, ICALP 2020, iFM 2019, ICTAC 2018, FoSSaCS 2017, RV 2016, ATVA 2016, RV 2015, HVC 2014, CAV 2014, CAV 2013

## Tutorials and Invited Presentations

- Feb. 2024**    **Invited Talk - Scania Center for Connected and Autonomous Systems**  
Host: Mattias Nyberg  
Title: Formal Analysis of Autonomous Systems: A Runtime Assurance Perspective
- Oct. 2023**    **Invited Talk - Digital Futures Center, Stockholm, Sweden**  
Host: Jana Tumova  
Title: Formal Analysis of Autonomous Systems: A Runtime Assurance Perspective
- Jun. 2023**    **Invited Talk - Workshop on Well-Founded AI, Center for Human-Compatible AI, Asilomar, CA, USA**  
Title: Formal analysis of AI-based autonomy: from modeling to runtime assurance
- Nov. 2022**    **Invited Talk - Workshop on Intelligent Autonomous CPS, NSF CPS PI Meeting, Arlington, VA, USA**  
Title: Learning Monitorable Operational Design Domains for Assured Autonomy
- Jul. 2022**    **Invited Talk - Workshop on Verified Software, Isaac Newton Institute, Cambridge, UK**  
Title: Synthesizing Pareto-optimal Interpretations for Black-box Models
- Oct. 2021**    **Tutorial - 21th Conference on Runtime Verification, Virtual**  
Title: Formal Analysis of AI-based Autonomy: From Modeling to Runtime Assurance
- Apr. 2021**    **Invited Talk - Workshop on Synthesis of Models and Systems, Simons Institute, Berkeley**  
Title: Synthesizing Approximate Implementations for Unrealizable Specifications
- Apr. 2021**    **Invited Talk - NUS, Singapore**  
Host: Prof. Kuldeep Meel  
Title: Model Counting for Reactive Systems
- Oct. 2019**    **Tutorial - 19th Conference on Runtime Verification, Porto, Portugal**  
Title: Stream-based Monitors for Real-time Properties
- Jul. 2018**    **Invited Talk - Runtime Verification for Rigorous Systems Engineering, CAV satellite workshop, Oxford, UK**  
Title: Real-time Stream-based Monitoring with RTLola
- Jul. 2018**    **Guest Talk - University of Leicester, Leicester, UK**  
Host: Prof. Rayna Dimitrova  
Title: Real-time Stream-based Monitoring with RTLola
- Feb. 2018**    **Guest Talk - Yale, CT, USA**  
Host: Prof. Ruzica Piskac  
Title: Model Checking Quantitative Hyperproperties
- Feb. 2018**    **Guest Talk - Cornell, NY, USA**  
Host: Prof. Hadas Kress-Gazit  
Title: Model Checking Quantitative Hyperproperties
- Nov. 2016**    **Invited Talk - National Technical University Athens, Athens, Greece**  
Host: Dr. Petro Stefanec  
Title: Stream-based Network Monitoring

## Student Supervision

### Chalmers

**2023 -** Alejandro Luque Cerpa  
PhD Candidate

### UC Berkeley

**2023** Beyazit Yalcinkaya (Graduate project)  
Topic: Compositional Simulation-Based Analysis

**2022** Beyazit Yalcinkaya (Graduate project)  
Topic: A Runtime Assurance Framework for Programming Safe CPS

Carol Xie (Undergraduate project)  
Topic: Statistical Compositional Simulation-based Analysis

**2020** Sumukh Shivakumar (Master's thesis)  
Topic: A Language-Based Approach to Runtime Assurance for AI-Based Autonomous Systems  
(Co-advised with Ankush Desai)

### Saarland University

**2020** Tom Baumeister (Immersion lab)  
Topic: Explainable Reactive Synthesis

**2019** Florian Kohn (Bachelor's thesis)  
Topic: A Stream-based Approach to Network Intrusion Detection

**2018** Lennart Haas (Bachelor's thesis)  
Topic: Learning Hyperproperties

Tom Baumeister (Bachelor's thesis)  
Topic: A Branching Semantics for Skeletons of Reactive Systems

**2017** Maximilian Schwenger (Immersion lab)  
Topic: Real-time Stream-based Monitoring  
Co-advised with Peter Faymonville

Valentin Seimetz (Bachelor's thesis)  
Topic: Learning Automata for LTL

Nathalie Zeller (Bachelor's thesis)  
Topic: Comparing Lola 2.0 with Quantitative Regular Expressions

Marcel Maltry (Master's thesis)  
Topic: FPGA-based Monitoring for Stream Specification Languages

**2015** Mark Timon Hüneberg (Bachelor's thesis)  
Topic: Optimizing Lola Specifications

Jennifer Nierderländer (Bachelor's thesis)  
Topic: Approximate LTL Model Counting

## Teaching Experience

### Chalmers

**LP2 23** Co-Instructor: Algorithms and Data Structures  
With Peter Ljunglöf

### UC Berkeley

**ST 23** Guest lecturer in the course of Formal Methods: Theory and Application.  
Instructor: Prof. Sanjit Seshia  
I gave lectures on Temporal Logic, Hyperproperties and Runtime Verification.

**ST 22** Guest lecturer in the course of Formal Methods: Theory and Application.  
Instructor: Prof. Sanjit Seshia  
I gave lectures on Hyperproperties and Runtime Verification.

**ST 21** Guest lecturer in the course of Formal Methods: Theory and Application.  
Instructor: Prof. Sanjit Seshia  
I gave lectures on Hyperproperties and Runtime Verification.

**FT 20** Virtual lab team member for the course of Embedded Systems:  
Instructors: Prof. Sanjit Seshia and Prabal Dutta  
We developed a virtual environment for simulating student solutions  
in addition to an automated grading platform for grading solutions.

**ST 20** Guest lecturer in the course of Formal Methods: Theory and Application.  
Instructor: Prof. Sanjit Seshia  
I gave lectures on Temporal Logic, Hyperproperties and Runtime Verification.

## Publications

### Conferences and Workshops

**2023** **Compositional Simulation-Based Analysis of AI-Based Autonomous Systems for Markovian Specifications**

Beyazit Yalcinkaya, Hazem Torfah, Daniel Fremont, and Sanjit Seshia.  
International Conference on Runtime Verification  
RV 2023

**Learning Monitor Ensembles for Operational Design Domains**

Hazem Torfah, Aniruddha Joshi, Shetal Shah, Supratik Chakraborty, S Akshay, and Sanjit Seshia.  
International Conference on Runtime Verification  
RV 2023

**2022** **Runtime Monitors for Operational Design Domains of Black-Box ML-Models**

Hazem Torfah and Sanjit Seshia.  
NeurIPS ML Safety Workshop  
MLSW 2022

**Learning Monitorable Operational Design Domains for Assured Autonomy**

Hazem Torfah, Carol Xie, Sebastian Junges, Marcell Vazquez Chanlatte, and Sanjit Seshia.  
International Symposium on Automated Technology for Verification and Analysis  
ATVA 2022

2021

**Runtime Monitors for Markov Decision Processes.**

Sebastian Junges, Hazem Torfah, and Sanjit Seshia.  
International Conference on Computer-Aided Verification  
CAV 2021

**Synthesizing Pareto-optimal Interpretations for Black-box Models**

Hazem Torfah, Shetal Shah, Supratik Chakraborty, S. Akshay, Sanjit A. Seshia.  
Formal Methods in Computer-Aided Design  
FMCAD 2021

**Formal Analysis of AI-based Autonomy: From Modeling to Runtime Assurance.**

Hazem Torfah, Sebastian Junges, Daniel Fremont, Sanjit A. Seshia.  
International Conference on Runtime Verification  
RV 2021

2020

**SOTER on ROS: A Run-Time Assurance Framework on the Robot Operating System.**

Sumukh Shivakumar, Hazem Torfah, Ankush Desai, and Sanjit Seshia.  
International Conference on Runtime Verification  
RV 2020

**Explainable Reactive Synthesis.**

Tom Baumeister, Bernd Finkbeiner, and Hazem Torfah.  
International Symposium on Automated Technology for Verification and Analysis  
ATVA 2020

**Probabilistic Hyperproperties for Markov Decision Processes.**

Rayna Dimitrova, Bernd Finkbeiner, and Hazem Torfah.  
International Symposium on Automated Technology for Verification and Analysis  
ATVA 2020

2019

**Approximate Automata for Omega-Regular Languages.**

Rayna Dimitrova, Bernd Finkbeiner, and Hazem Torfah.  
International Symposium on Automated Technology for Verification and Analysis  
ATVA 2019

**Synthesizing Approximate Implementations for Unrealizable Specifications.**

Rayna Dimitrova, Bernd Finkbeiner, and Hazem Torfah.  
International Conference on Computer-Aided Verification  
CAV 2019

**StreamLAB: Stream-Based Monitoring of Cyber-Physical Systems.**

Peter Faymonville, Bernd Finkbeiner, Malte Schledjewski, Maximilian Schwenger,  
Marvin Stenger, Leander Tenstrup, and Hazem Torfah.  
International Conference on Computer-Aided Verification  
CAV 2019

**Canonical Representations of k-Safety Hyperproperties.**

Bernd Finkbeiner, Lennart Haas, Hazem Torfah.  
IEEE Computer Security Foundations Symposium  
CSF 2019

**Stream-Based Monitors for Real-time Properties.**

Hazem Torfah  
International Conference on Runtime Verification  
RV 2019

**2018 Model Checking Quantitative Hyperproperties**

Bernd Finkbeiner, Christopher Hahn, and Hazem Torfah.  
International Conference on Computer-Aided Verification  
CAV 2018

**The Challenges in Specifying and Explaining Synthesized Implementations of Reactive Systems.**

Hadas Kress-Gazit and Hazem Torfah.  
Workshop on Formal Reasoning about Causation, Responsibility, and Explanations  
in Science and Technology  
CREST@ETAPS 2018

**2017 The Density of Linear-Time Properties.**

Bernd Finkbeiner and Hazem Torfah.  
The International Symposium on Automated Technology for Verification and Analysis  
ATVA 2017

**2016 Synthesizing Skeletons for Reactive Systems.**

Bernd Finkbeiner and Hazem Torfah.  
International Symposium on Automated Technology for Verification and Analysis  
ATVA 2016

**A Stream-Based Specification Language for Network Monitoring.**

Peter Faymonville, Bernd Finkbeiner, Sebastian Schirmer, and Hazem Torfah.  
International Conference on Runtime Verification  
RV 2016

**2014 The Complexity of Counting Models of Linear-Time Temporal Logic.**

Hazem Torfah and Martin Zimmermann.  
IARCS Annual Conference on Foundations of Software Technology and Theoretical  
Computer Science  
FSTTCS 2014

**Counting Models of Linear-Time Temporal Logic.**

Bernd Finkbeiner and Hazem Torfah.  
International Conference on Language and Automata Theory and Applications  
LATA 2014

**Journals**

**2023 ULGEN: A Runtime Assurance Framework for Programming Safe Cyber-Physical Systems**

Beyazit Yalcinkaya, Hazem Torfah, Ankush Desai, and Sanjit Seshia  
IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems

- 2019**      **FPGA Stream-Monitoring of Real-time Properties.**  
Jan Baumeister, Bernd Finkbeiner, Maximilian Schwenger, Hazem Torfah.  
ACM Transactions on Embedded Computing Systems  
Accepted at EMSOFT 2019
- 2018**      **The Complexity of Counting Models of Linear-Time Temporal Logic.**  
Hazem Torfah and Martin Zimmermann.  
Acta Informatica 2018