Anna Becchi

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🌐 https://annabeks.github.io/

Date of birth 4 October 1995   **Nationality** Italian

ABOUT ME

I'm a PhD student working on automated formal verification of infinite-state transition systems. My research interests include SMT-based invariant checking techniques and their interaction with approaches based on abstract interpretation. I developed an efficient domain for convex polyhedra, applied to both static analysis and reachability of piecewise constant hybrid systems.

I am working on an industrial project addressing the migration from legacy implementations to modern ones for Railway Interlocking Systems, where I tackle reverse engineering, verification, and automated test case generation from electro-mechanical circuits.

CURRENT POSITION

2021 – Today   **Enrolled Ph.D. Student in Computer Science**

Institute   Fondazione Bruno Kessler *and* Information Engineering and Computer Science Doctoral School, University of Trento, Italy

Topic   *Formal verification of complex cyberphysical systems*

Supervisor   Prof. Alessandro Cimatti

WORK EXPERIENCE

2019 – 2021   **Software developer and research assistant**

Embedded Systems and *Formal Methods* Unit. Fondazione Bruno Kessler, Trento, Italy

EDUCATION

May-Aug 2024   **International Graduate Visiting Student**

Institute   University of Waterloo, Canada

Supervisor   Prof. Arie Gurfinkel

2017–2020   **Master's Degree in Computer Science**

Institute   Department of Mathematics, Computer Science and Physics, University of Udine, Italy.

Curriculum   *Languages, Concurrent and Distributed Systems: Analysis and Verification.*

Final grade   110/110 *with honors*

Thesis   *Synthesis of P-stable Abstractions for Hybrid Systems*, July 2020

Supervisor   Prof. Angelo Montanari; Co-supervisor: Prof. Alessandro Cimatti

2014–2017   **Bachelor's Degree in Computer Science**

Institute   Department of Mathematical, Physical and Computer Sciences, University of Parma, Italy

Final grade   110/110 *with honors*

Thesis   *NNC Polyhedra: a New Representation and Conversion Algorithm*, September 2017, in Italian, Supervisor: Prof. E. Zaffanella.

2009–2014   **High School Diploma**

Institute   Liceo Scientifico G. Marconi, Parma, Italy

Final grade   100/100

PUBLICATIONS

Selected publications (complete list available at my dblp page).

Conferences

CAV'24   "Testing the migration from analog to software-based Railway Interlocking Systems", *A. Becchi*, A. Cimatti, G. Scaglione

CAV'23   "Searching for i-Good Lemmas to Accelerate Safety Model Checking", Y. Xia, *A. Becchi*, A. Cimatti, A. Griggio, J. Li, G. Pu

DSN-W'23	"SMT-Based Stability Verification of an Industrial Switched PI Control Systems", S. Basagiannis, L. Battista, *A. Becchi*, A. Cimatti, G. Giantamidis, S. Mover, A. Tacchella, S. Tonetta, V. A. Tsachouridis
CAV'22	"Abstraction Modulo Stability for Reverse Engineering", *A. Becchi*, A. Cimatti
TACAS'22	"NORMA: a tool for the analysis of Relay-based Railway Interlocking Systems", A. Amendola, *A. Becchi*, R. Cavada, A. Cimatti, A. Ferrando, L. Pilati, G. Scaglione, A. Tacchella, M. Zamboni
SEFM'20	"Synthesis of P-Stable Abstractions", *A. Becchi*, A. Cimatti, E. Zaffanella
ISoLa'20	"A Model-Based Approach to the Design, Verification and Deployment of Railway Interlocking System ", A. Amendola, *A. Becchi*, R. Cavada, A. Cimatti, A. Griggio, G. Scaglione, A. Susi, A. Tacchella, M. Tessi
SAS'19	"Revisiting Polyhedral Analysis for Hybrid Systems", *A. Becchi*, E. Zaffanella, Winner of Radhia Cousot Young Researcher Best Paper Award
SAS'18	" An Efficient Abstract Domain for Not Necessarily Closed Polyhedra ", *A. Becchi*, E. Zaffanella
CAV'18	"A Direct Encoding for NNC Polyhedra", *A. Becchi*, E. Zaffanella
Journals	
FMSD '24	"Abstraction Modulo Stability", *A. Becchi*, A. Cimatti
SoSyM '24	"P-Stable abstractions of hybrid systems", *A. Becchi*, A. Cimatti, E. Zaffanella
Inf&Comp '20	"PPLite: Zero-overhead encoding of NNC polyhedra", *A. Becchi*, E. Zaffanella

AWARDS

2019	**Radhia Cousot Young Researcher Best Paper Award**
	Awarded by the program committee of the Static Analysis Symposium 2019, for the paper *Revisiting Polyhedral Analysis for Hybrid Systems*, A. Becchi, E. Zaffanella.

SEMINARS AND SUMMER SCHOOLS

AbsInt'24	Lipari Summer School on *Abstract Interpretation*, September 2024
Dagstuhl Seminar	Partecipant and collector of Dagstuhl seminar *Theoretical Advances and Emerging Applications in Abstract Interpretation*, July 2023
MOD'23	Marktoberdorf Summer School *Safety and Security through Formal Verification*, August 2023
VTSA'22	EuroProofNet Summer School *Verification Technology, Systems & Applications*, September 2022

SERVICE

AEC member	CAV'22, SAS'22, CAV'23, CAV'24, SAS'24, TACAS'25
Subreviewer	TACAS'20, CAV'20, SEFM'20, SETTA'20, TACAS'21, ATVA'21, TACAS'22, SEFM'22, FMCAD'22, CAV'22, ATVA'22, TACAS'23, TACAS'24, CAV'24, FM'24
Student Volunteer	FLoC'18, FLoC'22, FMCAD'22, CAV'24

PROJECTS

LRA-BDD	C++ library combining multi terminal binary decision diagrams (MTBDDs) and convex polyhedra, for reachability analysis and Computational Tree Logic fixpoint computations on timed transition systems. Main developer. 2020 – 2022
NORMA	Tool for the graphical modelling and analysis of Relay-based Railway Interlocking System, leveraging DIA frontend, nuXmv model checker, PySMT library and MathSAT solver. Main developer of SMT-based optimizations and automated property extraction, 2020 – 2021
PPLite	C++ library for the convex polyhedra abstract domain (web page). Main developer. 2017 – 2020
PHAVerLite	Hybrid systems verifier (web page). Contributor. 2018 – 2019

ADACEMIC PROJECTS

Languages&Compilers	Haskell-written type checker and three address code generation for an imperative language. 2019
Distributed Systems	Design and implementation of a distributed algorithm for the subgraph isomorphism problem using the Akka toolkit for Java. 2018

LANGUAGES

Italian	Mother tongue
English	First Certificate in English (FCE) - B2