Ana Maria Mainhardt Carpes

Curriculum Vitae

Research Interests

Formal Methods, Control Systems, Decentralised and Distributed Supervisory Control, Privacy and Security on Discrete Events Systems, Systems Biology.

Education

Late 2020 – present **PhD Candidate**, *Max Planck Institute for Software Systems (MPI-SWS)*, Germany.

Topic: Decentralised Supervisory Control for Discrete Events Systems, Contract-Negotiation Synthesis of Local Supervisors for Distributed Processes with Private Behaviour

Supervisor: Dr. Anne-Kathrin Schmuck

2012–2015 **Master of Automation and Systems Engineering**, *Federal University of Santa Catarina (UFSC)*, Brazil.

Thesis: *Study on the Dynamics of Gene Regulatory Networks which Exhibit Circadian Cycles* (link)

Supervisors: Professor José Eduardo Ribeiro Cury & Fabio Luis Baldissera

2006–2012 **Bachelor of Control and Automation Engineering**, *Federal University of Santa Catarina (UFSC)*, Brazil.

Bachelor Final Thesis: *Properties of LD Programs: Expression and Verification* (link)

Supervisors: Professor Jean-Marie A. Farines (UFSC) & Professor Xavier Crégut (ENSEEIHT)

Awards and Honours

2022 **Best Student Paper Award**.
16th IFAC Workshop on Discrete Event Systems (WODES'22)

2006–2007 **Honours Advanced Mathematics Program**, Federal University of Santa Catarina (UFSC), Department of Mathematics, Florianópolis, Brazil.
Highly selective four-semester Honours Course on Advanced Calculus and Linear Algebra

Publications

2025 **A. M. Mainhardt** and A. K. Schmuck, *Distributed Contract Negotiation for Decentralised Supervisory Control beyond Two-Component Architectures*, 64th IEEE Conference on Decision and Control, under review (preprint).

2024 **A. M. Mainhardt**, A. Wintenberg, S. Lafortune and A. K. Schmuck, *Formulating Attacks with Supervisory Control*, 17th IFAC Workshop on Discrete Event Systems (link).

2023 **A. M. Mainhardt** and A. K. Schmuck, *Synthesis of Distributed and Decentralised Supervisory Control via Contract Negotiation*, IEEE Transactions on Automatic Control, under review, conditionally accepted (preprint).

2022 **A. M. Mainhardt** and A. K. Schmuck, *Assume-Guarantee Synthesis of Decentralised Supervisory Control*, 16th IFAC Workshop on Discrete Event Systems (original, extended version).

2011 J. M. A. Farines, M. H. Queiroz, V. G. Rocha, **A. M. M. Carpes**, F. Vernadat and X. Cregut, *A model-driven engineering approach to formal verification of PLC programs*, IEEE 16th Conference on Emerging Technologies & Factory Automation (link).

2011 J. M. A. Farines, M. H. Queiroz, M. F. Souza, **A. M. M. Carpes** and F. Vernadat, *Modeling and Verification of PLC Programs by using FIACRE Tool Chain*, First TOPCASED Days.

Kaiserslautern, Germany
✉ *amainhardt@mpi-sws.org* • *anamainhardt.github.io*

Research Experience

April 2023, April 2024 — **University of Michigan DES Group**, Ann Arbor, USA. *Research Collaboration*.
Attacks on Supervisory Control Systems
Collaborator: Professor Stéphane Lafortune

Fall 2011 — **Institut de Recherche en Informatique de Toulouse (IRIT), ACADIE Group**, and **Institut National Polytechnique, ENSEEIHT**, Toulouse, France.
Research Intern with 6-Month Scholarship from ENSEEIHT.
Properties of LD Programs: Expression and Verification (Bachelor Final Thesis)
Supervisors: Professor Jean-Marie A. Farines and Professor Xavier Crégut

2009–2011 — **Federal University of Santa Catarina (UFSC), Automation and Systems Department**, Florianópolis, Brazil.
Research Intern with 3-time Annual PIBIC/CNPq Scholarship.
Formal Verification of PLC Programs Written in Ladder Diagram
Supervisor: Professor Jean-Marie A. Farines

2008 — **Federal University of Santa Catarina (UFSC), Automation and Systems Department**, Florianópolis, Brazil.
Research Intern with Annual PIBIC/CNPq Scholarship.
Development of Lisp Procedures for Supporting Discrete Event Systems Control Synthesis
Supervisor: Professor Max Hering de Queiroz

Presentations / Events Participation

2024 — **17th IFAC Workshop on Discrete Event Systems (WODES'24)**, Rio de Janeiro, Brazil.
Paper presentation and conference attendance

2023 — **Virtual Talk Series on Discrete Event Systems**, by IEEE CSS TC DES (recording).
PhD Forum Invited Talk

2023 — **MPI-SWS Lightning Tutorial Series**.
Tutorial talk on Supervisory Control

2022 — **16th IFAC Workshop on Discrete Event Systems (WODES'22)**, Prague, Czech Republic.
Paper presentation and conference attendance

2022 — **DISC Summer School**, *Security and Resiliency for Cyber-Physical Systems – foundations and recent advances*, Noordwijk, The Netherlands.
Poster presentation and school attendance

2015 — **XII Brazilian Symposium on Intelligent Automation (XII SBAI)**, Natal, Brazil.
Paper presentation and conference attendance

Teaching Experience

2013 — **Graduate Teaching Assistant, Modelling and Control of Automated Systems**, Federal University of Santa Catarina (UFSC), Florianópolis, Brazil.

Reviewer

Journals — IEEE Transactions on Automatic Control, Journal Of Discrete Event Dynamic Systems
Conferences — NFM, VMCAI

Skills

Languages — English (fluent), Portuguese (mother tongue), French (intermediate), German (basic)
Programming Languages — Java (proficient), Lisp (intermediate), C, Python, R, Matlab (familiar, academic use)