

Enrico Fraccaroli, PhD

PERSONAL DATA

ADDRESS : Strada Le Grazie 15, Verona, Italy
OFFICE : Room 1.71, CaVignal 2, Department of Computer Science, University of Verona
PHONE : +39 346 1047979
EMAIL : enrico.fraccaroli@univr.it

Open Research and Contributor ID (ORCID): [0000-0002-9739-6501](https://orcid.org/0000-0002-9739-6501)

ACADEMIC PROFILE

I am currently a postdoctoral research fellow at the Department of Computer Science of the University of Verona. My main research interests are the simulation of Cyber-Physical Systems with a focus on analog components.

My greatest achievement during my PhD was the development of an innovative methodology for the abstraction of analog components inside Cyber-Physical Systems. This method can drastically reduce the overall simulation time of such systems, so that it can be quickly verified, tested, and eventually re-engineered. While working on my thesis I spent six months in a semiconductors supplier company called On Semiconductor in Belgium, under the supervision of Renaud Gillon. During this period I improved and applied my methodology to real case studies obtaining great results. Right after this experience I spent six months at the Pratt School of Engineering of the Duke University, where I was supervised by Prof. Krishnendu Chakrabarty.

I obtained my Ph.D. in Computer Science in May 2019 supervised by Prof. Franco Fummi. Previously, I received my Master's and Bachelor's degrees from University of Verona, respectively in 2015 and 2012.

EDUCATION

8th September 2015 - 14th May 2019,

Ph.D. in Computer Science,

Dept. of Computer Science, University of Verona - Italy,

Thesis : *A Holistic Approach to Functional Safety for Networked Cyber-Physical Systems*

Advisor: Prof. Franco Fummi

10th October 2012 - 19th March 2015,

Master's degree in Computer Science and Engineering,

Dept. of Computer Science, University of Verona - Italy,

Thesis : *Optimizing Virtual Platform Integration for Smart System Simulation*

Advisor: Prof. Davide Quaglia

15th September 2008 - 21st March 2012,

Bachelor's degree in Computer Science,

Dept. of Computer Science, University of Verona - Italy,

Thesis : *Etl design phase for the construction of a data warehouse to support data management for the screening of neonatal metabolic diseases*

Advisor: Prof. Carlo Combi

VISITING EXPERIENCES

Date : 2018

Duration : 6 months

Institution : Pratt School of Engineering - Duke University

Supervisor : Prof. Krishnendu Chakrabarty

Description:

This visit aimed at defining a methodology for the abstraction of transistor-level descriptions to behavioral-level (*i.e.*, from SPECTRE to Verilog-AMS).

Date : 2017

Duration : 6 months

Institution : ON Semiconductor BVBA

Supervisor : Renaud Gillon, PhD

Description:

During this visit I have applied the abstraction methodology developed with PhD at industrial descriptions written in SPICE and SPECTRE.

TEACHING ACTIVITIES

Position : **Teacher** of Computer Science, Laboratory module
Institution : Polytechnic University of Milan, Piacenza Campus, Italy
Program : Bachelor's degree in Mechanical Engineering
Acad. Year : 2019/2020

Position : **Teacher** of Operating Systems, Laboratory module
Institution : Dept. of Computer Science, University of Verona - Italy
Program : Bachelor's degree in Computer Science
Acad. Year : 2019/2020

Position : **Instructor** of Design automation of embedded systems, Laboratory module
Institution : Dept. of Computer Science, University of Verona - Italy
Program : Master's degree in Computer Science and Engineering
Acad. Year : 2015-16, 2016-17

Position : **Instructor** of Introduction to computer architecture and operating systems, Laboratory module
Institution : Dept. of Computer Science, University of Verona - Italy
Program : Master's degree in Computer Science and Engineering
Acad. Year : 2015-16, 2016-17

Mentoring activities:

Four Master's Students Thesis co-advised.

Two Bachelor's Students Thesis co-advised. Mentor for four "younger" Ph.D. Students, during my last year of PhD and during the Postdoc.

ACTIVITIES FOR THE SCIENTIFIC COMMUNITY

Position : **Publication Chair**
Event : ECSI/IEEE Forum on Design and Specification Languages (FDL)
Years : 2019

Position : **Multimedia Chair**
Event : ECSI/IEEE Forum on Design and Specification Languages (FDL)
Years : 2017

Position : **Member of the Organizing Committee**
Event : IEEE International Conference on Electromagnetics in Advanced Applications (ICEAA)
Years : 2017

RESEARCH RESUME

My research firstly focuses on the efficient fault simulation of Networked Cyber-Physical Systems.

I started, during my first year of PhD with the analog abstraction flow, a methodology which simplifies the original model and produces portable C/C++ code. I presented this flow [C10], and then in [J2] I offered a more in-deep explanation of the methodology and also an extensive study of its accuracy. The works in [C1, C6, C9] show that this approach works not only for electrical circuits but also for multi-disciplinary designs described with different physical domains, e.g., digital, mechanical, thermal, rotational.

Then, my research moved on the application of the abstraction in the functional safety field. I first extended the abstraction flow for the automatic injection of analog faults and presented the work in [C7, C4]. Then, I started injecting faults also inside the digital and network domains of a smart device and simulating together all these faults [C5, C3, C2].

One of the critical parts of Networked Cyber-Physical Systems is communication. For this reason, I wanted to study an automated flow for the synthesis of network infrastructures [J1]. This step performs network synthesis, but also prepare a simulation infrastructure for the injection of network faults.

PUBLICATIONS

JOURNAL PUBLICATIONS

[J1] **E. Fraccaroli**, F. Stefanni, R. Rizzi, D. Quaglia and F. Fummi, "Network Synthesis for Distributed Embedded Systems," in IEEE Transactions on Computers, vol. 67, no. 9, pp. 1315-1330, 1 Sept. 2018.

- [J2] M. Lora, S. Vinco, **E. Fraccaroli**, D. Quaglia and F. Fummi, "Analog Models Manipulation for Effective Integration in Smart System Virtual Platforms," in IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, vol. 37, no. 2, pp. 378-391, Feb. 2018.
- [J3] **E. Fraccaroli**, M. Lora, and F. Fummi, "Automatic Generation of Analog/Mixed Signal Virtual Platforms for Smart Systems," in IEEE Transactions on Computers, Jan. 2020.
- [J4] **E. Fraccaroli**, R. Gillon, and F. Fummi, "Analog Fault Modeling and Injection for Functional-level Simulation," **under submission** in IEEE Transactions on Computers.

BOOK CHAPTERS AND INVITED CONTRIBUTIONS

- [B1] **E. Fraccaroli**, F. Stefanni, F. Fummi and M. Zwolinski, "Fault analysis in analog circuits through language manipulation and abstraction," in: D. Große, S. Vinco, H. Patel (Eds.) "Lecture Notes in Electrical Engineering." Springer International Publishing, December 20, 2018.
- [B2] **E. Fraccaroli** and D. Quaglia, "Chapter 3: Engineering IoT Networks," in: F. Firouzi, K. Chakrabarty, S. Nassif (Eds.) "Intelligent Internet of Things: From Device to Fog and Cloud." Springer International Publishing, due: December 14, 2019.

CONFERENCE PUBLICATIONS

- [C1] S. Centomo, **E. Fraccaroli** and M. Panato, "From Multi-Level to Abstract-Based Simulation of a Production Line," 2019 Design, Automation & Test in Europe Conference & Exhibition (DATE), Florence, Italy, 2019, pp. 1253-1256.
- [C2] **E. Fraccaroli**, D. Quaglia and F. Fummi, "Efficient Simulation of Faults in Networked Cyber-Physical Systems," 2018 Conference on Design of Circuits and Integrated Systems (DCIS), Lyon, France, 2018, pp. 1-6.
- [C3] **E. Fraccaroli**, D. Quaglia and F. Fummi, "Simulation-based Holistic Functional Safety Assessment for Networked Cyber-Physical Systems," 2018 Forum on Specification & Design Languages (FDL), Garching, 2018, pp. 5-16.
- [C4] **E. Fraccaroli**, F. Stefanni, F. Fummi and M. Zwolinski, "Fault analysis in analog circuits through language manipulation and abstraction," 2017 Forum on Specification and Design Languages (FDL), Verona, 2017, pp. 1-7.
- [C5] **E. Fraccaroli**, L. Piccolboni and F. Fummi, "A homogeneous framework for AMS languages instrumentation, abstraction and simulation," 2017 22nd IEEE European Test Symposium (ETS), Limassol, 2017, pp. 1-2.
- [C6] **E. Fraccaroli**, M. Lora and F. Fummi, "Automatic abstraction of multi-discipline analog models for efficient functional simulation," Design, Automation & Test in Europe Conference & Exhibition (DATE), 2017, Lausanne, 2017, pp. 662-665.
- [C7] **E. Fraccaroli** and F. Fummi, "Analog fault testing through abstraction," Design, Automation & Test in Europe Conference & Exhibition (DATE), 2017, Lausanne, 2017, pp. 270-273.
- [C8] M. Lora, **E. Fraccaroli** and F. Fummi, "Virtual prototyping of smart systems through automatic abstraction and mixed-signal scheduling," 2017 22nd Asia and South Pacific Design Automation Conference (ASP-DAC), Chiba, 2017, pp. 232-237.
- [C9] **E. Fraccaroli**, M. Lora, F. Fummi and P. Montuschi, "A fast simulation environment for smart systems validation in presence of electromagnetic interferences," 2016 International Conference on Electromagnetics in Advanced Applications (ICEAA), Cairns, QLD, 2016, pp. 740-743.
- [C10] **E. Fraccaroli**, M. Lora, S. Vinco, D. Quaglia and F. Fummi, "Integration of mixed-signal components into virtual platforms for holistic simulation of smart systems," 2016 Design, Automation & Test in Europe Conference & Exhibition (DATE), Dresden, 2016, pp. 1586-1591.
- [C11] C. Barnes, J. Cottin, D. Quaglia, **E. Fraccaroli**, A. Pegatoquet, F. Verdier, S. Angeleri, "Network-Aware Virtual Platform for the Verification of Embedded Software for Communications," 2015 Euromicro Conference on Digital System Design, Funchal, 2015, pp. 518-525.