



Fundamental field: Engineering
Specialisation: Computer Science

HABILITATION THESIS

- ABSTRACT -

**Data-Driven Monitoring of Cyber-Physical Systems: from Data
Acquisition to Anomaly Detection**

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This thesis presents my scientific, professional, and academic achievements from my PhD defense in 2014 to the present. It focuses on outlining my scientific achievements in the area of data-driven monitoring of cyber-physical systems as well as my professional and academic achievements, including teaching, mentoring, and my involvement in administrative tasks. Moreover, it presents the perspective on the evolution of my career, encompassing future research related activities and my academic development plan.

Since 2006, I have conducted my research activities as a member of the ***Embedded and Dedicated Computer Systems*** research group, and since 2007 I started my activities as member of the ***Computer Science Department***, at the ***Technical University of Cluj-Napoca***.

During this time, I participated as a member of the research team in four international projects and nine national projects. Additionally, I led four projects as director. I served as a reviewer for several WoS-indexed journals and was part of the technical program committee for various international conferences. I co-organized several scientific events, including conferences, workshops, and research summer schools for PhD students. I have also been a member of the doctoral supervision committee for three students and a member of the PhD defense committee for one student.

After my PhD defense, my objective was to tackle research topics with practical applications, leveraging the experience I gained in real-time systems. The field of cyber-physical systems (CPS) captured my interest, particularly challenges in data acquisition, data management, and anomaly detection. The results in these areas led me to explore more specific problems like privacy preservation, guaranteeing predictable execution for online data processing tasks using specialized hardware designs and finding solutions for the edge offloading problem. The results of my research activities during this period were published in:

- 3 book chapters
- 10 journal papers (all WoS Indexed, 2-Q1, 3-Q2)
- 16 WoS Indexed conference papers
- 8 SCOPUS/IEEE/ACM indexed conference papers

Teaching activities represent a large part of my responsibilities. I am currently teaching the courses of “Assembly Language Programming” (bachelor 1st year, Computer Science), “Microprocessor-based Systems” (bachelor 2nd year, Automation) and “Parallel and Distributed Computing” (bachelor 4th year elective, Computer Science) and leading semester projects of “Structure of Computer Systems” (bachelor 3rd year, Computer Science). I manage the laboratory activities, as well, my responsibilities being coordinating the curation of laboratory support materials, the activities of teaching assistants, and laboratory equipment acquisition and modernization. I have contributed to the publication of teaching materials and guides for three disciplines. Annually, I have advised 4 to 10 undergraduate students on their license thesis of and I have coordinated the research activity of 1-2 master students. Over the past five years, the findings from bachelor's and master's theses have contributed to the publication of five research papers.

I gained extensive experience in the administrative area as I coordinated internal quality evaluations for Computer Science programs (2022-present), participated in organizing classes schedules (2015-2022), supervising students' internship activities (since 2008). I have also

been involved in migrating data from the information system of the University Library to the Alephino bibliographic data management system (2007-2009).

Regarding my future activities, I plan to continue researching data processing on edge devices with computing resource constraints, as well as efficient and predictable streaming data processing using specialized hardware designs. My efforts will be directed towards finding practical solutions that can be deployed in real-world applications. To achieve this, I aim to establish partnerships both in academia and with the industry. Moreover, I intend to secure funding to attract PhD students and build a team of researchers.

From an academic perspective, I will keep adapting my teaching materials and strategies to the ever-evolving Computer Science domain, while introducing lectures on new topics like modern hardware design, data management for Edge Intelligence and streaming data processing. I will try to increase bachelor students' interest in research topics by creating opportunities for internships in research laboratories. Additionally, I will work towards creating more networking opportunities for doctoral students to establish relationships with external research groups.