



University POLITEHNICA of Bucharest  
Faculty of Automatic Control and Computers

Splaiul Independenței nr.313, sector 6, cod 060042,  
Bucharest, ROMANIA



**Professor Dr. Eng. CIPRIAN DOBRE**

PhD coordination in “Computers and Information Technology”

Doctoral School of Automatic Control and Computers,  
University POLITEHNICA of Bucharest

**Contact:**

Ciprian Dobre, Professor, Ph.D., Habil.

University POLITEHNICA of Bucharest

313, Splaiul Independentei, Office EG403, sector 6, 060042

Bucharest, Romania

Phone: +40.745.174.359, Fax: +40.318.163.028

E-mail: [ciprian.dobre@cs.pub.ro](mailto:ciprian.dobre@cs.pub.ro)

Web: <http://cipism.hpc.pub.ro>

LinkedIn: <http://www.linkedin.com/in/cipriandobre>

**Research profile:**

Ciprian Dobre and the team have scientific and scholarly contributions in the field of large scale distributed systems concerning **mobile applications** and **pervasive services and computing**. Among recent results, worth mentioning are research products and smart technologies designed to *reduce urban congestion and air pollution* (projects MobiWay and TRANSYS), *context-aware applications* designed to make full-use of sensors and resources available on modern smartphones (project CAPIM), *opportunistic wireless networks* and *mobile data offloading* (projects SPRINT, SENSE), monitoring large scale distributed systems (project MonALISA), high-speed networking (projects VINCI, FDT), and evaluation using modeling and simulation (projects MONARC 2, VNSim, Sim2Car and MobEmu). More details available at: <http://cipism.hpc.pub.ro>.

**Proposed subjects:**

Currently, the laboratory hosts a series of successful activities and projects, focused on the research and development of solutions for collecting and aggregating uncertain context data, understanding and reasoning about context (through machine-learning techniques, semantic and temporal reasoning), the use of social awareness to deliver better sensing capabilities, and development of models for privacy, and data usage restrictions. These investigated research issues are at the intersection between the areas of mobile and pervasive computing, context representation and reasoning, and privacy.

Proposals are for PhD students having a strong background in several disciplines in particular: mobile app development, a good understanding of wireless technologies and protocols, and machine learning and statistics. The candidate needs to show a strong commitment and major interest to go to next level (our group publishes in prestigious journals and conferences), on research subjects related to mobile wireless networks and computing applications, pervasive services, context-awareness, and people-centric or participatory sensing. Examples of topics/subjects for PhD (but these are not limited to):

- The recent proliferation of sensor-rich portable devices, such as today’s smartphones, is enabling novel communication, sensing, and computation paradigms for users, contributing to the emergence of the pervasive and ubiquitous computing vision of the future. At present, these sensor-rich devices are used stand-alone, but when combined or as a complement to an infrastructure-based computation substrate, such as Cloud Computing, they leverage the mobility of end users, and the processing power of these end-devices, to enhance users’ ability to communicate, sense and compute in the absence of reliable end-to-end

connectivity. The PhD direction would investigate new models of decentralized computing for support of collaborative computation in Cloud-of-Clouds formed of mobile devices. In such a vision, mobile and wearable devices, and people, could interconnect to form ad-hoc dynamic collaborations to support the equivalent of a crowd-based edge Cloud-of-Clouds, where the capabilities of any single device are extended beyond the technology barriers of the local resources, to accommodate external resources available in the geographically-dispersed crowd of other devices.

- As the mobile industry continues to scale rapidly, today network infrastructures have to adapt to cope with the increasing communication demands of these subscribers. With 5G, new concepts of connecting end-user devices are being investigated, such as wireless mesh networking and dynamic ad-hoc networking. In 5G cellular systems, a user will be able to concurrently connect to several wireless access technologies and seamlessly move between them. With the variety of different access schemes, it will be possible to link to other nearby devices to provide ad-hoc wireless networks for much speedier data flows. The PhD direction proposes to investigate novel networking paradigms, such as User-Centric Networking (UCN), to explore the concept of allowing what are known as user-centric wireless networks, formed between wireless devices able to link together using standard wireless protocols (such as Wi-Fi, Bluetooth, Wi-Fi Direct or NFC) to form autonomously. The term user-centric, in this context, is meant to express a community model that extends the traditional multi-access broadband communication with a perspective where the end-user device is actually part of the network. It is foreseen that phone-to-phone communication will be the key to decongestion the already congested broadband networks through new communication models.
- Monitoring crowds is receiving much attention lately. An increasingly popular technique is to scan mobile devices, notably smartphones. We previously investigated the possibility to look at scanning such devices based on transmitted WiFi messages. Although research on capturing crowd patterns using WiFi detections has been done, there are not many published results when it comes to tracking movements. This is not surprising when realizing that the data provided by WiFi scanners is susceptible to much seemingly erroneous and missed detection, caused by the use of randomized network addresses, overlap between scanners, high variance in WiFi detection ranges, among other sources. Thus, we take a different approach and propose the investigation of a couple between phone-to-phone sensing and WiFi sensing, for tracking movement. Given the abundance of sensors available on modern smartphones, we could design apps that incentivize participants to monitor their surroundings, giving us a sense of “the crowd”. This, couple with fixed WiFi scanners, could really lead to next-generation smart technologies for crowd monitoring. The candidate has to have a strong background on telecommunication (especially a good understanding of wireless protocols) and machine learning and statistics. To give you an example, the work will most likely lead to the design of techniques for cleaning up sets of raw detections to sets that can subsequently be used for crowd analytics.
- More and more applications today use, generate and handle very large volumes of data. In particular, this is true for Smart City applications, which attract a rapidly increasing interest from government, companies, citizens, developers, scientists, etc. They cover a large spectrum of needs in public safety, water and energy management, smart buildings, government and agency administration, social programs, transportation, health, education. They are fed with huge amounts of input data, in various formats, from a continuously increasing number of sources (sensors, governmental, regional, and municipal sources, citizens, public open data sources, etc.), are describe by complex workflow and in many cases impose real-time processing capabilities, useful in decision taking. The PhD direction aims to investigate new technologies for making sense of Big Data, by extracting valuable information in an intelligent way by aggregation, reduction, retrieval, composition and decomposition of data processing tasks, which can de described by real-time analytics.