

PHD PROGRAMME IN COMPUTER SCIENCE AND MATHEMATICS

Subject area CUN: 01 Mathematics and Computer Science, 09 Industrial and information Engineering

Coordinator: Prof. Maria Francesca COSTABILE

Administrative office: Dipartimento di Informatica – Università di Bari Aldo Moro

Duration: 3 years

Number of available positions: 8

- 5 with scholarships funded by the University; 2 of these have a priority for graduates from foreign Universities.
3 positions with a “higher education apprenticeship contract” for graduates under the age of 30. The contracts aim at developing research on specific topics; one contract is established with Exprivia S.p.A, an enterprise whose main location is in Molfetta (BA) (contract **C1**), another is established with Omnitechit s.r.l, an enterprise whose main location is in Roma (contract **C2**), and another with Auriga S.p.A, an enterprise whose main location is in Altamura (BA) (contract **C3**). The research profiles of contracts C1, C2 and C3 are illustrated in the following:

C1. Business process optimization

Most approaches to business process redesign use empirical and pragmatic quality aspects related to Business Process Improvement or Business Process Rengineering. In the industrial sector, Business Process Management Systems (BMPS) are software systems that support the definition, execution and monitoring of business processes. Many of these systems include Business Intelligence functionality. However, it is important to accurately evaluate the optimization schemes of the business processes and select the best scheme to implement, since each company has its own structure and operates in a very specific context. The goal of the research activities is to develop new systems that, through the use of advanced techniques of Business Intelligence and Dynamic Optimization, could permit the business process re-design according to specific optimality criteria.

C2. Cyber-Security in IoT Ecosystems

Cyber-Security deals with the protection of systems, networks, software and data from unauthorized access aimed at the illicit use of resources. The widespread of increasingly smaller and pervasive devices, able to communicate with each other and the outside world, has made the IoT (Internet of Things) possible. This technology certainly has great potential, but it also comes with many vulnerabilities due to the large amount of data and events handled by such devices, exploitable by hackers. IoT ecosystems bring together not only devices of different producers and from different frameworks, but also developers and end users who co-exist and collaborate. The research to be conducted during the PhD, beside the technological aspects, will focus on the weakest link in the Cyber-Security chain: human users, who have limited awareness of the specific risks deriving from any interaction. Models and techniques able to prevent or manage such vulnerabilities of the IoT ecosystems will be studied and developed, particularly focusing on the users' interaction with the various devices.

C3. Microservice Science and Engineering

The rise of cloud computing and the progressive streamlining of development processes have led to the emergence of "microservices". Microservice architectures require an approach for developing individual applications as if they were a set of small services, each of which is executed by its own process and communicates with a lean mechanism. However, this poses

new challenges that software engineering research must deal with and that will be the focus of the PhD research. The goal is to provide solutions to problems such as: how to manage changes to a service that may have side effects on other communicating services; how to prevent attacks that exploit network communications; how to integrate a monolithic legacy system with new microservices; what is the optimal size of a microservice; how to effectively test a system of microservices. In this way, the research will lay the foundations for Science and Engineering of microservices

Curricula:

1. Computer Science (Scientific Subject Code: INF/01, ING-INF/05)
2. Mathematics (Scientific Subject Code: MAT/03, MAT/05 e MAT/08)

Even if the PhD programme is organized in the two curricula mentioned above, the admission procedure is only one and the available positions will be assigned according to the ranking obtained by the applicants, until all positions are covered and by taking into account the reserved positions. Thus, the applicants do not have to provide their choice of the curriculum in the attachment A), which is an integral part of this call for applications.

Admission procedure (ordinary positions, including the 3 with apprenticeship contracts)

Applicants will be evaluated on the basis of: a) the documents presented with the application, b) a written exam, c) an oral exam that will also include the assessment of the applicant's knowledge of English. The admission to the oral exam depends on the positive result of the written exam.

Foreign applicants for ordinary positions can choose Italian or English language for their admission exam.

As regards the applicants to the 3 positions with an apprenticeship contract, during the oral exam the Committee will also ask questions about the research topics described in C1, C2 and C3 above, with the aim of assessing the eligibility to each position. Applicants interested in the two positions with an apprenticeship contract have to fill and sign Attachment B), and attach it to the application.

Admission exam dates, time and place:

Written exam: 24th September 2018 at 03:00 p.m., *Room Hume – Dipartimento di Informatica – 2nd floor*

Oral exam: 26th September 2018 at 12:00 p.m., *Room Consiglio – Dipartimento di Informatica – 7th floor*

Address: Dipartimento di Informatica – Università di Bari Aldo Moro – Via Orabona, 4 – 70 125 Bari, Italy

Positions reserved to graduates at foreign Universities

Applicants will be evaluated on the basis of: a) the documents presented with the application, b) an interview in which, among other things, they will discuss a research project (written in English, max 500 words) presented with the application. The interview, which will be in English or Italian depending on the applicant's choice, can be conducted via Skype and the applicant has to provide a Skype ID in the application.

The results of the interview will be combined with the evaluation of the application documents to create a ranking. In case the 2 scholarships will not be assigned to graduates at foreign Universities, they will be awarded to the next students in the ranking of ordinary positions.

Interview date: 25th September 2018, the exact time will be communicated via email to each applicant.

For more information, see <http://dottorato.di.uniba.it>