Ph.D. in Information Technology:
BARKAT - BOUSNINA- DI GIORGI
Final Dissertations

DEIB – Room PT1 – Building 20
June 30th, 2017
09.30 am

Ph.D. presentations and discussions:

Amine BARKAT– XXIX Cycle
"Efficient Energy-Aware Models for Cloud Computing Systems and Networks"
Advisor: Prof. **Antonio Capone**

Abstract:

Developments in communication networks gave the birth to cloud computing which is revolutionizing the use of IT services in companies as electricity did in its time. Once, companies had to produce their own energy to operate before the arrival of electricity networks. Today, companies must manage their IT assets with the constraints related to their consumption and maintenance. With cloud computing, companies can use on demand IT services without worrying about the management, security and maintenance of the infrastructure.
However, the energy consumption of cloud system is not negligible. Indeed, currently the energy consumed by ICT is estimated to be more than 4% of the worldwide consumption and it is expected to double in the next few years. This consumption has effects not only on economies of governments and companies, but also on planet environment through its carbon footprint, which makes energy efficiency of cloud systems one of todays major challenges.
In this thesis we will address cloud energy issues by developing optimization models based on operational research techniques by taking into account the economic perspective of the cloud providers and users. More specifically, we consider two different types of clouds, the first is the classical cloud system in which data centers offer computing services to users. While the second is a cloud system used in mobile networks named Cloud-RAN. For each system, our goal is to wider the vision and consider more than one problem related to energy in a joint way.
Obtained results show that joint optimization for both cases is more efficient in terms of energy consumption and expenses.

Sonda BOUSNINA – XXIX Cycle
"Optimization Model for Resource Allocation of Multiple Applications in Virtual Sensor Networks"
Advisor: Prof. **Matteo Cesana**

Abstract:

An increasing need towards efficient design of general purpose, easy-reconfigurable WSNs started recently attracting considerable attention in the research community. This view encompasses the creation of Virtual Sensor Networks (VSNs) in which multifold physical resources (sensor nodes, communication protocols, etc.) are virtually shared by multiple concurrent applications seamlessly. The VSNs' vision essentially is represented in moving away from highly-customized, application-specific wireless sensor network deployment by opening up to the possibility of dynamically assigning general purpose physical resources to diverse stakeholder applications.
In this context, we propose a novel optimization framework to perform resource allocation in Virtual Sensor Networks where the physical network infrastructure is shared among several types of applications. The proposed framework aims to maximize the benefit from application deployment in the network, while accounting for the distinguishing characteristics and limitations of the wireless sensor environment (storage, processing power, bandwidth, tight energy consumption requirements).

Bruno DI GIORGI – XXIX Cycle
"Modeling Harmonic and Rhythmic Complexity for Applications Of Music Information Retrieval"
Advisor: Prof. **Augusto Sarti**

Abstract:

What exactly defines "complexity"? It can be argued that obeying or violating the common patterns and expectations will affect the complexity of a work of art. Music is no exception, with its many languages that unfold through time, such as harmony, rhythm, melody, orchestration, timbre.
In this work we focus specifically on harmony and rhythm and analyze some of the characteristics that influence complexity. In doing so, we first study the relevant music descriptors, such as chords, keys and beats, proposing new models to automatically extract these properties from the audio signal. Successively, we propose data-driven and model-based methods for estimating complexity from symbolic representations of harmony and rhythm. Signal processing, machine learning techniques and musical theory are used throughout this work to achieve such goals.
The main contributions of the thesis are subdivided into two parts: the first addresses harmony and contains our works on chord and key extraction as well as the estimation of harmonic complexity; the second part is devoted to rhythm analysis and includes our works on the estimation of beat instants and rhythmic complexity.

PhD Committee:
Prof. **Matteo Cesana**, DEIB
Prof. **George Fazekas**, Queen Mary University of London
Prof. **Fabio Martignon**, Université Paris-Sud