**ICT PHD**

Research project for a PhD curriculum in ICT – Computer Engineering and Science

**Tutor:** Nicola Bicocchi

**Co-Tutor:** Marco Mamei

**Proposed Title of the research:**

Software Infrastructures for Smart Cities and Autonomous Systems

**Keywords – (5)**

Distributed Systems, Machine Learning, Industry 4.0, Smart Cities

**Research objectives: – (max 10 rows)**

The research aims at proposing software engineering techniques for supporting the development of increasingly autonomous smart cities. Smart buildings, connected/autonomous cars, and industrial IoT deployments pose unseen challenges related to the development, deployment, monitoring, and re-configuration of these massively distributed and dynamic systems. The research will be focused on theoretical aspects as well as on the practical effectiveness of the proposed solutions.

**Proposed research activity – (max 10 rows)**

The research aims to better understand how the Digital Twin technology can be used for developing and maintaining large-scale, dynamic, software ecosystems envisioned as the foundations of near-coming smart cities. This endeavor, intrinsically multi-disciplinary, starts from the definition of the key features of Digital Twins in the proposed scenario and develops by investigating how engineering and software patterns can be used to develop, deploy, monitor, and dynamically reconfigure these software components. Furthermore, the topic of transparently and opportunistically migrating software components between cloud nodes and edge nodes with different capabilities will be investigated. Students will develop and verify their research ideas on the *Modena Automotive Smart Area* guided by a network of specialists coming from both academia and private companies.

**Supporting research projects (and Department)**

This project will be carried out at the Department of Engineering Enzo Ferrari in conjunction with Prof. Marco Mamei working at the Department of Scienze e Metodi dell’Ingegneria.

**Possible connections with research groups, companies, universities.**

The research may involve the undergoing collaborations with research groups at:

* University of Bologna (Prof. Paolo Bellavista)
* University College London (Prof. Mirco Musolesi)
* Comune di Modena (Luca Chiantore)
* TIM (Roberto Querio)