

The faculty of Engineering of Università degli Studi di Perugia and the faculty of Engineering of Vrije Universiteit Brussel invite you to attend the public defense leading to the degree of

DOTTORE IN INGEGNERIA INDUSTRIALE E DELL'INFORMATICA (UNIPG)
DOCTOR OF ENGINEERING SCIENCES (VUB)

of **Priscilla Benedetti**

The public defense will take place on **June 14th at 11.00 a.m.**, Aula Magna (Great Hall) of the Department of Engineering, University of Perugia,

Address: via Goffredo Duranti 93, Perugia.

To join the digital defense, please click [here](#)

SERVERLESS TECHNOLOGIES AND ARTIFICIAL INTELLIGENCE FOR EDGE SERVICE MANAGEMENT

BOARD OF EXAMINERS

Prof. dr. ir. Emilio Di Giacomo

Prof. dr. ir. Mauro Femminella

Prof. dr. ir. Wendy Meulebroeck

Prof. dr. ir. Jacques Tiberghien

Prof. dr. ir. Giovanni Giambene

Prof. dr. ir. Rosario Garroppo

PROMOTORS

Prof. dr. ir. Gianluca Reali

Prof. dr. ir. Kris Steenhaut

Prof. dr. Ann Nowé

Abstract of the PhD research

The emergence of the Internet of Things (IoT) ecosystem has exponentially increased the need for real-time and data-intensive applications. It has shifted the computing load from the centralized cloud to peripheral nodes, hence introducing the adoption of edge computing. In edge computing, services are deployed closer to the users and IoT devices. Edge computing provides computation and storage on geographically distributed nodes, some with limited resources. For this reason, resource efficiency and flexibility is fundamental in edge services: To tackle this challenge, serverless computing can be leveraged. It allows to efficiently deploy containerized applications on resource constrained nodes. It aims at providing the required Quality Of Service (QoS) while limiting resource consumption and allows scaling with traffic volume.

In this context, our work aims at analyzing and developing serverless-based technologies for edge computing applications. It evaluates the use of Artificial Intelligence, namely Reinforcement Learning (RL) techniques, to optimize the scalability and resource efficiency of serverless frameworks on edge computing clusters.

The study will be divided into two main focus areas: Firstly, an experimental analysis of serverless computing for IoT and 5G services is done, considering infrastructures with various features and various open-source software. Secondly, the development and analysis of reinforcement-learning tools to enhance the performance of serverless computing on edge clusters is presented. These tools are evaluated on various IoT-based applications, from simple lightweight web servers to complex stream processing pipelines.

Given the growing traction of serverless computing in both academia and industry, the analysis and tools included in this study will provide important insights on its benefits and drawbacks, while enhancing serverless computing performance for edge services deployment and management.