MARIE SKŁODOWSKA-CURIE POSTDOCTORAL FELLOWSHIPS 2023

EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

HOST INSTITUTION

Universidade Nova de Lisboa

RESEARCH GROUP AND URL

https://www.it.pt/Members/Index/5030

SUPERVISOR (NAME AND E-MAIL)

Rodolfo Oliveira
rado@fct.unl.pt

SHORT CV OF THE SUPERVISOR

Rodolfo Oliveira obtained the *Licenciatura* Diploma in Electrical Engineering from Universidade Nova de Lisboa (UNL) in 2000 and the M.Sc. degree in Electrical and Computer Engineering from the Technical University of Lisbon in 2003. In 2009, he received the PhD degree in Electrical and Computer Engineering from UNL, where he is currently Associate Professor w/ Habilitation (Agregação) and is also affiliated as a Senior Researcher with Instituto de Telecomunicações - IT.

He obtained the Habilitation (Agregação) in 2018. From 2000 to 2001 he was a Graduate Research Assistant with Uninova, Lisbon, and from 2001 to 2003 he held the same position with ISR - Institute for Systems and Robotics, Technical University of Lisbon. From 2003 to 2009 he was a Teaching Assistant in the Department of Electrical Engineering, UNL. For the period October-2007 to March-2008 he was a Visiting Researcher at the Department of Computer Engineering and Communications, University of Thessaly, Greece, being hosted by Professor Leandros Tassiulas (now at Yale University, U.S.) and Iordanis Koutsopoulos. During the 2011 fall semester, he was a visiting scholar at the Electrical and Computer Engineering Department, at Carnegie Mellon University, Pittsburgh, US. He   often collaborates with researchers based on Europa, America, Asia, and Africa. His research interests lie in the area of stochastic processes applied to computer and data science, wireless mobile networks, network modeling and performance analysis, and the design of cross-layer services for mobile unstructured networks. Most recent activities include the design of distributed PHY/MAC architectures for ad hoc networks, networking aspects of cognitive radio networks, analysis of protocols particularly tailored to the future internet and cybersecurity, and machine learning problems associated with data science, network science, and stochastic analytics.

Rodolfo Oliveira has been involved in several research projects and scientific cooperation networks (including the participation in the Management Committee of a COST Action) funded in a competitive scheme. Currently, he acts as a Principal Investigator of a National project funded by FCT and participates as a researcher in another three. He is also involved in an ITN Marie Sklodowska-Curie Action, where he is responsible for hosting an ESR holder and represents the NOVA University in the Action's Supervisory Board.

In the last 5 years, Rodolfo has hosted over 20 research fellowships (as a Scientific Advisor) funded by different research projects. In the same period, he supervised over 30 MSc students and 3 PhD students (completed). All PhD students were supported by the Portuguese Science Foundation in a highly competitive

grant process ("bolsa de doutoramento"). Currently, he hosts 2 Postdocs and supervises 4 PhD students and 6 MSc students. Rodolfo did over 50 oral communications in different international conferences and gave multiple invited talks in the U.S., Europe, and Asia. He has published over 150 research publications in top-ranked international peer-reviewed journals and conferences. He served as an evaluator of different research projects' calls (e.g. European COST Action). He is an active Senior Member of the Institute of Electrical and Electronics Engineers (IEEE), ACM, and Portuguese Engineers Association.   Rodolfo has integrated the organizing committee of multiple international conferences (e.g. IEEE ICC, IEEE WCNC, IEEE Globecom, etc.) and was the General Chair of the 15th International Symposium on Wireless Communication Systems - ISWCS 2018. Currently, he serves in the Editorial Board of the Ad Hoc Networks (Elsevier), ITU Journal on Future and Evolving Technologies, Frontiers in Communications and Networks, and is Associate Editor of the IEEE Open Journal of the Communications Society and the IEEE Communications Letters. Rodolfo serves as the Chair of the IEEE Portugal Section.

5 SELECTED PUBLICATIONS

D. Fadhil and R. Oliveira, "A Novel Packet End-to-End Delay Estimation Method for Heterogeneous Networks," in *IEEE Access*, vol. 10, pp. 71387-71397, 2022, doi: 10.1109/ACCESS.2022.3188116.

D. Pereira, R. Oliveira and H. S. Kim, "A Machine Learning Approach for Prediction of Signaling SIP Dialogs," in *IEEE Access*, vol. 9, pp. 44094-44106, 2021, doi: 10.1109/ACCESS.2021.3065660.

B. K. S. Lima, D. B. da Costa, L. Yang, F. R. M. Lima, R. Oliveira and U. S. Dias, "Adaptive Power Factor Allocation for Cooperative Full-Duplex NOMA Systems With Imperfect SIC and Rate Fairness," in *IEEE Transactions on Vehicular Technology*, vol. 69, no. 11, pp. 14061-14066, Nov. 2020, doi: 10.1109/TVT.2020.3029791.

A. Furtado, J. Pacheco and R. Oliveira, "PHY/MAC Uplink Performance of LoRa Class A Networks," in *IEEE Internet of Things Journal*, vol. 7, no. 7, pp. 6528-6538, July 2020, doi: 10.1109/JIOT.2020.2974429.

L. Irio, A. Furtado, R. Oliveira, L. Bernardo and R. Dinis, "Interference Characterization in Random Waypoint Mobile Networks," in *IEEE Transactions on Wireless Communications*, vol. 17, no. 11, pp. 7340-7351, Nov. 2018, doi: 10.1109/TWC.2018.2866426.

PROJECT TITLE AND SHORT DESCRIPTION

Currently interested in multiple projects:

Project 1: Distributed Access Design for Cell-less Smart 6G Networks

Short abstract:

This project investigates multiple solutions to be integrated into the upcoming generation of wireless networks (6G). The innovative aspects include the adoption of advanced communication technologies to address ultra-dense deployment scenarios capable of serving data-centric applications requiring stringent throughput, very low latency, and a huge density of connected devices. To this end, the project explores the innovative concept of cell-less networks, which breaks the conventional paradigm of associating a device with a single base station. The goal is to explore dissociated operation to support a user-centric paradigm where the devices can be served by several base stations simultaneously.

The solutions to be investigated require a deep knowledge of wireless communication systems and computer networks, which are topics under the Telecommunications area, and more broadly in Electrical and Electronic Engineering.

Project 2: Context-awareness based on Radio Sensing

Short abstract:

This project is focused on the development of innovative solutions to sense the surrounding environment in a three-dimensional way. The goal is to sense short-range motion of objects, meaning that the sensing is only based on the received signal reflections and the objects to sense do not have to carry any wireless device. The context-aware solutions to be developed rely on the use of stochastic techniques and deep learning algorithms to implement a statistical inference method capable of identifying a specific context. T objectives to be achieved in include:

  - The design and implementation of innovative signal processing techniques that are capable of accurately estimating the time-of-flight of each reflection in a short period of time;

  - The development of different algorithms capable of distinguishing the RF reflections originated by mobile objects from those originated by static objects;

  - The design of a context-aware service, capable of identifying the type of human motion and the recognition of the human body part that has been moved;

Project 3: Advanced Data Analytics Design for Future Networks

Short abstract:

The rapid evolution of telecommunication networks (TNs) has spurred exponential data traffic from different sources, mainly due to the surge of new gadgets such as smartphones, tablets, and a plethora of other mobile devices. The global demand for telecommunications services, not only due to the increasing popularity of the over-the-top media streaming services, but also due to the growing trend of working from home, suddenly increased by COVID-19 outbreak, poses new challenges to telecom operators, who need to make decisions to guarantee a desirable level of network performance and avoid services to experience any perturbation. Understanding how the users are behaving can lead to better networks that automatically adapt to high demand. When unexpected network behaviors occur, such as service denial, a peak of signaling information occurs in the network's core due to users' retries, which may lead to a partial or even complete shutdown of the network. This is a risk that must be minimized, to ensure that telecom customers have access to their products at all times. Data analytics is a crucial tool to improve the performance of complex networks such as TNs. However, innovative analytic methodologies are still required to quickly detect technical problems due to the specific features of the TNs. Apart from the data velocity, volume, and variety characterizing such big data systems, a TN has specific features that hinder real- time data analytics. Those include the biased and noisy data labeling due to unexpected signaling and abnormal events, and also slight changes in the causal relation of the sequential data used in the learning due to time-varying delays to report the events over the network.

The research plan of this project is focused on innovative data analytics techniques designed to quickly detect abnormal technicalities in TNs and also identify their causes and explores the advantages that big data and data science bring to TNs, by proposing data analytic methodologies particularly tailored to TNs, as well as disruptive techniques applied on top of it. The research will be mainly conducted in a formal way, through

mathematical modeling and ML/AI data-driven approaches embodied in experimental software pilots, to evaluate the different solutions achieved in the multiple stages of research. The methodology for the research aims to establish well functioning relations between research and practice, guaranteeing that the research process is tightly connected to practice.

SCIENTIFIC AREA WHERE THE PROJECT FITS BEST*

Information Science and Engineering (ENG)

*Scientific Area where the project fits best – Please select/indicate the scientific area according to the panel evaluation areas: Chemistry (CHE) • Social Sciences and Humanities (SOC) • Economic Sciences (ECO) • Information Science and Engineering (ENG) • Environment and Geosciences (ENV) • Life Sciences (LIF) • Mathematics (MAT) • Physics (PHY)