



# **PhD Thesis Project Offer**

# (valid during the calendar year 2025)

## **Provisional Title of the Doctoral Thesis**

Advanced Network Analytics: Order Statistics for NGN Security and Performance

#### Subject area\* / Research line

Engineering and Architecture – Signal Theory and Communications

Analysis and interpretation of massive data using advanced statistical tools. Application to traffic in next-generation networks.

#### Summary of the Doctoral Thesis (maximum 300 words)

The development and deployment of next-generation networks (NGNs), such as 5G and Beyond 5G (B5G), represent a crucial step toward the connectivity of the future. These technologies offer faster connection speeds, lower latency, and enhanced connectivity—key features that drive multiple emerging technologies and lay the groundwork for the ongoing Industry 4.0 revolution. Understanding the challenges of transitioning to 5G and B5G networks is practically a necessity, both to ensure the success of the significant investments operators are making in infrastructure and equipment upgrades, and to maintain the status quo of contemporary society, where modern communications are essential for continued technological progress.

The working hypothesis is based on using non-classical statistical concepts in traffic flow analysis, which will facilitate both network management and early detection of security breaches. To this end, the thesis may include tasks related to data analysis to improve NGN management through the detection of anomalies in network flow parameters and in aggregated application-level data, using L-moments in combination with clustering algorithms and complex networks. Additionally, it may also address early detection of network attacks, applying the statistical theory of L-moments to leverage their unbiased and highly efficient estimators, even in the presence of outliers and small sample sizes, enabling near real-time practical outcomes.

Is the development of this thesis associated with the execution of any research project? If so, provide details of the project (title, funding entity, and execution period)

No.





# Academic Profile of the Student (maximum 200 words)

Graduates from bachelor's or master's degrees in the field of Telecommunications Engineering or Computer Engineering.

The ideal candidate to undertake this PhD thesis should have a solid understanding of the fundamental principles of next-generation networks, including architectures, communication protocols, switching and routing technologies. Additionally, knowledge of statistics and data analysis, cybersecurity, and network management would be highly desirable, along with programming skills to implement and develop algorithms and statistical models.

# Contact: institutional email of the Supervisor

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\*See the Subject Areas at <u>https://www.urjc.es/informacion-practica#oferta-proyectos-de-tesis</u>. Each project will be included in a single subject area.