

DC09

Individual Research Project title – **Machine Learning methods for Cell-free systems in 6G Networks**

Lead beneficiary (place of employment) – **NOKIA SOLUTIONS AND NETWORKS OY / NOKIA BELL LABS FINLAND (NOF)**, KARAPORTTI 3, ESPOO 02610, Finland and - **TAMPEREEN KORKEAKOULUSAATIO SR** (Tampere University, TAU), KALEVANTIE 4, 33100, TAMPERE, Finland.

Secondment at - **UNIVERSIDAD CARLOS III DE MADRID (UC3M)**, CALLE MADRID 126, 28903 GETAFE (MADRID), Spain

Supervisory team - Academic: Prof. Mikko Valkama and Prof. E. Simona Lohan (TAU); Industry: Dr. Akshay Jain, (NOF); Mentor: Prof. Ana García Armada (UC3)

Project tasks and objectives - Develop novel ML algorithms for evolving UmMIMO scenario in the context of distributed/Cell Free MIMO with the objective to provision automated solutions for radio resource management, mobility, and other MAC/RRM level aspects. The challenge of multiple service types, ultra-dense scenarios, super high density of UEs as well as heterogeneous RAT types will be some of the many constraints that will be considered in the design of ML algorithms. These algorithms will also be envisioned from the perspective of deployment in an ORAN setting, wherein their computational complexity and deployment capabilities will also be analyzed.

Expected Results - Novel Analysis of existing MAC/RRM methods and ML algorithms, including computational complexity and deployment capabilities. Development of novel methods for MAC/RRM procedures in a cell free/distributed Massive MIMO scenario for 6G networks.

Planned secondment objectives - to study cell-free options in the context of ORAN architecture.

Eligibility - University master's degree and be eligible to enroll in a PhD program. Knowledge in fields related to Telecommunications (or closely related disciplines) is appreciated. A high level of English language is required. International experience is appreciated. Research experience and good communication skills are appreciated. Not have resided or carried out their main activity (work, studies, etc.) in Finland for more than 12 months in the 36 months immediately before the recruitment date. Non EU-candidates should have preferably an EU working permit.

Evaluated criteria –

- Study records, including Bachelor and Master
- Work & research experience
- Motivation
- Letters of recommendation
- Positive attitude, previous mobility experience, good communication skills
- English proficiency and other languages. Note: for the selected candidate, an English certificate in accordance with TAU regulations is needed for the PhD enrollment at TAU (see [admissions webpage](#)) before the contract can start

Preferred starting date - June 2024 (as soon as possible)

Trial period – 6 months

Target degree - PhD degree from – **TAMPERE UNIVERSITY (TAU), TAMPERE, Finland.**

Approximate gross salary –

3 250€ for a fellow without family

3 700€ for a fellow with family (e.g., married/in recognized relationship/with children)

In addition to this, the fellow will get yearly holiday bonus and increments based on the labor agreement.

Working and living conditions –

Detailed information about Finland: <https://www.oecdbetterlifeindex.org/countries/finland/>

Detailed information about Spain: <https://www.oecdbetterlifeindex.org/countries/spain/>

NOKIA SOLUTIONS AND NETWORKS is a Finnish multinational telecommunications, information technology, and consumer electronics corporation, established in 1865. Nokia's main headquarters are in Espoo, Finland, in the greater Helsinki metropolitan area, but the company's actual roots are in the Tampere region of Pirkanmaa. In 2020, Nokia employed approximately 92,000 people across over 100 countries, did business in more than 130 countries, and reported annual revenues of around €23 billion. Nokia is a public limited company listed on the Helsinki Stock Exchange and New York Stock Exchange. It was the world's 415th-largest company measured by 2016 revenues, according to the Fortune Global 500, having peaked at 85th place in 2009. It is a component of the Euro Stoxx 50 stock market index.

Website: <https://www.nokia.com>

TAMPEREEN KORKEAKOULUSAATIO The Tampere Universities community comprises Tampere University and Tampere University of Applied Sciences. Together we are building a new model for higher education and research in Finland. Tampere Universities came into being at the beginning of 2019 when the University of Tampere and Tampere University of Technology were merged to create the new foundation-based Tampere University that maintains close collaboration with Tampere University of Applied Sciences. One of the research spearheads at TAU deals with new enabling technology for future wireless networks, with specific emphasis on 5G evolution and future 6G networks.

Website: <https://www.tuni.fi/en> and <https://www.tuni.fi/en/about-us/communications-engineering-and-radio-systems>

UNIVERSIDAD CARLOS III DE MADRID: It is ranked 35th in the world and 12th in Europe in the QS ranking of the 50 best universities in the world under 50 years old and is included in THE academic ranking of universities. The UC3M also stands out for the high employability of graduates, which reaches 90.6%

Webpage: <https://www.uc3m.es/home>