

Job Description

MetaWireless Early Stage Researchers

NEC Laboratories Europe GmbH

Heidelberg, Germany

NEC Laboratories Europe GmbH is seeking to appoint one high-calibre Early Stage Researchers (ESRs) to join the Marie Skłodowska-Curie Innovative Training Network on ‘**Future Wireless Communications Empowered by Reconfigurable Intelligent Meta-Surfaces**’ (MetaWireless).

Position	Early Stage Researcher
	-NEC-1: Scalable software-configurable large-scale intelligent radio environments
	NEC Laboratories Europe GmbH, Kurfürsten-Anlage 36, 69115 Heidelberg, Germany
Location:	
Working time:	Full Time
Duration:	Fixed-Term (3 years)
Living, mobility, family, and research allowances:	In agreement with the MSCA-ITN financial regulations (http://ec.europa.eu/research/participants/data/ref/h2020/other/guides_for_applicants/h2020-guide-appl-msca-itn_en.pdf - Section 5, page 27)

About MetaWireless

Wireless connectivity has become a pillar of our society. The growth of wireless traffic is relentless, forecast to reach a staggering worldwide aggregate of 5,016 exabytes by 2030, along with bit rates of 1 Tb/s and new services related to sensing, localization, low-latency, and ultra-reliability. While the performance of wireless networks has improved phenomenally over the last decades, progress is by now pushing against fundamental limits and the mechanisms that have sustained these huge improvements are starting to falter. New evolutionary leaps are called for in order to ensure that the aforementioned forecasts can become a reality. To date, every wireless system has abided by the premise that the propagation radio channel is fixed by nature and cannot be tampered with, but only compensated through ever more sophisticated transmission/reception schemes. A potential evolutionary leap for 6G-and-beyond networks is to break free from the postulate that channels are uncontrollable factors. Serving such a vision, MetaWireless pursues the disruptive idea of designing wireless networks by treating the environment itself as a quantity to be controlled and optimized. Precisely, the manipulation of the wireless environment can be made possible by incorporating reconfigurable intelligent surfaces. These are planar structures, made of meta-materials and electromagnetically discontinuous, which do not adhere to conventional reflection and diffraction laws; rather, they can modify in a controllable fashion the phase and wavefront of impinging radio waves. If deployed to coat objects, walls, or building facades, they could allow customizing in real time the electromagnetic response of environments. Making this vision a reality requires the training of a new generation of researchers and a multidisciplinary effort involving wireless communications, physics, electromagnetic theory, and computational learning, which are the ingredients that define the MetaWireless project.

The Role

NEC-1 will be hosted by NEC Laboratories Europe GmbH, which is located in Heidelberg, Germany. The ESR will be enrolled on the PhD programme of University of Cassino and Lazio Meridionale, Italy, and will write their thesis on a topic related to “*Scalable software-configurable large-scale intelligent radio environments*” (NEC-1) under the supervision of Dr. Vincenzo Sciancalepore for the entire duration of their Ph.D. programme. NEC-1 will benefit, in addition, of a secondment period at other partners of the MetaWireless project.

Further information about the Ph.D. projects can be found in the following tables.

Position: NEC-1
Title: Scalable software-configurable large-scale intelligent radio environments.
Scientific context: For their effective operation in large-scale wireless networks, RISs need to be remotely configured via software and need to be equipped with computational learning methods with superior prediction capabilities in order to ensure on-demand network intelligence for complex deployment planning, real-time programmability for end-to-end optimization, and dynamic control for multi-service provisioning. Software-controlled RISs are an active field of research, but current approaches are based on heuristics (e.g., genetic models) with no predictive capabilities and are not scalable for application to large-scale networks, since mostly cloud-based. The scalability of learning, programming, and controlling RIS-based wireless networks is an open issue, especially in the presence of a large number of RISs each with a massive number of tunable unit cells. To overcome such a gap, the ESR project is on developing distributed algorithms for controlling and programming the operation of RIS-based wireless networks in a scalable manner. The proposed approach will be based on leveraging federated learning to reduce the amount of data to exchange (low overhead), and deep-based and reinforcement-based unfolding to devise fast-implementable and performance-guarantee algorithms whose parameters can be optimized by using the data sensed by the RISs.
Objectives: Develop distributed algorithms for controlling/programming the operation of RIS-based wireless networks in a scalable manner.
Expected results: Fast-implementable and performance-guarantee algorithms whose parameters are optimized based on RIS-sensed data.
Acquire knowledge: Optimization theory and federated learning methods for performance optimization of RIS-based networks.
Planned secondment(s): KTH (Sweden) for 3 months and UPF (Spain) for 3 months.
Ph.D. enrolment: University of Cassino and Lazio Meridionale (Italy).

Duties and Responsibilities

1. Undertake postgraduate research in support of the agreed doctoral research project.
2. Work closely with the academic supervisors to ensure the compatibility of the individual project with the overall goals of MetaWireless.
3. Present and publish research in both academic and non-academic audiences.
4. Attend and participate to academic and non-academic conferences, events and seminars.
5. Attend and participate to all training events and supervisory meetings.
6. Be seconded to other network partners as necessary to fulfil the grant obligations.
7. Prepare progress reports and similar documents on research for funding bodies, as required.
8. Contribute to the delivery and management of the wider programme, including attending and participating in programme committee meetings.
9. Actively contribute to the public engagement and outreach activities as described in the grant agreement.

As job descriptions cannot be exhaustive, the ESR may be required to undertake other duties, which are broadly in line with the above duties and responsibilities.

Person Specification

1. An undergraduate degree and a postgraduate Master's degree (or equivalent) in electronic or electrical engineering, mathematics, electromagnetics, or a physical sciences subject.
2. Excellent mathematical skills and background.
3. High proficiency in Matlab, Mathematica, Maple, R, or similar programming software.
4. Solid background on wireless communications (antennas, propagation, stochastic geometry is a plus).
5. Excellent written and verbal communication, including presentation skills.
6. Highly proficient English language skills.
7. Excellent organisational skills, attention to detail and the ability to meet deadlines.
8. Ability to think logically, create solutions and make informed decisions.
9. Willingness to work collaboratively in a research environment.
10. A strong commitment to his/her own continuous professional development.
11. Willingness to travel and work across Europe.

Eligibility Requirements

All candidates must meet the following requirements to be considered for this post:

- a) Early-Stage Researchers (ESRs) shall at the time of recruitment by the host organisation be in the first four years (full-time equivalent research experience) of their research careers and not yet have been awarded a doctoral degree. Full-time equivalent research experience is measured from the date when a researcher obtained the degree which would formally entitle him or her to embark on a doctorate, either in the country in which the degree was obtained or in the country in which the researcher is recruited.
- b) At the time of recruitment by the host organisation, ESRs must not have resided or carried out their main activity (work, studies, etc.) in the country of their host organisation (Germany) for more than 12 months in the three years immediately prior to the recruitment date. Compulsory national service and/or short stays such as holidays are not taken into account.

How to Apply

Applications must be submitted, to the attention of Dr. Vincenzo Sciancalepore, according to the following procedure:

- 1) Registration and submission of the application material to the MetaWireless recruitment website (<https://h2020-msca-itn-metawireless.cnit.it/jobs/>).
- 2) Registration and submission of the application material to the NEC recruitment website (<https://www.neclab.eu/join-us>).

Informal enquires for further information about the positions can be sent to Dr. Vincenzo Sciancalepore (vincenzo.sciancalepore@neclab.eu).

Note 1: Registrations and submissions need to be done to both websites.

Note 2: By registering on either of the two websites mentioned above, the applicants agree that all members of the MetaWireless project can access their personal data and application material.

Each application must include the following material:

- a) A cover letter explaining the motivation for applying for the post.
- b) A curriculum vitae setting out the educational qualifications as well as any additional scientific achievements and publications.
- c) Evidence of English proficiency.
- d) Copy of Bachelor's and Master's certificates.
- e) Copy of Bachelor's and Master's transcripts.

f) Any additional material useful for the assessment of the candidate (e.g., recommendation letters, research project/statement in agreement with the requirements specified in previous text).

Selection Process

The selection and recruitment processes of the ESR will be in accordance with the European Charter and Code of Conduct for the Recruitment of Researchers. The recruitment process will be open, transparent, impartial, equitable, and merit-based. There will be no overt/covert discrimination based on race, gender, sexual orientation, religion or belief, disability or age. To this end, the following selection criteria for the recruitment of the ESRs will be considered:

- 1) Curriculum vitae
- 2) Academic performance (diplomas, university transcripts, etc.)
- 3) Research and industrial experience
- 4) Awards and fellowships
- 5) Publications and patents
- 6) Research, leadership, and creativity potential
- 7) English knowledge
- 8) Other relevant items based on the specific candidate

The recruitment process will adhere to the guidelines described in the Grant Agreement of the MetaWireless project. At the network's level, the recruitment will be coordinated by the Recruitment Committee of the project in order to guarantee gender- and sector-balance. At the NEC's level, the recruitment will be coordinated by the host laboratory (NEC Laboratories Europe GmbH). More precisely, the recruitment and selection of the ESRs will be executed by the Scientist-in-Charge of the MetaWireless project for NEC (Dr. Vincenzo Sciancalepore) and by at least another research scientist or senior researcher of NEC Laboratories. The entire process will be overseen and approved by the Administrator and the Responsible of the Human Resources of NEC Laboratories.

The application deadline for both posts is on **1 April 2021**. Each application will be acknowledged electronically (e.g., by return email) and a unique ID number will be assigned to it. The applications will be analysed after the application deadline, and the shortlisted candidates will be invited to a teleconference interview. The selected candidates are expected to be recruited during the period **1 May 2021 - 30 November 2021**. At the end of the selection process, all the applicants will be informed of the outcome of their application by return email. Applicants interested in joining NEC Laboratories are invited to apply to post NEC-1, and to express their preference for the most suitable post (if any).

Further Information

For more information about NEC-1, please contact Dr. Vincenzo sciancalepore (vincenzo.sciancalepore@neclab.eu).

Disclaimer

By applying for this position, the applicants give their consent to circulate their application and personal data within the members of the consortium.

By applying for this position, the applicants declare to fulfil the eligibility requirements defined by the MSCA.

By applying for this position, the applicants agree that they will comply with the secondment plan.

By applying for this position, the applicants agree that they will comply with the planned Ph.D. enrolment.