

Job Description

PAINLESS Early Stage Researcher

Department of Electronic and Electrical Engineering, University College London

The Department of Electronic and Electrical Engineering, University College London is seeking to appoint **two** high-calibre Early Stage Researchers (ESR) to join the Marie Skłodowska-Curie Innovative Training Network on ‘**energy-autonomous Portable Access points for INfrastructure-LESS networks - (PAINLESS)**’.

Position	Early Stage Researcher
Location:	#1 and #9 : energy-autonomous Portable Access points for INfrastructure-LESS networks - (PAINLESS) UCL, London, with secondments to project partners in the EU
Working Time:	Full Time (36.5 hours per week)
Duration:	Fixed-Term (1st June 2019 – 31st May 2022)
Salary:	Between £37,730 and £46,950 gross per annum at the current rate of exchange. These figures are before employer and employee deductions, including tax, national insurance and pension contributions, subject to the pension choices of the appointee. The level of salary is also subject to the family status of the appointee as to whether they qualify for a family allowance. Due to potential future changes in the Euro/Pound Sterling exchange rate over the period of the appointment, where amendments are required, corrective payments will be made. Salaries are not subject to either cost-of-living adjustments or increment progression, and are inclusive of London Allowance.

About PAINLESS

The explosive growth of applications and industrial sectors that rely on broadband connectivity, is set to stretch the demand for wireless networks beyond the reach of the power grid infrastructure. Access points are being deployed on board of drones, while more than 84,000 hybrid-energy base stations are expected to be deployed annually in remote areas by 2020. Portable network nodes that are energy-autonomous and operate detached from the power grid will become indispensable in the coming applications of wireless networks. Energy-autonomy presents immense challenges for the wireless network design and imposes a complete re-think of technological solutions. PAINLESS has the visionary aim to establish a training and research platform to pioneer green, energy-autonomous portable network nodes which are self-subsistent and limitlessly-scalable, to satisfy future demands with minimal infrastructure. It promises a paradigm shift by integrating and jointly optimising wireless networks with renewable energy sources, radiated energy harvesting and airborne access points, as well as establishing disruptive performance benchmarks for the combined wireless power-and-information distribution. Our results will kick-start an innovation ecosystem for infrastructure and service providers of ICT to develop and commercialise a new generation of autonomous, sustainable and power-independent communication networks with selforganising functionality, to enable 100% coverage in urban environments in a power-efficient manner; provide network access to all types of emergency, disaster and special events areas; and connect remote / developing areas with problematic infrastructure. PAINLESS relates to H2020-MSCA with a vision to produce the first generation of experts in a radically new wave of energy autonomous networks that will revolutionise the wireless networking technology landscape and the plethora of associated vertical business sectors.

The Role

ESR1

The ESR1 will be enrolled on the PhD programme at UCL's EEE Department and will write his/her thesis on a topic related to **Energy Balancing and Optimisation framework for future Energy Neutral HetNets based on Energy Generation / Storage / Consumption Modelling and Trade-offs**, supervised by Dr. Christos Masouros and Prof. John Mitchell at UCL and co-supervised by members of the industrial teams during the secondments. Further information about the PhD project is below:

Title: Energy Balancing and Optimisation framework for future Energy Neutral HetNets based on Energy Generation / Storage / Consumption Modelling and Trade-offs

Objectives: This ESR will first construct detailed and realistic models for energy generation and storage, by advancing current elementary models based on measurements of existing small base stations and EH equipment owned by partners (NOK, LYRA, AAU). These will then be used to build an analytical energy optimisation framework for ensuring energy balancing in a number of practical scenarios, and determine fundamental limits of transmission constrained on energy neutrality. As part of this work, analytical conditions for energy neutrality will be derived for a number of HetNet scenarios. The work will incorporate performance metrics based on energy autonomy, and span from link-level scenarios to multi-user and multi-cell HetNet transmission.

Expected results:

- Analytical models for energy consumption, generation, and storage.
- Energy optimisation framework, to drive the joint design of enabling front/back-haul and energy harvesting techniques
- Fundamental limits analysis based on energy autonomy, providing performance benchmarks

Planned secondment(s): In Year 2 ESR1 will spend 3 months at Lyra Electronics and 6 months at Nokia Bell Labs. (TBC)

ESR9

The ESR9 will be enrolled on the PhD programme at UCL's EEE Department and will write his/her thesis on a topic related to **Energy-informed communication for aerial base stations**, supervised by Dr. Christos Masouros and Prof. Sarah Spurgeon at UCL and co-supervised by members of the industrial teams during the secondments. Further information about the PhD project is below:

Title: Energy-informed communication for aerial base stations

Objectives: Study of optimal and suboptimal transmission for aerial BSs, based on energy availability constraints with the help of digital signal processing. The study will build upon energy optimization and balancing together with interference management and coordinated transmission from groups of drones, drone trajectory optimization for coverage vs energy lifetime optimization. A number of drone topologies, communication channel models and uncertainties, and hardware aspects will be considered.

Expected results:

- Modelling of energy-vs-interference optimization, and UAV trajectory-vs-lifetime optimization.
- Signal processing techniques for energy balancing with coordinated drone transmission
- Comparative evaluation of techniques and integration to a system level simulator.

Planned secondment(s): In Year 2 ESR9 will spend 3 months at ORION INNOVATION and 6 months at Athens Information Technology. (TBC)

The ESR's PhD must be designed and conceived as an integral part of the overall PAINLESS project. The successful candidate will be a team player, prepared to work closely with the Project's senior staff and other ESRs. By the end of the third year the ESR will be expected to complete a publishable chapter for the volume constituting one of the major deliverables of PAINLESS. This chapter can be a part of the PhD dissertation, which, most likely, will be completed at a later date.

This is an outstanding opportunity to be part of a network of leading scholars working on state of the art technologies in Wireless Communications. In addition to PhD supervision, the successful candidate will benefit from a wide-ranging training programme, which will encompass:

- a) Regular summer/winter schools pertaining to both, technical skills on topics in wireless communications relevant to the scope of the PAINLESS project, and a range of transferrable skills (research management, entrepreneurship, patents, etc.);
- b) An overseas research secondment to one of the partner universities in the PAINLESS consortium;
- c) A secondment to a non-academic training partner;
- d) A number of career fares towards the end of their project, to assist in their future employment.

The ESR will help organise and present their research at a major international conference on the themes of the PAINLESS research programme.

Duties & 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 PAINLESS.
3. Present and publish research to both academic and non-academic audiences.
4. Attend and participate in academic and non-academic conferences, events and seminars.
5. Actively participate in outreach activities and in promoting the Project's progress and events in social networks.
6. Attend and participate in all training events and supervisory meetings.
7. Be seconded to other network partners as necessary to fulfil the grant obligations.
8. Prepare progress reports and similar documents on research for funding bodies, as required.
9. Contribute to the delivery and management of the wider Programme, including attending and participating in programme committee meetings.

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

Person Specification

1. A good Undergraduate degree and a postgraduate Master's degree (or equivalent) in electronic or electrical engineering, or a physical sciences subject.
2. Excellent written and verbal communication, including presentation skills.
3. Highly proficient English language skills.
4. Excellent organisational skills, attention to detail and the ability to meet deadlines.
5. Ability to think logically, create solutions and make informed decisions.
6. Willingness to work collaboratively in a research environment.
7. A strong commitment to your own continuous professional development.
8. Ability 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, researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of their host organisation 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

Application must be submitted online to www.ucl.ac.uk/hr/jobs.

The application must include:

- a) A cover letter explaining your motivation for applying.
- b) A Curriculum Vitae setting out your educational qualifications as well as any additional scientific achievements and publications.
- c) Evidence of Advanced-level English – IELTS (or equivalent) overall grade of 7.5 with a minimum of 6.5 in each of the subtests. See also: www.ucl.ac.uk/prospective-students/graduate/life/international.
- d) A copy of your Master's certificate (or equivalent) or certificate of graduation.
- e) An official transcript of the completed subjects and grades achieved in the course of the Master's programme.
- f) Two letters of recommendation from researchers familiar with your academic activities, e.g. the advisor of your Master's thesis. The referees must e-mail their recommendations directly to v.coombes@ucl.ac.uk.
- g) A short research proposal on the project's theme (max. 2,000 words)

Selection process

The selection and recruitment processes of the ESRs 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 PAINLESS project. At the network's level, the recruitment panel will include a minimum of 3 members of the project in order to guarantee gender- and sector-balance.

The applications will be analysed after the application deadline, and the shortlisted candidates will be invited to a Skype interview.

Further Information

For more information about the post, please contact: v.coombes@ucl.ac.uk or c.masouros@ucl.ac.uk