

EUROPEAN SPACE AGENCY

Internal Research Fellow (Post Doc) in Artificial Intelligence

Job Req ID: 14123

Closing Date: 13/04/2022

Publication: External Only

Vacancy Type: Internal Research Fellow

Date Posted: 16/03/2022

Internal Research Fellowship Opportunity in the Directorate of Telecommunications and Integrated Applications.

ESA is an equal opportunity employer, committed to achieving diversity within the workforce and creating an inclusive working environment. We therefore welcome applications from all qualified candidates irrespective of gender, sexual orientation, ethnicity, beliefs, age, disability or other characteristics. Applications from women are encouraged.

This post is classified F2.

Location

ECSAT, Harwell, United Kingdom

Our team and mission

The European Space Agency is seeking a post-doctoral researcher to perform state-of-the-art research in Artificial Intelligence applied to dynamic spectrum management, network resource optimization, self-organizing networks and other related SatCom fields.

The main research area is on Cognitive Radio Networks/ Dynamic Spectrum Sharing, which includes Machine Learning as a core element requiring a combination of mathematical tools from Statistics, Optimization and Control Theory. Machine learning/ Reinforcement Learning methods will be used for actively learning a set of features describing the network environment and subsequently for assigning the adequate level of resource allocation in each of the nodes of the network, using Software-Defined Radio in the different nodes of the network. The desired KPI indicators include the throughput of the cognitive network, the cumulative interference towards primary systems and the convergence rate of the developed algorithms. Within the "Space for 5G/6G" program, the team has been active in exploring candidate solutions for resource optimisation that could prove to be useful under both 5G terrestrial and satellite networks. As of 25th of October 2019, a patent [RD1] titled "Global Artificial Intelligence-driven Cognitive Network", was filed by ESA as an international (PCT) application.

The invention features a cognitive-driven network architecture which autonomously

explores the behaviour of centralised-based network topologies and improves response times by distributing decision-making capabilities across different layers of the network, aiming at optimising frequency resources while reducing spacecraft control time. The applicant for this vacancy will have the opportunity to implement the architecture of this novel invention as well as to propose improvements or even propose alternative solutions.

You are encouraged to visit the ESA website: www.esa.int

Field(s) of activity/research for the traineeship

You will carry out research in artificial intelligence. Areas of research are partly chosen by you based on your own expert judgements and insight into trends and developments, and partly chosen by the team as to follow strategic directions of the Agency.

Scientifically you will in particular:

- Propose and perform research in the field of artificial intelligence, where a) the concept of the above-mentioned patent [RD1] could be applied to a 5G use-case scenario, targeting the optimisation of resources of an integrated satellite-terrestrial network intelligence, or b) state-of-the-art Machine Learning algorithms are proposed, tested and applied to dynamic spectrum sharing or other SatCom-related use-cases, where appropriate together with universities of ESA Member States.
- Develop AI models that can simulate the behaviour of the patent [RD1];
- Generate KPIs that can evaluate the performance of the AI-driven cognitive network (i.e. main concept of the invention [RD1]) against a baseline scenario defined by traditional state-of-the-art multiple access methods or any other state-of-the-art frequency sharing mechanisms;
- Use the AL Lab and 5G/6G hub to test the models developed under real 5G network scenarios;
- Bring forth one or more of the following research lines; a) Deep Learning applied to SatCom data, b) Reinforcement Learning/ Adaptive Programming for self-management of 5G/6G networks;
- Contribute to the creation and coordination of potential AI competitions to be tested under live conditions in the AI Lab and 5G/6G hub;
- Contribute to the management of the AI Lab.

As an ESA researcher, you will:

- Publish results in peer-reviewed publications and use modern communication tools to communicate with broader audience inside and outside ESA;
- Lead and assist interdisciplinary projects with other Engineers, Research Fellows and Young Graduate Trainees within the 5G/6G SPL;
- Participate together with the team in the assessment of proposed space system concepts - these not being restricted only to artificial intelligence and computer science - and propose new concepts and assessment studies.

Technical competencies

Knowledge relevant to the field of research

Research/publication record

Ability to conduct research autonomously

Breadth of exposure coming from past and/or current research/activities

General interest in space and space research

Ability to gather and share relevant information

Behavioural competencies

Result Orientation

Operational Efficiency

Fostering Cooperation

Relationship Management

Continuous Improvement

Forward Thinking

Education

You should have recently completed, or be close to completion of a PhD in on artificial intelligence, computer science, robotics or machine learning, mathematics or engineering. Robotics or Machine Learning. Subject of the thesis being relevant to the description of the tasks outlined above and aim at an academic/research career. Preference will be given to applications submitted by candidates within five years of receiving their PhD.

Additional requirements

- Proficiency in Python and Matlab programming languages is mandatory. Knowledge of C++ will be considered an asset;
- Experiences in open-source projects, GPU programming, distributed computing and cloud computing are considered as strong assets;
- Project-based experience (FP7/H2020, ESA, Industry) and a good publication record in the field of Machine Learning (Reinforcement Learning) applied to Dynamic Spectrum Sharing, Network Resource Optimization or similar;
- Interest in space science and technology;
- Ability for and interest in prospective interdisciplinary research;
- Aptitude to contextualise specialised areas of research and quickly assess their potential with respect to other domains and applications;
- Academic networking to add functioning links to universities and research institutes;
- Ability to work in a team, while being able to work individually and autonomously regarding his/her own personal research plans and directions;
- Natural curiosity and a passion for new subjects and research areas.

The working languages of the Agency are English and French. A good knowledge of one of these is required. Knowledge of another Member State language would be an asset.

Other information

For behavioural competencies expected from ESA staff in general, please refer to the [ESA Competency Framework](#).

For further information on the Internal Research Fellowship Programme please visit: [Internal Research Fellowship](#)

The Agency may require applicants to undergo selection tests.

In addition to your CV and your motivation letter, please add your proposal of no more than 5 pages outlining your proposed research in the "additional documents" field of the "application information" section.

At the Agency we value diversity and we welcome people with disabilities. Whenever possible, we seek to accommodate individuals with disabilities by providing the necessary support at the workplace. The Human Resources Department can also provide assistance during the recruitment process. If you would like to discuss this further please contact us at contact.human.resources@esa.int.

Please note that applications are only considered from nationals of one of the following States: Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, and the United Kingdom. Nationals from Latvia and Slovenia, as Associate Member States, or Canada as a Cooperating State, can apply as well as those from Bulgaria, Cyprus and Slovakia as European Cooperating States (ECS).

According to the ESA Convention, the recruitment of staff must take into account an adequate distribution of posts among nationals of the ESA Member States*. When short-listing for an interview, priority will first be given to candidates from under-represented or balanced Member States*. (<https://esamultimedia.esa.int/docs/careers/NationalityTargets.pdf>)

In accordance with the European Space Agency's security procedures and as part of the selection process, successful candidates will be required to undergo basic screening before appointment.

*Member States, Associate Members or Cooperating States.