

Internal Research Fellow (PostDoc) in Artificial Intelligence for Hyperspectral Imaging Data AI4HSI

Job Req ID: 11782

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Vacancy Type: Internal Research Fellow

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Research Fellowship Opportunity in the Directorate of Earth Observation Programmes.

ESA is an equal opportunity employer, committed to achieving diversity within the workforce and creating an inclusive working environment. For this purpose, we 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

ESTEC, Noordwijk, Netherlands

Our team and mission

The Copernicus Hyperspectral Imaging Mission for the Environment (CHIME) aims at augmenting the Copernicus space component with precise spectroscopic measurements to derive quantitative surface characteristics supporting the monitoring, implementation and improvement of a range of policies in the domain of raw materials, agriculture, soils, food security, biodiversity, environmental degradation and hazards, inland and coastal waters, snow, forestry and the urban environment. For this CHIME is currently developed which will allow collecting a large amount of data with high spatial, temporal and spectral resolution. In order to handle the data volumes, CHIME is playing a pathfinder role for On-board data processing bridging the gap between latest state-of-the-art research, newest Earth Observation Applications and On-board processing technology development. In this context Artificial Intelligence (AI) allows automatic retrieval/analysis of the hyperspectral Earth observation imagery from the satellite's sensor on-board, amongst others for pre-filtering of Earth observation data so that only relevant parts of the image with usable information are downlinked to the ground. This would allow improving bandwidth utilisation and significantly reducing aggregated downlink costs. Further, AI and related machine learning will improve the retrieval accuracy of geo-biophysical variables from the hyperspectral data-sets.

Recently, the first artificial intelligence (AI) technology carried onboard a European Earth observation mission, ϕ -sat-1, launched from Europe's spaceport in French Guiana provided an enhancement of the Federated Satellite Systems mission (FSSCat). This pioneering artificial intelligence technology is the first experiment to improve the efficiency of sending vast quantities of data back to Earth, using on-board AI techniques.

The purpose of this Research Fellowship is to investigate potential AI approaches to support higher-accuracy geo-bio-physical variable retrieval from massive CHIME data sets. Further the pre-filtering of relevant (e.g. cloud-) contaminated data onboard the satellite after data acquisition for transmission down to ground depending on Ground targets needs is to be analyzed and tested.

Field(s) of activities/research/learning areas

You will work in the framework of Onboard data processing (AI) helping us to bridge the gap between latest state-of-the-art research, newest Earth Observation Applications and currently ongoing CHIME on-board processing technology development.

Depending on your previous research experience you are invited to suggested topics in the following areas:

- Developing new algorithms for onboard (on-ground) AI implementation depending on processing architectures (inline and/or offline);
- Implementing and testing new algorithms or scenarios with existing CHIME End-to-End simulator;
- Testing AI-based selective data reduction and compression schemes, e.g., for latency and frame loss;
- Implementing CCSDS 123.0-B-2 (lossless and near lossless) or optimized forms of the standard;
- Developing and testing novel algorithms for hyperspectral image processing for geo-bio-physical variables extraction, e.g., for Feature / Information Extraction or Super resolution.

In particular, your activities will be to:

- Proposing and performing research in one of the above themes, bringing the power of novel on-board processing technologies and AI-based algorithms to Earth Observation;
- Publishing results in peer-reviewed publications;
- Sharing your research within conference and workshops, as well as using modern communication tools (webinars, Jupiter Notebooks, social media).

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

Innovation & Creativity

Continuous Learning

Communication

Relationship Management

Self Motivation

Problem Solving

Cross-Cultural Sensitivity

Education

You should have recently completed, or be close to completion of a PhD in Applied Mathematics, Information Technology or similar Science/Engineering domains preferably with Earth observation application experience. Preference will be given to candidates awarded their doctorate within the past five years.

Additional requirements

Solid AI-related Information Technology background with preferable background in Earth Observation image processing is expected. Proven experience in artificial intelligence, data science, hyperspectral image processing, computer vision and optics are considered strong assets. Solid programming skills in Python, Matlab, C++ or other high-level programming languages are essential.

Other requirements include:

- Ability to work cooperatively in a multi-disciplinary team, as well as individually on personal research projects and direction;
- Proven experience in leading research, with track record of publications;
- Experience in academic networking to build links with universities and research institutes, at national and international levels;
- Natural curiosity and passion for new subjects, methodologies 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](#).

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, 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, Lithuania and Slovakia as European Cooperating States (ECS).

Priority will first be given to candidates from under-represented Member States.

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