

Internal Research Fellow (PostDoc) in Digital Twin Spacecraft

Job Req ID: 12463

Closing Date: 28 September 2021

Publication: External Only

Vacancy Type: Internal Research Fellow

Date Posted: 17 August 2021

Research Fellowship Opportunity in the Directorate of Operations.

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

ESOC, Darmstadt, Germany

Our team and mission

You will be based in the Earth Observation Mission Data System Section, Mission Operations Data Systems Division, Ground Systems Engineering & Innovation Department.

The Mission Operations Data Systems Division is responsible for software system use during the preparation and operational phases of most ESA space missions, including:

- Mission Control Systems (to monitor and operate the satellite);
- Mission Planning Systems and Mission Automation Systems;
- Spacecraft Simulators (used for testing, validation and training);
- Service Provision Data Centres.

Supported missions include the ESA Earth explorer, science, planetary and exploration missions, as well as most of the EU Copernicus missions.

The Division is also very active in software innovation by means of R&D studies on software technologies applied to space missions focused on the systems listed above. This includes standardisation of interfaces with other space agencies (e.g. NASA, JAXA, CNES and DLR), CubeSats, robotics, virtual and augmented reality, model based system engineering, security, and artificial intelligence, as well as software technologies such as service oriented architecture, web technology, advanced human-machine interfaces and cloud computing.

Candidates are encouraged to visit the ESA websites:

www.esa.int

www.esa.int/About_Us/ESOC

https://download.esa.int/esoc/esa_ESOC_BR_web_2015.pdf

Field(s) of activity/research for the traineeship

Traditionally for each mission, the Agency uses the following systems:

- A high-fidelity simulator, for testing, training and validation activities, to ensure that all operational tasks can be tested as part of a realistic scenario before being executed;
- A data archive, for storing all data received from and sent to the spacecraft for evaluation of the historical behaviour of the spacecraft;
- A mission planning facility, for planning future operations including constraint checking and prediction of utilisation of on-board resources.

The research will focus on enhancing the above using digital twin technology to improve the digital representation of a spacecraft and the engineering processes. The IRF will contribute to research enabling digital twin utilisation in spacecraft operations at ESA/ESOC. This includes:

- Advances in concepts for end-to-end digital continuity, from spacecraft design to manufacturing, and finally to operations, including the use of model-based systems engineering, simulation models and simulator data, together with “in-field” (physical) data to represent the spacecraft;
- Using the combination of models and data (with the focus on AI/machine learning) to create output supporting spacecraft design, production, verification and operations as well as improve spacecraft design;
- Utilisation of advanced visualisation (for example AR/VR) and analytics tools to increase the usefulness of a digital twin for operational tasks such as:
 - Anomaly detection and investigations
 - Preparation for future operational tasks to improve operational reliability;
- Improvements in modelling technology to increase digital twins' representativeness of physical spacecraft, including utilisation of AI/ML based self-learning or data driven models;
- Improvements in processing, storage and analytics capabilities for data gathered from both physical assets and digital twins;
- Identification of new concepts for automation and optimisation of the spacecraft operations process to increase science return and rationalise operational tasks.

As the spacecraft digital twin topic is very broad, the expected research may focus on a selected subset of the items listed above, depending on your interests and background.

Day-to-day activities will cover a wide spectrum, such as stand-alone research, supervision of student trainees (internships, masters' theses and possibly a PhD theses), lab activities, supervision of industrial research contracts, development of proof-of-concept software, and contributing to the Agency's R&D/investment roadmaps.

Technical competencies

Knowledge relevant to the field of research, in particular Digital Twins and/or Artificial Intelligence

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 a related technical or scientific discipline, such as artificial intelligence, data science, modelling and simulation, MBSE or any related field. Preference will be given to applications submitted by candidates within five years of receiving their PhD.

Additional requirements

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.