EUROPEAN SPACE AGENCY

Internal Research Fellow (PostDoc) in Machine Learning for Advanced Space Control Systems

Job Req ID: 12705
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Vacancy Type: Internal Research Fellow
Date Posted: 17 December 2021

Research Fellowship Opportunity in the Directorate of Technology, Engineering and Quality.

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
ESTEC, Noordwijk, Netherlands

Our team and mission
Within the Systems Department, the GNC, AOCS and Pointing Division is responsible for the following activities:
• Engineering and R&D of Attitude and Orbit Control Systems (AOCS) for satellites including Failure Detection Isolation & Recovery (FDIR);
• Engineering and R&D of Guidance, Navigation and Control (GNC) systems for space vehicles including interplanetary cruise, aero assistance, precision landing, ascent, rendezvous and docking, re-entry, formation flying and drag-free systems;
• R&D of advanced control, estimation & optimisation techniques and tools;
• Technology development for AOCS and GNC sensors;
• End-to-end engineering and R&D of high pointing accuracy systems;
• Development of control engineering standards in the framework of ECSS and ESA standardisation boards.
Division objectives of particular relevance to the proposed Research Fellowship activities are indicated in the first three bullet points above.

Field(s) of activity/research for the traineeship
Our team has a strong background in advanced modelling of dynamical systems, system identification, simulation technologies, advanced robust and embedded control. AI technologies are deployed to vision-based navigation applications and worst-case analysis, including multi-parameter optimisation for control design.
As a subsequent step we are interested in extending our field to the development of certifiable physics-based machine learning AOCS/GNC and modelling concepts relying on a strong background in dynamical systems, controls and numerical optimisation technologies.
If selected for this fellowship, you will thus have the opportunity to work on a variety of challenging space projects with an emphasis on implementing the AI developed for navigation, estimation and control concepts on physical space systems.
We will also place a great deal of emphasis on the modelling opportunities provided by machine learning to allow efficient simulation of complex dynamics governed by partial differential equations.

Areas of research will be tailored with the team in line with the Agency's strategic directions and activities.

Your research tasks will comprise:
• Developing a computational infrastructure for the design and validation on advanced ML systems by working together with team members to maximise synergies and to capture the problem areas and group needs.
• Collaborating on the Division's space technology projects, for example in orbital robotics and satellites (active debris removal, Earth observation, telecom, exploration, space transportation systems) as well as re-entry systems towards the design and implementation of novel machine learning navigation, control and failure detection concepts, possibly in the Division laboratory facilities.
• Contributing to the development of advanced benchmark problems that will serve as baseline and reference cases for various R&D projects. This will be done in collaboration with industry and academia.
• Maintaining close contact with the world's leading research communities involved in machine learning for dynamical systems, system identification and control systems.

As Research Fellow, you will be responsible for:
• disseminating results obtained via technical reporting and peer-reviewed journals;
• communicating, disseminating and providing in-house expertise;
• in a broader context outside of the ESA environment, disseminating results via colloquiums and webinars;
• participating, with the team, in the assessment of proposed space system concepts providing support/advice in the technical areas related to machine learning concepts of strategic interest to ESA;
• supporting the elaboration of a machine learning AOCS/GNC strategy;
• making full use of the extensive engineering expertise available within the Group as well as within ESTEC, in order to foster collaboration and expand our knowledge domain.

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 must have recently completed, or be close to completing, a PhD in a related technical or scientific discipline, preferably in dynamical systems, control systems and machine learning.

Additional requirements
A background in robust and embedded control, aerospace systems, physical modelling, simulation as well as AI-related concepts, electrical engineering, computer vision, and mathematics and numerical optimisation.
Proficiency in MATLAB, Julia, Python programming languages and associated packages needed for optimisation, modelling, requirements and machine learning are considered an

asset.
Good analytical skills and the ability to work in a multicultural environment in an autonomous manner. You should have a methodical approach to your work and the ability to clearly document, disseminate and communicate your work and results.
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.

Specificities
The position of Research Fellow within the TEC-SA GNC, AOCS and Pointing Division is similar to a standard academic post-doc placement, but with a few key differences:
1. Although you are not required to be involved in teaching, it is presumed that hands-on knowledge dissemination within the Division will take place via working groups.
2. You will be involved in mentoring PhD students, Young Graduate Trainees and interns (stagiaires) within the team.
3. TEC-SA is a diverse, changing and interdisciplinary research team forming part of a large space agency, in contrast to a more specialised, focused research group with related or similar competences.
4. TEC-SA aims to maximise contact with other disciplines, contributing to interdisciplinary research and collaboration.
5. TEC-SA aims to communicate expertise and research results internally and externally, including the potential implications and importance for ESA's long-term strategy.

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, Lithuania 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 internal candidates and secondly to external 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.

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