

## **Research Fellowship in Artificial Intelligence**

### **Advanced Concepts Team Directorate of Technology, Engineering and Quality**

#### **ESTEC, Noordwijk, the Netherlands**

#### **ESA/RF-ESTEC(2017)004**

The European Space Agency's Advanced Concepts Team (<http://www.esa.int/act>) is looking for a highly motivated young researcher in the field of Artificial Intelligence.

### **Duties and Tasks**

The successful candidate will carry out research in artificial intelligence with a particular emphasis on methods allowing realising truly autonomous control and operations. Areas of research are partly chosen by the successful candidate based on his/her own expert judgements and insight into trends and developments, and partly chosen by the team as to follow strategic directions of the Agency.

#### **Scientifically she/he will in particular:**

- Propose and perform research in the field of artificial intelligence, where appropriate together with universities of ESA Member States (in particular through the *Ariadna* programme);
- Assess and investigate concepts and novel theoretical methods in artificial intelligence for synergies with space systems;
- Bring forth one or more of the following research lines: a) Differential intelligence (use of high order automated differentiation for robotic behaviour design), b) Machine Learning in space applications, c) (deep) Reinforcement learning for approximately optimal control.
- Help to develop further open source projects of the ACT (pagmo2, pyaudi, pykep, etc.) and propose and lead research projects harnessing their functionalities.
- Use and further develop the web portal Kelvins (<https://kelvins.esa.int>) to run scientific competitions on advanced machine learning or general AI problems.
- Identify the trends and needs of the research communities involved in artificial intelligence and the potential roles of space to address these trends, and liaise with an internal research group on the use of AI in Earth observation.

#### **As ACT researcher, she/he will:**

- Publish results in peer-reviewed publications and use modern communication tools to communicate with the broader audience inside and outside ESA;
- Lead and assist interdisciplinary projects with other ACT researchers;
- Participate together with the team in the assessment of proposed space system concepts - these not being restricted only to artificial intelligence - and propose new concepts and assessment studies; and
- Perform and participate in assessments on subjects of strategic interest of ESA, provide in-house expertise to strategy development.

## Team

The Advanced Concepts Team (ACT) is a group of research fellows (post-docs) and young graduates who originate from a broad variety of academic fields and aim at an academic career. Its task is to monitor, perform and foster research on advanced space systems, innovative concepts and working methods. It interacts externally almost exclusively with academia and operates as a truly interdisciplinary team bound to high scientific standards. Via its research, the team acts as a cross-departmental pathfinder to explore novel, potentially promising areas for ESA and the space sector, ranging from applied to basic fundamental research topics. An important task of the team is to communicate scientific trends and results, as input to the strategic planning of the Agency.

## The Research Field

The team has been active in the field of artificial intelligence since 2007. Research areas, so far, included swarm intelligence, evolutionary computing, tree searches, machine learning, deep learning, bio-inspired sensors, robotic vision and serious gaming. The field is closely linked to computer science in which the team has performed research projects related to distributed-parallel-GPU computing (pagmo2), high order differential intelligence (pyaudi) and differentiable genetic programming (d-CGP).

Candidates are highly encouraged to get familiar with the research done in the above fields by the team (<http://www.esa.int/gsp/ACT/ai/index.html>) as well as on the overall research of the ACT and the main activities lines of ESA.

## Specificities of Research Fellowships in the Advanced Concepts Team

The position of Research Fellow at ESA's Advanced Concepts Team is similar to a regular academic Post-Doc placement, however with a few notable key differences:

1. ACT RFs have no teaching obligations. However, they will likely be involved in the mentoring of Young Graduate Trainees and stagiaires (student interns) within the team.
2. As the team does not have a professor-like position, ACT RFs are academically more independent than most post-docs. This implies more freedom but also more responsibility for their research directions and approaches.
3. ACT RFs are joining a diverse, changing and interdisciplinary research team embedded in a large space agency, in contrast to a more specialised, focused research group with close or similar competences.
4. ACT RFs need to actively reach out to other disciplines, to bring in their competences to interdisciplinary research projects and to encourage other researchers to join them in their core research projects (research at the intersections of disciplines).
5. ACT RFs need to communicate their expertise and research results internally and externally, including potential implications and importance for ESA's long-term strategy.

## Who can apply - Required Qualifications

The programme is open to suitably qualified women and men. Preference will be given to applications submitted by candidates within five years of receiving their PhD.

The Research Fellow Programme is open to nationals of the following states: Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, and the UK, Slovenia as an Associate Member or Canada as a Cooperating State, Bulgaria, Cyprus, Latvia, Lithuania, Slovakia as European Cooperating States (ECS).

Applicants must have obtained:

- A degree in either artificial intelligence, computer science, mathematics or engineering;
- PhD (completed before take up of duty) on Artificial Intelligence, Computer Science, 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.
- Proficiency in C++ and Python programming languages.
- Experiences in open source projects, GPU programming, distributed computing and cloud computing are considered as strong assets.

Additional Requirements:

- 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 regarding his/her own personal research plans and directions;
- natural curiosity and a passion for new subjects and research areas;
- good methodological and organisation skills;
- applicants must be fluent in English and/or French, working languages of the Agency. A good proficiency in English is required.

## Application Process and Deadlines

Please fill in the [online](#) application form attaching to it, **in one document only**, your CV, motivation letter and your research proposal.

Candidates must also arrange for up to **three letters of reference** to be sent by e-mail, before the deadline, to [temp.htr@esa.int](mailto:temp.htr@esa.int). The letters must be sent by the referees themselves with the candidate's name mentioned in the subject of the email.

Applications satisfying the general conditions for eligibility and submitted **by 1 September 2017**, will be evaluated and successful applicants will be invited for an interview. All applications will be considered until the available post is filled. A round of interviews is expected to take place in September 2017 timeframe, with the option of pre-screening interviews via videoconference.

Interested candidates are highly encouraged to visit the team's website: <http://www.esa.int/act> as well as the ESA website: <http://www.esa.int/>

If you have questions about the Research Fellowship in the Advanced Concepts Team, please write an email to [act@esa.int](mailto:act@esa.int).