

## **Research Fellowship in Artificial Intelligence**

### **Advanced Concepts Team, Directorate of Technical and Quality Management**

#### **ESTEC, Noordwijk, The Netherlands**

#### **ESA/RF-ESTEC(2015)004, Rev1**

#### **Overview of the Advanced Concepts Team's mission**

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.

#### **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 (e.g. [PyGMO/PaGMO](#) project), interval arithmetic, fast computer algebra (e.g. [Piranha project](#)) and high performance scientific computing.

Candidates are highly encouraged to get familiar with the research done in these 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.

#### **Overview of the field of research proposed – Duties and Tasks**

The successful candidate will carry out research in artificial intelligence. 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) Vision based estimation of non-cooperative targets, b) Deep Learning paradigm applied to Earth Observation or/and Astronomical data, c) Reinforcement learning and adaptive dynamic programming for approximately optimal control.

- Developing further open source projects of the ACT (PyGMO, PyKEP, the Jupiter Game, etc.) and propose and lead research projects harnessing their functionalities.
- Coordinate the team participation to summer of code initiatives such as GSoC and SOCIS (Google summer of code and ESA Summer of code).
- Identify the trends and needs of the research communities involved in artificial intelligence and the potential roles of space to address these trends.
- Propose and follow stage topics in areas of artificial intelligence of interest to the space sector.

#### **As ACT researcher, she/he 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 ACT Research Fellows and Young Graduate Trainees;
- 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; and
- Perform and participate in assessments on subjects of strategic interest of ESA, provide in-house expertise to strategy development and ESA's General Studies Programme.

#### **Who can apply**

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, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, and the UK, or Canada as a Cooperating State, Estonia, Hungary, Latvia and Slovenia as European Cooperating States (ECS).

#### **Required qualifications**

Required academic qualifications:

- 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 is mandatory.
- Experiences in open source projects, GPU programming, distributed computing and cloud computing are considered as strong assets.

Additional Requirements:

- 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;

- 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.

### **Specificities of the Research Fellowship 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 be involved in the mentoring of Young Graduate Trainees and 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.
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.

### **How to Apply**

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**. 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 22 May 2015**, will be evaluated and successful applicants will be invited for an interview. All applications will be considered until the available post is filled. A first round of interviews is expected to take place in June/July 2015 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)