Offer #2025-09012

PhD Position F/M Generating expressive motions for humanoid robots

Contract type : Fixed-term contract

Level of qualifications required : Graduate degree or equivalent

Fonction : PhD Position

Context

The position is funded by the ANR project OSTENSIVE, focused on generating motions that convey the purpose of an action in a natural and expressive way. In this context, the HUCEBOT team is involved in designing robot motions that are expressive and facilitate the communication.

About the team:

The candidate will join the Human Centered Robotics team (HUCEBOT) in the Inria Center of the University of Lorraine in Nancy, France.

The team HUCEBOT develops control, learning, and interaction skills of human-centered robots, such as humanoid, mobile manipulators and exoskeletons. The team develops learning and control algorithms for teleoperated / supervised / autonomous robots, involved in complex manipulation tasks in man-made environments. It also develops prediction and control techniques for wearable exoskeletons designed to assist humans at work. The team has excellent robotics facilities, including several humanoid robots (Talos, iCub, G1), manipulators, drones, passive and active exoskeletons, wearable sensors, force plates etc. Its laboratory has a 3D printing facility and a mechatronic workshop for prototyping and maintenance.

The team consists of many research scientists, postdocs, PhD and has the support of 1 software and 1 mechatronics engineer. The team is international - English and French speaking. French is not required, although free French classes are available in the institute for non-French speakers.

About the laboratory and Nancy:

The Inria Center of the University of Lorraine, is co-located with the Loria laboratory, in the Science and Technology Campus of the University of Lorraine (Nancy, France), next to the Botanical Gardens, at 20 minutes by public transportation or bike from the Nancy train station and City Center. Several

student residences and facilities are at walking distance. Nancy is a University town, with a high quality of life and a vibrant student and expat community.

Assignment

The position is about the design of expressive motions for humanoid robots, e.g., biped robots. The PhD student will collaborate with the engineers of the team to build expressive motions for the many robots of the teams, with a specific focus on humanoid robots such as G1.

To generate the motions, we will explore different strategies, to investigate the limitations and advantages of each in terms of explainability, communication to the partner, communication to the observer, expressivity and human-likeness.

For example, we will take inspiration from the work of Vianello et al. to leverage null-space projection to generate variations of a movement while doing a task; the work of Disney (https://la.disneyresearch.com/wp-content/uploads/BD_X_paper.pdf) using reinforcement learning from several simulated behaviors; or, we will adopt a different strategy and will apply MAP-elite to generate behaviors exhibiting quality diversity of expressive metrics. We will also consider stochastic optimal control and trajectory optimization to optimize for different criteria, which include the presence of observers potentially interacting with the robot.

The motion generation will integrate the existing low-level whole-body control libraries we use in the team, such as CARTESI/O, OpenSOT, and LLM/VLM and more generally foundation models for motion generation.

Validation on a real world platform such as one of our humanoid robots is fundamental.

The candidate will also interact with the other partners of the OSTENSIVE project to conduct common experiments.

Main activities

- Review state of the art in expressive and ostensive motion generation
- Generate expressive behaviors for real robots.
- Test generated behaviors on the real robot interacting with humans.
- Collaborate with the team to communicate on the current experiments and developments.
- Demonstrate the research work on real robots.

Skills

- Technical skills:
  - Very good programming skills (python, C++).
  - Background in robotics, or Ability to understand mechatronics.

- o Excellent skills and/or experience with reinforcement learning, optimization, numerical optimization, and/or generative AI models.
- Soft skills:
  - o Excellent communication skills at work, and ability to report progress
  - o Proactivity.
  - o Not afraid of challenging projects.
  - o Rigour and intellectual honesty
  - o Curiosity and desire to learn
  - o Practical mindset and ability to develop robust and reliable solutions
  - o Autonomy and organizational skills
  - o Love working in a multi-cultural environment
  - o Team player

Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

Remuneration

2200 € gross/month

General Information

- **Theme/Domain :** Robotics and Smart environments
  Software engineering (BAP E)
- **Town/city :** Villers lès Nancy
- **Inria Center :** Centre Inria de l'Université de Lorraine
- **Starting date :** 2025-10-01
- **Duration of contract :** 3 years
- **Deadline to apply :** 2025-07-16

Contacts

- **Inria Team :** LARSEN
- **PhD Supervisor :**
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About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

The keys to success

Bachelor Degree or Master Degree studies in Computer Science, Robotics, Engineering or AI.
Excellent communication in English; French is a plus.

Warning : you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

Instruction to apply

Defence Security :
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST).Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy :
As part of its diversity policy, all Inria positions are accessible to people with disabilities.