Offer #2024-07753

PhD Position F/M Learning diffusion policies for robotic manipulation

Contract type : Fixed-term contract

Level of qualifications required : Graduate degree or equivalent

Fonction : PhD Position

Context

As part of a partnership between Inria and the La Poste group, our team seeks to leverage generative artificial intelligence techniques to enable a robot to grasp and handle mailbags of varying sizes and weights. Mailbags combine several open challenges: they are soft (like clothes), do not have any defined shape, and are typically organized in a heap (compared to a stack of boxes).

We aim to build on diffusion techniques [1] that allow learning image-conditioned policies from demonstrations. These techniques reuse ideas developped for generating images (Dall-E, MidJourney, etc.) but to generate trajectories.

The objective of this thesis will be to (1) evaluate current techniques in this context and (2) propose improvements to diffusion techniques to make them more effective (learning with fewer examples, better generalization, taking into account the constraints of the task and the robot, etc.).

[1] Chi C, Feng S, Du Y, Xu Z, Cousineau E, Burchfiel B, Song S. Diffusion policy: Visuomotor policy learning via action diffusion. arXiv preprint arXiv:2303.04137.
2023. https://arxiv.org/abs/2303.04137 https://www.youtube.com/watch?v=w-CGSQAO5-Q

Assignment

This PhD will be mainly supervised by Jean-Baptiste Mouret and Serena Ivaldi. It will be focused on contributions in machine learning that can be used in robotics, which will be mainly published in the main conferences in robotics (ICRA/IROS/CoRL/RSS) and machine learning (NeurIPS, ICLR, ICML, ...).

The experiments will be carried on with the Tiago++ robot (PAL Robotics), with the help of the research engineers of the team.

The PhD will be synchronized with the other work of the team, which exploit similar techniques but for other applications.

Main activities

Main activities (5 maximum) :

- read and understand the relevant scientific papers
- propose new techniques and new algorithms in machine learning
- implement these algorithms
- evaluate these algorithms on experimental datasets
- write scientific articles
- present the work in scientific conferences

Skills

Technical skills and level required:

- very good knowledge of machine learning
- very good level in python, especially with the current machine learning libraries (Pytorch / numpy / etc.)
- knowledge of robotics is appreciated

Languages :

- the main language of the team is English and all the communication will be in English
- French is not required.

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

2100€ gross/month the 1st year

General Information

- **Theme/Domain :** Robotics and Smart environments
- **Town/city :** Villers lès Nancy
- **Inria Center :** Centre Inria de l'Université de Lorraine
- **Starting date :** 2024-10-01
- **Duration of contract :** 3 years
- **Deadline to apply :** 2024-06-28

Contacts

- **Inria Team :** LARSEN
- **PhD Supervisor :**
  Mouret Jean-baptiste / jean-baptiste.mouret@inria.fr

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

The ideal candidate has defended (or will have defended by October 2024) a master in machine learning and/or robotics. He/She is in love with machine learning and artificial intelligence. Experience in robotics is appreciated, but not required.

> **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.