Call for research engineer and/or postdoc

Topic: Intrinsically motivated multi-goal deep reinforcement learning in open virtual worlds

Host and location: Inria Flowers Lab, Bordeaux, France
Collaboration with Ubisoft (Bordeaux)
Supervision: Pierre-Yves Oudeyer (Flowers team, Inria and Ensta ParisTech)
Duration: between 18 months and 2 years
Deadline for application: the position will be assigned and start as soon as possible.

This position takes place within the context of a project that aims to develop autonomous lifelong machine learning techniques that enable virtual intelligent agents to make discoveries and acquire large repertoires of skills in open uncertain environments. This is key for developing agents that need to continuously explore and adapt interaction skills to new or changing tasks, environments, people to interact with, and preferences of others. The approach will leverage recent advances in curiosity-driven developmental learning (also called intrinsically motivated learning) to drive exploration in a multi-goal deep reinforcement learning framework. In particular, it will consist in studying several extensions of recent results of the Flowers lab in this area, including unsupervised learning of goal spaces using deep learning approaches (Laversanne-Finot et al., 2018) and the CURIOUS algorithm for intrinsically motivated modular multi-goal deep RL (Colas et al., 2019). These algorithms will be evaluated on benchmarks involving novel virtual environments dedicated to study exploration and curiosity (e.g. based on Unity3D MLagents), as well as modern open world video games in the context of a collaboration with Ubisoft (Bordeaux).

Keywords : Deep RL, neural networks, multi-task learning, transfer learning, curiosity, intrinsic motivation, curriculum learning, Unity3D.

Required knowledge and background:

Candidates should already have shown very strong experience and achievements in either:
- Deep Learning algorithms (theory and practical implementations)
- Reinforcement learning

Other requirements:
- strong skills in mathematics, statistical inference, machine learning
- Advanced programming skills
- Motivation to work in an interdisciplinary project

Contact and application: Send CV and letter of motivation to pierre-yves.oudeyer@inria.fr

Web:
Inria Flowers: **http://flowers.inria.fr** and **http://www.pyoudeyer.com**

The Flowers Lab: developmental robotics and lifelong multitask machine learning
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The Flowers Lab, headed by Pierre-Yves Oudeyer, gathers a team of ~20 members and has been one of the pioneers of developmental robotics and lifelong machine learning and artificial intelligence in the last decade, in particular through developing models of intrinsically motivated learning of repertoires of skills that have both contributed to advance understanding of human curiosity and development, and to advance incremental online multitask machine learning techniques in difficult high-dimensional robotic spaces.

This work in the Flowers lab is conducted in the context of large international projects (e.g. ERC grant, European projects 3rdHand and DREAM, HFSP project Neurocuriosity), with interdisicplinary collaborations with other labs in neuroscience, psychology, machine learning and robotics. The successful candidates would be directly involved in these international collaborations.

The Flowers lab has recently spin-off the Pollen Robotics startup company, and is involved in multiple collaborations with industrials through Inria's strong support towards impacting both science and industry.

Inria and EnstaParistech
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The lab is within Inria Bordeaux, which is a prestigious, and also the largest, public European research insitution focused on computer science, mathematics and their applications. Inria's teams and researchers (> 2800 employees) have received prestigious awards, coordinate many international projects, and have created strong innovations now used in many parts of industry. Inria research center in Bordeaux gathers around 300 researchers. The Flowers Lab is also associated to EnstaParisTech, which is a prestigious French engineering school (university).

Bordeaux
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The Flowers lab in Bordeaux is located in a great building on the border of one of the world most famous vineyard, and 10mn by tram from Bordeaux town center (and 2 hours from Paris through high-speed trains): https://www.inria.fr/en/centre/bordeaux Bordeaux has been recently rated by Lonely Planet as the world's best city to visit: http://www.independent.co.uk/travel/news-and-advice/best-cities-in-the-world-top-10-lonely-planet-bordeaux-cape-town-la-a7379066.html

References:

Baranes, A., & Oudeyer, P. Y. (2013) Active learning of inverse models with intrinsically motivated goal exploration in robots. *Robotics and Autonomous Systems*, 61(1), 49-73. https://hal.inria.fr/hal-00788440/document

COLAS, Cédric, SIGAUD, Olivier, et OUDEYER, Pierre-Yves (2019) CURIOUS: Intrinsically Motivated Multi-Task, Multi-Goal Reinforcement Learning. To appear at *ICML 2019* https://arxiv.org/pdf/1802.05054.pdf

Colas, C., Sigaud, O., and P-Y. Oudeyer (2018) Gep-pg: Decoupling exploration and exploitation in deep reinforcement learning algorithms. Proceedings of ***ICML 2018***. https://arxiv.org/abs/1802.05054

Laversanne-Finot, A., Péré, A., Oudeyer, P-Y. (2018) Curiosity Driven Exploration of Learned Disentangled Goal Spaces, In Proceedings of Conference on Robot Learning (***CoRL 2018***).
Blog post : https://openlab-flowers.inria.fr/t/discovery-of-independently-controllable-features-through-autonomous-goal-setting/494

Péré, A., Forestier, S., Sigaud, O, and P.-Y. Oudeyer (2018) Unsupervised learning of goal spaces for intrinsically motivated goal exploration. In *International Conference on Learning Representations (**ICLR**)*, 2018.
https://arxiv.org/abs/1803.00781