PhD scholarship in machine learning for public health decision making

Research topic

The researcher will perform research in the context of **reinforcement learning** under the supervision of prof. dr. Pieter Libin.

The researcher will operate within the ACCELERATE research project that has the goal to **support decision making in the next pandemic** with a **public health framework** grounded in **advanced statistics, health economics** and **artificial intelligence**. To achieve these goals, the researcher will have the unique opportunity to work in an inter-university and inter-disciplinary collaboration with researchers from the University of Antwerp and the University of Hasselt.

The researcher will investigate **novel reinforcement learning** (RL) algorithms to support decision makers. On the one hand, you will develop new **multi-armed bandit algorithms** to assist the **evaluation of multi-criteria policies** to respond to **spatially driven pandemics** with **high uncertainty**. These algorithms will be practically evaluated in the context of public health decision making and theoretically analysed to obtain formal guarantees. On the other hand, **sample-inefficiency** of state-of-the-art **deep reinforcement learning** algorithms is **holding back learning policies** in computationally intensive individual-based models. Therefore, you will investigate the development of new **algorithms** based on **model-surrogates** to **increase sample efficiency** while retaining the detailed state and action space that is associated with the model. This work will facilitate a wide range of RL algorithms, including deep RL algorithms that explore the **Pareto front of the epidemic policy space**, to explore epidemic mitigation policies that are inherently multi-criteria.

Context

The AI Lab of the Vrije Universiteit Brussel offers a strong research environment spanning a wide range of research topics such as reinforcement learning, game theory, natural language processing, evolution of speech, computational creativity, computational biology, knowledge representation and reasoning.

Qualifications

To be eligible to apply for this position, applicants need to have or be close to obtaining an MSc degree in computer science. While we do not request prior experience in computational biology for this position, we expect applicants to be interested in this problem domain. The applicant should also be willing to work in a multidisciplinary environment, collaborating with computer scientists, statisticians, and health economists. Applicants must be strongly motivated for doctoral studies; should possess the ability to work independently, perform critical analysis and have good levels of cooperative and communicative abilities. They must also have a very good command of English in writing and speaking, to be able to participate in international collaborations and to publish and present research results at international conferences and in peer-reviewed journals. Applicants are expected to be proficient scientific programmers, with an excellent knowledge of the python language.

Offer

We offer employment as a **full-time doctoral researcher**. The researcher can start as soon as he/she is available. As an employee of the Vrije Universiteit Brussel you will work in a dynamic, diverse, and multilingual environment. Our green campus is in the centre of Brussels, the lively capital of Belgium and Europe. Depending on your experience and academic merits you will receive a **salary according to the official pay scales**. **Hospitalisation insurance** and **free use of public transport** for travel to and from work are standard employment benefits. We have extensive sporting facilities which are at your disposal and a nursery is within walking distance. More information is available at the VUB job website.

<u>Contract</u>

Full-time research grant for one year, renewable on an annual basis for a **maximum of four years**. Extension of the contract is subject to the agreement of the doctoral committee. Remuneration is at the level of a full-time research assistant at a Flemish university (i.e., approximately € 2.400 net per month) depending on personal situation and includes contributions for social security.

<u>How to apply</u>

The PhD candidate will be selected based on their expertise, work experience, and qualifications. The **application deadline is 30 September 2023**. Applications will be evaluated continuously, and the position will be filled as soon as a good candidate is found. Please apply via e-mail to pieter.libin@vub.be, with a one-page motivation letter explaining the candidate's interest in pursuing a PhD on the chosen topic and a curriculum vitae listing all academic qualifications, relevant research experience and previous publications. Any questions about the position can be asked to prof. dr. Pieter Libin via e-mail (pieter.libin@vub.be).