

## Faculty of Science and Engineering

### Profile report: Artificial Intelligence - Reinforcement Learning

- Discipline: Artificial Intelligence
- Level: Educational Tenure-track assistant professor
- Fte: 0,8-1,0 fte

#### 1. Scientific discipline

The discipline Artificial Intelligence studies and develops intelligent systems, advancing and innovating the field. Currently, AI methods and applications are encountered in healthcare, government, industry, and many other societal domains. The understanding and innovation of intelligent systems requires interdisciplinary expertise and methods, including those of mathematics, computer science, engineering, philosophy, cognitive science and humanities. A current challenge is the development of AI systems that are well-aligned with the needs of human and societal goals. This requires the innovation and integration of various AI methods in machine learning, robotics, human-computer interaction, logic, cognition and natural language processing.

#### 2. Vacancy

This position is opened by the Board of the Faculty (ref. PT/gl/22/00181) and will be embedded within the Bernoulli Institute, basic unit Artificial Intelligence. The criteria and conditions pertaining to the position are described in the document 'Assistant professor with an education profile'. At the stage of Assistant Professor 60% of time is for teaching and education development, 30% for research and 10% for organizational tasks.

The strong increase of the importance of Artificial Intelligence, and in general the rise in student numbers in AI, raises the necessity for additional courses and specialized electives in the BSc and MSc programmes in Artificial Intelligence, and the MSc programme Computational Cognitive Science. Given the speed in which the field develops and the demands of society, additional expertise is necessary to cover all the topics in this emerging field. The rising student intake in the AI MSc programme also requires more capacity for Final year Master's projects in Machine Learning within the institute and in collaboration with societal partners.

#### 3. Selection committee (BAC)

Dr. F. Cnossen (chair)	Director of Education Artificial Intelligence & Computational Cognitive Science
Prof. dr. N.A. Taatgen	Scientific director Bernoulli Institute and Professor Cognitive Modeling
Prof. dr. A. Lazovik	Director of Education Computer Science
Prof. dr. L.R.B. Schomaker	Professor Artificial Intelligence
Prof. dr. L.C. Verbrugge	Professor of Logic and Cognition
Prof. dr. H.B. Verheij	Head of Department Artificial Intelligence
Prof. dr. T. Lenaerts	Machine Learning Group, Université Libre de Bruxelles
TBD	Student member

*HR advisor:*

L.A. Boomsma

*Advisor:*

A.G. Gringhuis, MSc

Policy Officer Bernoulli Institute

#### **4. Area of expertise**

In reinforcement learning, artificial agents learn to optimize their behavior in terms of the gains and costs of their choices. Reinforcement learning is a key area of artificial intelligence bridging machine learning and agent modeling approaches, for instance in deep reinforcement learning. Reinforcement learning also plays a significant role in recent high profile AI successes, such as game playing competing with human professionals. We are looking for candidates with cutting edge expertise in reinforcement learning, for instance focusing on online deep learning, computational learning theory, integrating machine learning with other AI areas (such as agent-based simulation and logical modeling) or other fundamental topics.

#### **5. Embedding: institute (and base unit)**

The Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence is part of the Faculty of Science and Engineering (FSE). The profile of the institute centers around modeling, computation, and cognition with a focus on science and technology, keeping a balanced mix of fundamental and applied aspects. The Bernoulli Institute has research groups in mathematics, computer science and artificial intelligence with three themes: Geometry and its Applications; Systems, Data and Society; and Computing and Cognition. The institute participates in various national research schools and most of the PhD students are enrolled in an educational programme and take part in other activities offered by these schools. The institute has a leading role in the cross-disciplinary research theme on Data Science and Systems Complexity (DSSC) and in the Center "Groningen Cognitive Systems and Materials" (CogniGron) within the Faculty of Science and Engineering.

The position will be embedded in the Artificial Intelligence department of the Bernoulli Institute. The department is organized as three research groups: Autonomous Perceptive Systems (focusing on machine learning, robotics and pattern recognition), Cognitive Modeling (focusing on cognition, human-computer interaction and language) and Multi-Agent Systems (focusing on social cognition, group decision making and argumentation).

#### **6. Local and (inter)national position**

The Bernoulli Institute has strong collaborations with other faculties of the university and the university hospital. The Bernoulli Institute will participate in the new Jantina Tammes school for Digital society, technology and artificial intelligence. Within the Netherlands, there is a growing interest in Artificial Intelligence as formulated in the NWO AI Research Agenda. Also the Gravitation project Hybrid Intelligence (a collaboration between six Dutch universities, with the Groningen AI department in a leading role) emphasizes the topic. In addition, both the EU and the Dutch Government are investing significantly in AI research.

## **7. Expected contributions to teaching**

The candidate plays a significant role in developing education concerning their area of expertise. The candidate initiates educational development concerning their expertise, in collaboration with colleagues, and will develop into an educational leader in the area of their expertise within the programmes. The candidate is expected to teach and develop relevant courses within our ambitious BSc and MSc programmes in Artificial Intelligence, and the MSc programme Computational Cognitive Science. The candidate should co-create an educational culture where Artificial Intelligence and Computational Cognitive Science students feel supported and where teachers foster personal growth in students. Importantly, the candidate is expected to add to a supportive and collaborative environment between colleagues. The candidate may also contribute to or teach more general courses on Research Methods in AI, Professional Skills, and others. Courses may be developed by the candidate, while the exact topics of the courses co-depend on the expertise and interests of the candidate. The candidate will supervise graduation projects in the BSc and MSc programmes. The candidate innovates and streamlines the current BSc and MSc curriculums throughout the programmes (learning lines). A further aspect of the position is the support of other staff members with innovating their courses and teaching. To support educational innovation, the candidate applies for grants that support innovation in teaching.

## **8. Expected contributions to research**

The candidate contributes to research in contemporary developments fitting the candidate's expertise and interests and extending the institute. The candidate (co-)supervises PhD students, publishes in peer-reviewed journals, and applies for external research funding.

## **9. Expected contributions to the organization**

The candidate is expected to have an active interest and to provide a positive contribution to the management and organizational tasks of the institute. At the level of FSE, the candidate will contribute to the organization of the faculty, for example by participating in working groups and committees in the area of education. The candidate will participate in relevant national and international organizations.