Faculty of Science and Engineering

Profile report: Tenure Track Assistant/Associate/Full Professor in Artificial Intelligence - Natural Language Processing

- Discipline: Natural Language Processing
- Level: Assistant/Associate/Full professor
- Focus: Education/Impact/Research
- Fte: 0,8-1,0 fte

1. Scientific discipline

Artificial Intelligence (AI) is a scientific discipline that focuses on creating computer systems capable of performing tasks that typically require human intelligence, such as problem solving, decision making, and learning from data. Natural language processing is a subfield within AI that focuses on systems capable of understanding, generating, and interacting with human language. It involves tasks like language translation, sentiment analysis, and chatbot development, enabling machines to comprehend and communicate in natural languages (such as English and Dutch), making human-computer interactions more accessible and efficient.

2. Vacancy

This position is opened by the board of the Faculty of Science and Engineering (PT/gl/22/00155) and will be embedded in the Bernoulli Institute, basic unit Artificial Intelligence. The position falls within the framework of the faculty's career system Career Paths in Science and Engineering. As the focus domain of the position is research, the criteria of the career path with a focus on research apply. Please see the link for more information.

3. Selection committee (BAC)

Prof. dr. N. Taatgen (chair)	Scientific Director Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence
Prof. dr. H.B. Verheij	Head of department Artificial Intelligence, Professor of Artificial Intelligence & Argumentation
Dr. F. Cnossen	Education Director Artificial Intelligence & Computational Cognitive Science
Prof. dr. L.R.B. Schomaker	Professor of Artificial Intelligence
Prof. dr. L.C. Verbrugge	Professor of Logic and Cognition
Prof. dr. M. Nissim	Professor of Computational Linguistics and Society
Prof. dr. C. Monz	Professor of Computer Science and Chair of Language Technology, University of Amsterdam, External member
TBA	Student member

Advisors:

F. Postma, MSc   HR Advisor

4. Area of expertise

Natural Language Processing (NLP) within the realm of Artificial Intelligence has witnessed remarkable advancements in recent years, primarily driven by the emergence of Large Language Models (LLMs) and the foundational Transformer architecture. This progress is both consequential and timely, aligning with the escalating demand for sophisticated language technologies across various industries. LLMs, distinguished for their ability to generate coherent and human-like text, represent a paradigm shift in NLP capabilities. However, they encounter challenges, prominently the hallucination problem, where generated information may lack factual accuracy.

At the core of these advancements lies the Transformer architecture, a fundamental element supporting efficient parallel processing and enhancing contextual understanding of language. This architectural innovation is indispensable for addressing the intricacies and diversities inherent in real-world language patterns.

A noteworthy stride in NLP is the emerging capability of reasoning and inference within the text generated by LLMs. This development holds immense promise for applications such as content summarization and question-answering systems, ushering in a new era of NLP functionality. Ongoing research is directed towards refining control and understanding, placing a particular emphasis on harnessing the potential of reasoning capabilities within NLP.

5. Embedding: institute (and base unit)

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). This position will be embedded within the basic unit Artificial Intelligence, in particular connecting to machine learning and logical methods. Building on existing collaborations with the Computational Linguistics research group (Faculty of Arts) is encouraged.

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 that work together on three scientific challenges: 1. Persistent Complex Systems, 2. The Future of AI, and 3. Tomorrow's Software-Intensive Infrastructures. 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.

6. Local and (inter)national position

The Bernoulli Institute has strong collaborations with other faculties of the university and the University Medical Center, and participates in the Jantina Tammes school for Digital Society, Technology and Artificial Intelligence. The institute leads a large national NWA-ORC project, HAICu, directed at the development of algorithms for digital humanities and the cultural heritage. In addition, the institute has a leading role in the 10 year NWO Gravitation project Hybrid Intelligence (2019-2029), a national collaboration between Dutch universities. Within the Netherlands, there is a growing interest in Artificial Intelligence as formulated in the NWO AI Research Agenda. Both the EU and the Dutch Government are investing significantly in AI research.

The Bernoulli institute has a strong international reputation in the area of Systems Theory, Dynamical Systems, Software Engineering and Cognitive AI, and collaborates with several international institutes, among which ETH Zürich, Stanford University, the University of Washington and Carnegie Mellon University.

7. Expected contributions to education

The candidate is expected to teach and develop relevant course modules within our ambitious BSc and MSc programmes in Artificial Intelligence, and our MSc programme Computational Cognitive Science. The candidate plays a role in developing education concerning their area of expertise. The exact topics of the course modules co-depend on the expertise and interests of the candidate. The candidate will also supervise graduation projects in the BSc and MSc programmes. 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.

8. Expected contributions to research

The candidate is expected to initiate and develop an internationally leading research programme in the field of Natural Language Processing. The research should have visibility on the national and worldwide levels and lead to publications in top journals and conferences. Further it is expected that the new professor will take a leading role in the field of Artificial Intelligence within the Netherlands. Obtaining substantial external funding for PhD projects is crucial. Supervision of PhD students is an important part of the research activities. The research is expected to strengthen the existing efforts in the field of Artificial Intelligence within the Bernoulli Institute, and

should lead to a strengthening of the international reputation of the group, the research center and the institute.

9. Expected contributions to the organisation

The candidate is expected to have an active interest and to provide a positive contribution to the management and organisational tasks of the institute. The candidate will furthermore contribute to the organisation of the faculty, for example by participating in working groups and committees, in the domains of education, research and management. The candidate will contribute to relevant organisational activities on the national and international level.