**Faculty of Mathematics and Natural Sciences**

**Profile report:** Cognitive Neuroscientific Modeling
Cognitief-neurowetenschappelijk modelleren

- Discipline:     Artificial Intelligence
- Level:            Assistant professor (tenure-track UD)
- Fte:              Full time (1,0)

## 1. Scientific discipline

Cognitive Neuroscientific Modeling is the area of research that bridges the disciplines of computational cognitive modeling and cognitive neuroscience. There exist a wealth of neuroimaging data, but to really understand the data, it is important to construct theory-based computational cognitive models of the human mind and to forge closer connections between the computational models and the neuroimaging data, for example, by developing new model-based methods of analysis.

## 2. Vacancy

This position is opened by the Board of the Faculty (see the letter EMK/gl/16/00085) and will be embedded in the Institute of Artificial Intelligence and Cognitive Engineering (ALICE). The position falls within the framework of 'Career Paths in Science 3' ('Bèta's in Banen 3'). Please see link for criteria and conditions.

## 3. Selection committee (BAC)

| | |
|---|---|
| Prof. dr. L.C. Verbrugge, Chair | Professor in Logic and Cognition, ALICE |
| Prof. dr. L.R.B. Schomaker | Professor in Artificial Intelligence, scientific director ALICE |
| Prof. dr. D.H. van Rijn | Adjunct Professor in Psychology |
| Prof. dr. N.A. Taatgen | Professor in Cognitive Modeling, ALICE |
| Dr. S.M. van Netten | Deputy programme director of Artificial Intelligence |
| Prof. dr. J-J. Meyer | Professor of AI, University of Utrecht |
| Vacancy | Student |

Advisor

| | |
|---|---|
| F.J. Broekhans | HR Services |

## 4. Research area

The ALICE institute hosts a number of topics in artificial intelligence and cognitive science: logic, cognition, machine learning and robotics. Central topics of interest are computational neuroscience and biologically inspired artificial intelligence.  An

important research theme within ALICE is *persistent cognition*: Instead of focusing on single optimization problems or single phenomena, cognition is treated as a life-long process of learning and improvement. This vision translates into robots and software agents that can survive in their environment for longer periods of time, machine learning programs that collect and integrate information over years, and cognitive models that gradually build up general problem solving skills. An especially timely issue is the abstraction of higher-level models from large amounts of neuroscience data. This will help understand how the human mind adapts itself and learns continuously in a dynamic environment.

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

The position is embedded in the ALICE institute of Artificial Intelligence & Cognitive Engineering of the Faculty of Mathematics and Natural Sciences (35 researchers). The institute's bachelor and master programs (400+ students) are evaluated as some of the best in the Netherlands as shown by a recent audit.

ALICE has three research themes: (1) Autonomous Perceptive Systems, (2) Multi-Agent Systems, and (3) Cognitive Modeling. The position concerns a tenure track position. For the candidate, during the initial stage of the developing tenure track, a natural nearest neighbor will be identified among the existing three full-professor group leaders. At a later stage in the process, the candidate must show the ability to lead a self-sustaining research group on a clearly identifiable and viable research theme.

The Autonomous Perceptive Systems (APS) group has a world-renowned status in handwriting recognition and other forms of large-scale pattern-recognition and in reinforcement learning. The Monk system for word-retrieval of in historical manuscript collections is one of the first instances of autonomous '24/7' machine learning using crowd sourcing over the internet, in this domain. The focus of our research is on robust systems and models ('big data' as opposed to toy problems). Apart from reinforcement learning and partially observable Markov decision processes, the group has a strong position in 'new' neural network modeling algorithms for dimensionality reduction and new, fundamental innovations in support-vector machines.

The *Cognitive Modeling* (CM) group is one of leaders in Europe of research in symbolic cognitive models. It coordinates a European school for learning cognitive modeling, and connects cognitive models to neuroscience and practical applications in human-computer interaction. The goal of the Cognitive Modeling group is to develop formal models of cognition and methods to test their capacity to predict human behavior and neuroscience data. As such, they bridge the gap between brain processing on the one hand and intelligent human behavior on the other hand. Although models are primarily developed for theoretical goals, they also serve practical purposes in human-computer interaction, educational technology and agent development.

The *Multi-Agent Systems* (MAS) group is a leading European group in logical and computational approaches to intelligent interaction. The goal of the Multi-Agent Systems group is to investigate, support and design interaction in cognitive systems. The group investigates social cognition, from evolution through development to application by adults, using a close-knit combination of formal modeling, computational cognitive modeling, agent-based modeling and experimentation. Moreover, the group investigates formal models of teamwork, strategic reasoning, and protocols for knowledge exchange. Finally there is a strong line of research on argumentation and legal reasoning, with an emphasis on combining probabilistic reasoning, scenarios and argumentation in a forensic context.

## 6. Local and (inter)national position

Within The Netherlands, the ALICE institute is the largest integrated, comprehensive AI institute, covering both research and teaching (BSc/AI and MSc/AI and MSc/Human-Machine Communication). ALICE addresses the fields of logic, cognitive modeling, as well as perceptual and computational intelligence. Within these domains, we study multi-agent systems, social cognition, skill acquisition, cognitive neuroscience, human-computer interaction, linguistics, sensory cognition, visual pattern recognition, machine learning and cognitive robotics.

The ALICE institute is a partner in the faculty theme Data Science and Systems Complexity (DSSC), a cluster of more than 65 researchers in the area of computer science, astronomy, artificial intelligence, systems & control, molecular modeling, and big data applications in genomics and pharmacy.
A second collaboration exists with biologists in the Adaptive Life cluster, exploiting the common interests in evolution, adaptivity and emergent behavior in flocks and groups. Within the university there is a strong collaboration with medical researchers in the University Medical Center Groningen (UMCG) in the area of cognitive neuroscience (fMRI) research and in the area of human factors in medical practice. Historically, there exist long-standing collaborations with the Faculty of Behavioral Sciences, the Faculty of Philosophy, and the Faculty of Arts. For example, researchers within humanities and forensic science make use of the APS group's pattern-recognition algorithms, using their e-Science services on the high-performance computing cluster of the University of Groningen.

A number of international collaborations exist between ALICE and strong groups worldwide in neural networks, reinforcement learning, handwriting recognition, cognitive modeling, logic, AI & law, and multi-agent systems. Researchers in ALICE have been awarded a number of important grants, not only from the Netherlands Organization for Scientific Research NWO (among others a Vici, an Open Competition, and a Forensic Science grant), but also from the European Union (among others an ERC Starting Grant and participation in a Horizon 2020 'Mantis' grant), as well as from public-private partnerships (such as participation in the 30M€ project 'Target', using a

ten petabyte storage architecture with HPC, together with astronomy and genomics research groups).

The ALICE institute has its own robotics lab with five Nao humanoids, a number of dedicated mobile robots for assistive home robotics and other robotics (sub)systems. The robotics researchers and AI undergraduate students actively participate in global competitions in robotics, such as RoboCup and RoboCup@Home and have obtained prestigious awards in these areas.

### 7. Expected contributions to research

The candidate is expected to develop his/her own highly visible line of research in artificial intelligence and/or cognitive engineering and to attract additional sources of funding. The candidate will be involved in current PhD-projects and will need to acquire new projects. The candidate is expected to publish in important venues with a stress on high-ranked ISI/Thomson rated journals and more specialized selective conference or workshop proceedings.

### 8. Expected contributions to teaching

The tenure-track assistant professor is expected to contribute to the teaching programs of the bachelor and master programs of Artificial Intelligence in the Undergraduate and Graduate Schools of Science, ranging from teaching core topics to student groups of more than 100 students to the teaching of specialized topics at the master level to groups of about 20 students.  Furthermore, the candidate will be involved in supervising bachelor and master students.  The assistant professor will spend 30% of his/her time on educational tasks.

### 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 the FMNS, the candidate will contribute to the organization of the faculty, for example by participating in working groups and committees, in the fields of teaching, research and management. The candidate will participate in relevant national and international organizations.

**Vacaturetekst**

**Tenure track assistant professor in Artificial Intelligence and Cognitive Engineering**

**Job description**
The Faculty of Mathematics and Natural Sciences has a vacancy for a tenure track assistant professor in Artificial Intelligence and/or Cognitive Engineering in the Institute for Artificial Intelligence and Cognitive Engineering (ALICE).

The candidate is expected to initiate new research in the area of Artificial Intelligence, in particular Cognitive Neuroscientific Modeling. He/she is expected to attract funding for new PhD projects and attain a leading international position in the field. He/she is an excellent teacher who can motivate students of different disciplines and he/she has to develop new courses on specific topics in the BSc and the MSc programs. Teaching duties include the supervision of bachelor, master and PhD students.

The University of Groningen is an equal-opportunity employer. Female candidates are encouraged to apply.

**Qualifications**

You have:
*  A PhD degree and minimal two years postdoctoral experience abroad (industrial experience can partially compensate for this requirement);
* Thorough knowledge of and research experience in artificial intelligence, preferably with an affinity for cognitive models.
* The tenacity to realize working models as well as having the level of ambition to publish the results on the highest scientific platforms.
* Excellent research qualities, as evidenced by a publication record in leading international peer-reviewed journals and renowned conferences, cited by prominent researchers, and a relevant international network;
* Excellent teaching and organizational skills, as well as teaching and organizational experience appropriate to your career stage;
* Fluency in the English language, in written and spoken form;
* Evidence of successful acquisition of external funding appropriate to your career stage.

You are:
* A team player with good communications skills;
* Willing to fulfill the obligatory requirement for University Teaching Qualification, if you have not yet obtained it;
* Willing to learn the Dutch language within 5 years, if you do not speak it well yet;

**Conditions of employment**

The appointment will be initially for a maximum of 6 years at the level of tenure track assistant professor with a gross monthly salary dependent on qualifications and work experience from €3,400 up to a maximum of €5,288 (CAO-NU salary scales 11 or 12) gross per month for a full-time position. After 5 years there will be an assessment of performance based on established criteria. If the outcome of the assessment is positive, the assistant professor will be promoted to associate professor with tenure. There will be another assessment at the end of a further 4-7 -year period for the promotion to full professor.

In addition to the primary salary the University offers 8% holiday allowance and an end-of-year bonus of 8, 3%.

The University of Groningen provides career services for partners of new faculty members moving to Groningen.

**Applications**

Interested candidates are invited to submit a complete application including:

- A letter of motivation;
- A Curriculum Vitae, including a list of publications;
- A list of five self selected 'best papers';
- A statement about teaching goals and experience and a description of scientific interest and plans;
- The names of three references complete with title and contact information.

You may apply for this position until ……… via the application form (click on 'Apply' below on this advertisement on the University website).

**Information**

Further, more detailed information can be obtained from prof. dr. L.C. Verbrugge, chair of the selection committee (e-mail L.C.Verbrugge@rug.nl) or prof. dr. L.R.B. Schomaker, scientific director of ALICE (tel: +31 (0)50 367908, email: L.R.B.Schomaker@rug.nl).

**More information can also be found at the following links:**

About the position: http://www.rug.nl/fwn/vacatures/structuurrapporten/index
About the institute: http://www.rug.nl/research/alice/
About the university: http://www.rug.nl/corporate/index