

PhD position on Nonlinear Networks of Memory Modeling, Analyses and Regulation

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Job description

Nonlinear networks of memory: Modeling, analyses and regulation

The Delft Center for Systems and Control (DCSC) of Delft University of Technology (TU Delft), The Netherlands is seeking a qualified candidate for 1 four-year PhD positions within an interdisciplinary research platform centered on systems and control theory with applications in cognition.

Background

Understanding the mechanisms of memory is one of the key components in our cognition, e.g. learning, attention, as well as in the development of efficient human-in-the-loop and computing algorithms. The human memory is composed of several modules that coordinate their activities in order to perform multiple tasks. Memory modules process and encode the sensed information from the environment, learn, store, and recall them. Cognitive abilities, e.g. learning, attention, are rooted in the activities of dynamic networks of neurons. Mathematical models, describing the relations between the cognitive functioning and the underlying neuronal activities, are essential in revealing, and predicting the memory functioning, and suggesting regulatory mechanisms.

Project description

This PhD project aims at developing mathematical models, conduct control-theory-based analyses and propose regulatory mechanisms for two topics related to memory functioning. To this aim, we will build upon/ and develop tools from nonlinear dynamical systems, oscillatory networks, learning-based, and data-driven techniques.

The human memory system can be categorized into two large groups: short-term and long-term memories. Among short-term memory modules is the working memory (WM) which is responsible for holding and processing information in a temporary fashion and in service of higher order cognitive tasks. The first project develops a dynamic computational model to explain behavioral and brain recording data in WM functioning in attention-related tasks. The project will be conducted in collaboration with the Donders Institute on brain, cognition and behaviour.

The department Delft Center for Systems and Control (DCSC) of the faculty Mechanical, Maritime and Materials Engineering, coordinates the education and

research activities in systems and control at Delft University of Technology. The Centers' research mission is to conduct fundamental research in systems dynamics and control, involving dynamic modelling, advanced control theory, optimisation and signal analysis.

The research is motivated by advanced technology development in physical imaging systems, renewable energy, robotics and transportation systems.

Requirements

We are looking for a candidate with an MSc degree in Systems and Control (Control engineering), Applied Mathematics, or a related field.

- A strong background and genuine interest in working with mathematical tools and techniques is required.
- While background in neuro/cognitive science is not required, a genuine interest for it is necessary.
- The candidate is expected to interact with cognitive and neuroscientists, be interested in participating in team-based scientific discussions, and enjoy curiosity-driven research.
- Proficiency in expressing yourself verbally and in writing in English is required.
- Good programming skills are a plus: MATLAB/Simulink, Python.

Doing a PhD at TU Delft requires English proficiency at a certain level to ensure that the candidate is able to communicate and interact well, participate in English-taught Doctoral Education courses, and write scientific articles and a final thesis. For more details please check the [Graduate Schools Admission Requirements](#).

Conditions of employment

Doctoral candidates will be offered a 4-year period of employment in principle, but in the form of 2 employment contracts. An initial 1,5 year contract with an official go/no go progress assessment within 15 months. Followed by an additional contract for the remaining 2,5 years assuming everything goes well and performance requirements are met.

Salary and benefits are in accordance with the Collective Labour Agreement for Dutch Universities, increasing from € 2443 per month in the first year to € 3122 in the fourth year. As a PhD candidate you will be enrolled in the TU Delft Graduate School. The TU Delft Graduate School provides an inspiring research environment with an excellent team of supervisors, academic staff and a mentor. The Doctoral Education Programme is aimed at developing your transferable, discipline-related and research skills.

The TU Delft offers a customisable compensation package, discounts on health insurance and sport memberships, and a monthly work costs contribution. Flexible work schedules can be arranged. For international applicants we offer the Coming to Delft Service and Partner Career Advice to assist you with your relocation.

TU Delft (Delft University of Technology)

Delft University of Technology is built on strong foundations. As creators of the world-famous Dutch waterworks and pioneers in biotech, TU Delft is a top international university combining science, engineering and design. It delivers world class results in education, research and innovation to address challenges in the areas of energy, climate, mobility, health and digital society. For generations, our engineers have proven to be entrepreneurial problem-solvers, both in business and in a social context. At TU Delft we embrace diversity and aim to be as inclusive as possible (see our [Code of Conduct](#)). Together, we imagine, invent and create solutions using technology to have a positive impact on a global scale.

Challenge. Change. Impact!

Faculty Mechanical, Maritime and Materials Engineering

The Faculty of 3mE carries out pioneering research, leading to new fundamental insights and challenging applications in the field of mechanical engineering. From large-scale energy storage, medical instruments, control technology and robotics to smart materials, nanoscale structures and autonomous ships. The foundations and results of this research are reflected in outstanding, contemporary education, inspiring students and PhD candidates to become socially engaged and responsible engineers and scientists. The faculty of 3mE is a dynamic and innovative faculty with an international scope and high-tech lab facilities. Research and education focus on the design, manufacture, application and modification of products, materials, processes and mechanical devices, contributing to the development and growth of a sustainable society, as well as prosperity and welfare.

Click [here](#) to go to the website of the Faculty of Mechanical, Maritime and Materials Engineering. Do you want to experience working at our faculty? This [video](#) will introduce you to some of our researchers and their work.

Additional information

For more information about these vacancies, please contact Dr. Matin Jafarian (email: m.jafarian@tudelft.nl).

For information about the application procedure, please contact Hilma Bleeker, HR advisor, application-3me@tudelft.nl

Application procedure

Are you interested? Please apply no later than July 15, 2022 via the application button and upload the following documents:

- Detailed curriculum vitae;
- Motivation letter (one page), also indicating your preferred position (1 or 2);

- BSc and MSc course programs and the corresponding marks (in English);
- Your M.Sc. thesis or a paper that you have written;
- Contact information for at least two academic references.

A pre-employment screening can be part of the selection procedure.

You can only apply online. We will not process applications sent by email and/or post.

Acquisition in response to this vacancy is not appreciated.

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