

PhD Position on Systems and Control for Human-centered Social Systems

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Job description

In this PhD project we will develop novel mathematical cognitive models that represent social and cognitive interactions of humans, as well as novel control architectures (based on model-based predictive control methods and/or game theory), and we will incorporate them into multi-agent architectures to realize optimal human-machine teamwork.

This PhD project is funded in the context of the TU Delft AI Labs & Talent programme, and is defined at the AI*MAN lab (Transparent & Traceable AI in Human-AI Teamwork). The primary supervisor (Dr. A. Jamshidnejad) is affiliated to the Aerospace Engineering Faculty of TU Delft (Mathematical Decision Making Group) and is the co-director of the AI*MAN lab. The promotor (Dr. M. Mazo Espinosa) and co-supervisor (Dr. C. Cenedese) are affiliated to the Mechanical Engineering Faculty of TU Delft (Delft Center for Systems and Control).

At the AI*MAN lab, our mission is to investigate the emerging interdisciplinary domain of human-AI teamwork. In such problems, optimality, adaptability, transparency, and traceability in control and decision-making of machines that interact or collaborate with humans, should be met. Therefore, the multi-agent systems that include humans and machines should achieve four crucial objectives:

1. Making real-time optimal decisions that meet all the constraints of the team and that assist the team to reach its global objectives, despite different preferences and goals of individual team members.
2. Adapting the decisions made by machines in the team according to the current and predicted changes in the dynamics of the environment and in the behavior of human teammates.
3. Communicating the decision-making processes of machines transparently with humans.
4. Developing mental models of humans that enable machines to understand and predict the decisions and actions of humans.

In this PhD project we will support the AI*MAN lab objectives by focusing on the following interacting objectives:

- Developing mathematical models of human cognition and decision making and incorporating them into multi-agent systems to represent the social interactions of humans and artificial agents.
- Introducing optimal, coordinated decision-making architectures for the artificial agents in the multi-agent system and analyzing the performance guarantees.
- Implementing the proposed theoretical approaches to applications that involve teams of humans and autonomous agents (e.g., social or service robots, autonomous vehicles, ...) using computer-based simulations and/or to (small) teams composed of real humans and robots.

Requirements

This position is perfect for you if you have an MSc degree in systems and control, applied mathematics, mechanical engineering, electrical engineering, robotics, computer science, or a related field, and a strong background or interest in human-robot interaction, optimization, programming (especially in Python and/or Matlab), machine learning, data processing. You are expected to work on the boundary of several research domains.

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 € 2770 per month in the first year to € 3539 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 a monthly work costs contribution. Flexible work schedules can be arranged.

For international applicants, TU Delft has the [Coming to Delft Service](#). This service provides information for new international employees to help you prepare the relocation and to settle in the Netherlands. The Coming to Delft Service offers a [Dual Career Programme](#) for partners and they organise events to expand your (social) network.

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 as one of our core [values](#) and we actively [engage](#) to be a university where you feel at home and can flourish. We value different perspectives and qualities. We believe this makes our work more innovative, the TU Delft community more vibrant and the world more just. Together, we imagine, invent and create solutions using technology to have a positive impact on a global scale. That is why we invite you to apply. Your application will receive fair consideration.

Challenge. Change. Impact!

Faculty Mechanical Engineering

From chip to ship. From machine to human being. From idea to solution. Driven by a deep-rooted desire to understand our environment and discover its underlying mechanisms, research and education at the ME faculty focusses on fundamental understanding, design, production including application and product improvement, materials, processes and (mechanical) systems.

ME is a dynamic and innovative faculty with high-tech lab facilities and international reach. It's a large faculty but also versatile, so we can often make unique connections by combining different disciplines. This is reflected in ME's outstanding, state-of-the-art education, which trains students to become responsible and socially engaged engineers and scientists. We translate our knowledge and insights into solutions to societal issues, contributing to a sustainable society and to the development of prosperity and well-being. That is what unites us in pioneering research, inspiring education and (inter)national cooperation.

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

Additional information

For more information about this vacancy, please contact Dr. Anahita Jamshidnejad via a.jamshidnejad@tudelft.nl.

Application procedure

Are you interested in this vacancy? Please apply by 14 August 2024, via the application button and upload your letter of application along with a detailed curriculum vitae, a motivation why the proposed research topic interests you, a list of publications (if applicable), the abstract and/or summary of your MSc thesis, your BSc and MSc course program and the corresponding marks, names and addresses of two to three reference persons, and all other information that might be relevant to your application.

For information about the application procedure, please contact our HR advisor at recruitment-ME@tudelft.nl.

Please note:

- A pre-employment screening can be part of the selection procedure.
- You can apply online. We will not process applications sent by email and/or post.
- Please do not contact us for unsolicited services.

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