Delft Center for Systems and Control

TU Delft
Delft University of Technology

PhD position Sustainable Artificial Intelligence and Probabilistic tensor Methods

Apply Now

Job description

Computer models are an essential tool of modern society. Whether it is for designing airplanes, predicting dominant virus strains in a pandemic or estimating how different policies will impact the CO2 concentration in the next 5 decades, our society makes abundant use of models. While some models can be built from first principles, the majority of artificial intelligence (AI) models are learned from data.

AI models have achieved unprecedented results in the past decade. But this success comes at a cost: it is unsustainable. In fact, the computational power needed to learn large models has doubled every 3.4 months since 2012. In 2019, learning a single model could emit as much carbon as five cars in their lifetimes. This ever-increasing need for computational power is driven by the large amounts of model parameters that can only be reliably learned from both large-scale and high-dimensional data.

The research in this PhD project will be on developing a new theory to make learning models from data sustainable. The key idea of this theory is to significantly compress model parameters with a novel technique: tensor networks. By exploiting correlations tensor networks can capture relevant information such that only a fraction of the original model parameters is required. The focus of this PhD project will be on developing theory for learning kernel machines (support vector machines, Gaussian processes, …) with tensor networks and by using a Bayesian inference approach.

You will join the Delft Tensor AI Lab (DeTAIL) where a team of enthusiastic researchers is developing new tensor theory for applications in machine learning, control and biomedical signal processing.

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

Applicants should have:

- Completed a relevant MSc degree in an applied sciences field relevant to the PhD research, i.e. Engineering, Computer Science, Statistics, Applied Mathematics.
- A strong mathematical background in (numerical) linear algebra, statistics and optimization.
- Knowledge of tensor networks/decompositions is a plus.
- Good programming skills (Julia, C, Python) is a plus.

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 € 2541 per month in the first year to € 3247 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 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, 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 this vacancy, please contact Dr. Kim Batselier, k.batselier@tudelft.nl.

For information about the application procedure, please contact Irina Bruckner, HR advisor, application-3mE@tudelft.nl.

Application procedure

Are you interested in this vacancy? Please apply before 15 September 2022 via the application button and upload:

1. A letter of motivation and research interests (up to 1 page)
2. Your CV
3. Contact information for two academic references
4. Up to 3 research-oriented documents authored by the applicant (e.g. thesis, journal/conference publication).

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.
Acquisition in response to this vacancy is not appreciated.

Apply Now