

# Sensor AI Lab 4 PhD Positions

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*Challenge:* Bringing AI to Sensors.

*Change:* Develop algorithms to unite the fields of sensor fusion and AI, to combine physics-based models with models learned using sensor data.

*Impact:* Energy-efficient and robust statistical inference e.g., distributed learning, human motion estimation and navigation of swarms.

## Job description

TU Delft is a top tier university and is exceedingly active in the field of Artificial intelligence. The Sensor AI Lab unites the fields of sensor fusion and AI, focusing on including physical knowledge in AI to open up for extracting more information from available sensor data.

The Sensor AI Lab has 4 PhD positions:

Position 1) will focus on combining physical knowledge with scalable Gaussian processes. These methods can be used in sensor fusion to learn new models and their uncertainties from data when it is difficult to learn these models from first principles. The PhD candidate will be located at the Delft Center for Systems and Control at the 3mE faculty and the daily supervisor will be Manon Kok.

Position 2) will focus on human motion estimation. Focus will be on both developing a new framework to incorporate biomechanical models into a sensor fusion framework and on learning parts of the model using AI. The PhD candidate will be located at the Delft Center for Systems and Control at the 3mE faculty and the daily supervisor will be Manon Kok.

Position 3) will focus on developing algorithms for relative navigation of multi-agent swarms (e.g., drones, satellites and automotive) which include localization, time-synchronization, environment perception and path planning for anchorless systems. Bayesian optimization approaches including graphical models and neural networks will be explored to address this challenge. This PhD candidate will be located at the Circuits and Systems (CAS) group of the Electrical engineering, Mathematics and Computer Science (EEMCS) faculty at TU Delft.

Position 4) will focus on developing algorithms for distributed learning in multi-agent networks, which would address the challenges of distributed sensing, distributed processing and statistical inference for large-scale distributed networks. In particular, energy-efficient distributed probabilistic machine learning algorithms will be explored for time-varying graphs, which naturally arises in mobile autonomous systems. This PhD

candidate will be located at the Circuits and Systems (CAS) group of the Electrical engineering, Mathematics and Computer Science (EEMCS) faculty at TU Delft.

## Requirements

For all 4 positions we expect you to have:

- Completed a relevant MSc degree in an applied sciences field relevant to PhD research
- An affinity with teaching and guiding students
- Proficiency in expressing yourself verbally and in writing in English
- The ability to work in a team and take initiative
- A background and / or strong interest in Sensor Fusion, Artificial Intelligence, Bayesian Estimation, Data Science, Gaussian Processes, Optimisation and Mathematical modelling
- Good programming skills, e.g. in Matlab or Python, for implementing state-of-the-art advanced algorithms.

Furthermore, for position 1 we expect you to have:

- A strong background in mathematics, probabilistic modelling and / or Bayesian estimation.

For position 2 we expect you to have:

- A strong background and / or strong interest in human motion estimation using inertial sensors.

For position 3 we expect you to have:

- A strong background in estimation theory. Applicants with a background in projects related to navigation, localization, formation flying, control systems, and autonomous sensor systems are preferred.

For position 4 we expect you to have:

- A strong background in distributed estimation and detection theory. Applicants with a background in projects related to distributed statistical inference, control systems, and autonomous sensor systems are preferred.

## Conditions of employment

You will receive a 5-year contract and will be deployed for AI-related education for the usual teaching effort for PhD candidates in the faculty plus an additional 20%. The extra

year compared to the usual 4-year contract accommodates the 20% additional AI, Data and Digitalisation education related activities. All team members have many opportunities for self-development. You will be a member of the thriving TU Delft AI Lab community that fosters cross-fertilization between talents with different expertise and disciplines.

## TU Delft

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!

## Sensor AI

Sensor AI is a TU Delft Artificial Intelligence Lab. Artificial Intelligence, Data and Digitalisation are becoming increasingly important when looking for answers to major scientific and societal challenges. In a TU Delft AI Lab, experts in 'the fundamentals of AI technology' along with experts in 'AI challenges' run a shared lab. As a PhD, you will work with at least two academic members of staff and three other PhD candidates. In total TU Delft will establish 24 TU Delft AI Labs, where 48 Tenure Trackers and 96 PhD candidates will have the opportunity to push the boundaries of science using AI. Each team is driven by research questions which arise from scientific and societal challenges, and contribute to the development and execution of domain specific education. You will receive a 5-year contract and will be deployed for AI-related education for the usual teaching effort for PhD candidates in the faculty plus an additional 20%. The extra year compared to the usual 4-year contract accommodates the 20% additional AI, Data and Digitalisation education related activities. All team members have many opportunities for self-development. You will be a member of the thriving TU Delft AI Lab community that fosters cross-fertilization between talents with different expertise and disciplines.

Sensor AI is led by Dr. Manon Kok (3mE, DCSC) and Dr. Raj Thilak Rajan (EEMCS, ME)

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.

The Faculty of Electrical Engineering, Mathematics and Computer Science (EEMCS) brings together three disciplines - electrical engineering, mathematics and computer science. Combined, they reinforce each other and are the driving force behind the technology we use in our daily lives. Technology such as the electricity grid, which our faculty is helping to make future-proof. We are also working on a world in which humans and computers reinforce each other. We are mapping out disease processes using single cell data, and using mathematics to simulate gigantic ash plumes after a volcanic eruption. There is plenty of room here for ground-breaking research. We educate innovative engineers and have excellent labs and facilities that underline our strong international position. In total, more than 1,100 employees and 4,000 students work and study in this innovative environment.

Click [here](#) to go to the website of the Faculty of Electrical Engineering, Mathematics and Computer Science.

## Additional information

For information about the positions 1 and 2, please contact Dr. Manon Kok, [m.kok-1@tudelft.nl](mailto:m.kok-1@tudelft.nl)

For information about the positions 3 and 4, please contact Dr. Raj Thilak Rajan, [R.T.Rajan@tudelft.nl](mailto:R.T.Rajan@tudelft.nl)

More information about the TU Delft AI Initiative can be found [here](#).

## Application procedure

Are you interested in this vacancy? Please apply no later than January 16, 2022 via the application button.

For more information about the application procedure, please contact *Nathalie van Benthem*, [N.vanBenthem@tudelft.nl](mailto:N.vanBenthem@tudelft.nl)

Please submit the following:

- 1-page Motivation letter
- Your CV
- A course list from your Masters curriculum
- Your M.Sc. thesis or a paper that you have written, in which you demonstrate your writing (and scientific) skills.
- 2 reference letters

- You can apply online. We will not process applications sent by email and/or post.
- A pre-Employment screening can be part of the selection procedure.
- Acquisition in response to this vacancy is not appreciated.

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