Delft Center for Systems and Control

TU Delft
Delft University of Technology

PhD Position on Machine-learning-based Multi-sensor Detection and Classification for Cleaning Coastal Waters using Autonomous Underwater Robots

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Job description

In this PhD project we will develop novel machine-learning-based approaches for detection and classification in the context of autonomous unmanned underwater robots for locating, detecting, and collecting unwanted objects from coastal waters and seabeds.

This PhD project is part of the Horizon Europe project SeaClear 2.0 (Scalable full-cycle marine litter remediation in the Mediterranean: Robotic and participatory solutions), which is a follow-up project of the ongoing European SeaClear project (see also https://seaclear-project.eu/).

The goal of SeaClear and SeaClear 2.0 is to develop a collaborative, heterogeneous multi-robot solution engaged in collecting marine waste using autonomous underwater robots for cost-effective marine litter detection and collection, while at the same time minimizing impact on underwater flora and fauna like seaweed and fish. This goal will be reached by bringing together state-of-the-art technologies from the fields of machine learning, control. optimization, and marine technologies and by building a stable and reliable system capable of tackling a highly relevant social, economic and environmental issue, namely ocean pollution.

In this PhD project we will focus on two main topics: (1) the development of novel multi-sensor detection, identification, and classification methods for underwater litter using the various sensors on-board of the underwater robots, and (2) integration of model-based and data-driven approaches for multi-sensor data fusion and detection classification of underwater litter. For topic (1) deep learning and multi-sensor fusion will be the primary solution directions where the aim is to combine and merge information from e.g. cameras, sonar, magnetic sensors to detect and classify litter, fish, seaweed, etc. At a next stage this can be extended with additional data from surface vessel or aerial drones. For topic (2) we will extend the methods developed in (1) into an integrated model-based decision making approach that is able to use a priori information from e.g. dynamical or behavior models of fish, seaweed, plastic, etc. to further enhance detection and classification.

If you are selected for the position, you will join our machine learning and optimization team at the Delft Center for Systems and Control (DCSC) of the faculty of Mechanical, Maritime, and Materials Engineering (3mE). At the DCSC, our mission is to conduct fundamental research in systems dynamics and control, involving dynamic modeling, advanced control theory, and optimization with societally relevant application fields including energy, transportation, and sustainability.

Requirements

This position is perfect for you if you have an MSc degree in systems and control, applied mathematics, AI, computer science, electrical engineering, or a related field, and a strong background or interest in systems & control and/or machine learning. You are also 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 € 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, 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, Maritime and Materials 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 3mE faculty focusses on fundamental understanding, design, production including application and product improvement, materials, processes and (mechanical) systems.

3mE 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 3mE'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, Maritime and Materials 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 Bart De Schutter, b.deschutter@tudelft.nl.

Application procedure

Are you interested in this vacancy? Please apply by June 1, 2023, 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-3mE@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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