Delft Center for Systems and Control

TU Delft
Delft University of Technology

PhD Position Data-driven and Modular control for Controlled Environment Agriculture

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Job description

Agriculture is an indispensable industry. Open field agriculture, however, requires large quantities of fertilizer, water, and land while representing a significant contribution to global greenhouse gas production. Moreover, open field agriculture is particularly sensitive to climate change as rising temperatures, floods, and droughts threaten food security in many areas of the world.

Controlled environment agriculture (CEA), such as greenhouse or vertical farming, offers a climate resilient alternative to open field agriculture with significantly lower fertilizer, water, and land use requirements. One of the main limitations of CEA, however, is that optimizing and maintaining climate conditions for plant growth is a complex and energy intensive task. While model-based and optimal control methods offer a potential solution, the large investment of time and expertise (i.e., cost) required to deploy these methods is prohibitive for applications such as CEA with many independent systems and high variability between systems.

This PhD project involves designing data-driven and modular control algorithms to address these challenges in CEA systems. These control algorithms should regulate the indoor temperature, humidity, CO2 concentration, and supplemental light input in CEA systems to maximize plant growth while minimizing energy cost and environmental impact. The goal is to leverage first-principles knowledge as well as advances in machine learning and data-driven control to design a control synthesis procedure specific to CEA applications. We plan to focus on modular approaches that allow us to apply the same low-cost control synthesis procedure to deploy controllers for a variety of CEA systems and plants with similar physics, but different parameters. During the project, we intend to collaborate with industrial partners and Wageningen University and Research (WUR) to test these algorithms on real CEA systems. By reducing the cost to deploy these advanced automation and control algorithms, we can expand the scope of these algorithms and thereby bring significant improvements to the resilience, economics, and sustainability of modern agriculture.

Requirements

Applications should have:

- Completed a relevant MSc degree in systems and control, engineering, applied mathematics, or a related field.
- A strong background or interest in systems & control and machine learning
- A desire to work in a multidisciplinary project
- Knowledge of controlled environment agriculture is a plus, but not required.

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

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 R.D. (Koty) McAllister, Assistant professor, email: r.d.mcallister@tudelft.nl.

Application procedure

Are you interested in this vacancy? Please apply before 17 April 2023 via the application button and upload:

1. A curriculum vitae (CV) that states your education and relevant working experience.
2. A motivation letter stating why the proposed research topic interests you (up to 1 page).
3. The names of two persons and their email addresses who could be contacted for a reference.
4. One or two research-oriented documents written by the applicant (e.g., MSc thesis, journal/conference publication).

For information about the application procedure, please contact Irina Bruckner, HR Advisor, 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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