

PhD Position in Data Driven Fault Diagnosis for Electric Vehicles

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Challenge: Accelerate the Transition to Electric Mobility.

Change: Make Data Driven methods work on sparse datasets.

Impact: Increase the useful life of electric batteries.

Job description

The introduction of heavy electric vehicles is an important step for reducing greenhouse emissions. Still, for these vehicles to be truly sustainable, we need to optimize the way we operate their electric batteries. This requires on-board diagnosis and prognosis algorithms that can maximize the battery lifespan and then allow to repurpose them in less demanding applications, such as grid energy storage.

While advanced diagnosis algorithms are model-based, their design, tuning and validation require knowledge of first principle equations and considerable amounts of data. Often, more than what is available: especially in real-world operating conditions, where continuous sampling over large fleet of vehicles is prohibitive.

On one hand, there is a need for system identification approaches that can deal with large, sparse or irregularly sampled datasets. On the other hand, there is a need for pure data-driven, machine learning approaches to simplify model identification from such datasets.

You will carry out research as part of the [project SPARSITY](#), which is an academic-industrial collaboration between the Delft Center for Systems and Control (TU Delft, The Netherlands) and Volvo Group, a world-leading automotive company based in Gothenburg (Sweden). You will be supervised by [Dr. Riccardo Ferrari](#), who is leading a young, dynamic and diverse group of researchers focusing on fault tolerant control, with applications in automotive and aerospace diagnosis, in safety and security of industrial control systems and in renewable energy generation. You will be co-supervised and mentored by [Prof. Michel Verhaegen](#), a renowned expert in system identification methods and an ERC grantee.

You will focus on research topics like:

- extending state-of-the-art system identification algorithms to use sparse, large datasets;

- developing pure data driven, machine learning methods with lower complexity for obtaining prediction models from such datasets — e.g. using compressive sensing for neural networks
- applying diagnosis and prognosis methods to automotive components, such as lithium-ion batteries.

You will have the chance to test your algorithm on real use cases and datasets, thus benefitting from TUD collaboration with Volvo.

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

- You have obtained a MSc. degree in a field related to the project, such as Electrical or Electronics engineering, Systems & Control, Applied Mathematics, Mechanical engineering or Vehicle engineering.
- Or are going to obtain it before the starting date of the position.
- You have a good command of the English language.
- Do you also have a background in System Identification, Data Driven and Machine Learning methods or Fault Diagnosis/Prognosis? Then you are especially encouraged to apply.

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 € 2443 per month in the first year to € 3122 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 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!

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. Riccardo Ferrari](#), r.ferrari@tudelft.nl.

For information about the application procedure, please contact Ms Hilma Bleeker, HR Advisor, application-3me@tudelft.nl.

Application procedure

Are you interested in this vacancy? Please apply by July 4, 2022 via the application button and upload: a motivation letter, a curriculum vitae, a research statement, a list of publications, transcripts of courses with grades and obtained degrees, contact information for two academic references and up to 3 research-oriented documents (e.g. thesis, conference/journal 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.

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