PhD Vacancy at the Energy Grids Lab: "Digital meshes and the decentralized control of energy flows"

Challenge: Transforming the conventional carbon-intensive energy use
Change: AI to turn data into knowledge for efficient systems
Impact: Boosting the sustainable, fair and reliable energy transition

Job description

University of Twente is a top technical university with over 250 scientists working with or on AI, including at the strong multi-disciplinary research group on Energy Management and Smart Grids. The world of energy is changing rapidly including a vastly ongoing electrification within various sectors (e.g. heating, transport) due to the increasing possibilities of generating electricity based on renewable resources. This poses substantial burdens on our electricity infrastructure and asks for completely new and dynamic forms of energy management. Contributing to this vision, the newly Energy Grids Lab unites TU Delft, Radboud University, University of Twente, HAN University of Applied Sciences and Alliander.

Alliander is a Distribution system operator there to maintain, operate the medium-low voltage grid and connect end-users with generators to the transmission high-voltage grid. With the goal to enhance the transport capability of the distribution grid, this lab aims to address distinct challenges arising in the Netherlands and the thousands of distribution grids worldwide. This lab focuses on two ways of impact towards extending the grid capability where one improves the grid operations and the other investigates targeted infrastructure expansions. This lab combines the expertise of Alliander data scientists and electrical engineers, the latest digitalization programs that make grid data available, with the academic expertise on methods from artificial intelligence enabling the lab's scientific success and broader global impact. Alliander is one of the frontrunners worldwide as a DSO in applying smart algorithms and AI, it is also one of the places where the limits of existing methods and available commercial software surface.

In the Energy Grids Lab, we combine ground-breaking Artificial Intelligence (AI) methods with the reliable theory of the physical energy system. The area of data-driven scientific computing promises to combine statistics, time-frequency analysis, low-dimensional model reductions, and other techniques to extract information from data. With AI, we make such information useful for the management and planning of complex energy systems. For example, it is possible to use neural networks to model the state of the grid so operators can act in full awareness of the operating situation. This new Energy Grids Lab investigates explainable AI and data-driven scientific modellings such as reinforcement learning, graph neural networks for their applicability for state estimation, decentralised control of energy flows, risk-based investments and operation. You will work as a team of five newly hired PhD researchers where the core PhD team is supported by around 10 Scientific staff and data scientists and power system experts at Alliander. You will extend the team and integrate your own ambitious research program within our research vision.

This PhD project focusses on digital meshes and the decentralized control of energy flows. By operating the network in a decentralized manner, also in terms of the data that stays locally at an agent, the network will become more resilient. For this we envision new situation aware algorithms that deal with different means of data aggregation. Hereby, the aim is to ensure that enough data is communicated for effective and robust control, but not more than needed to reduce communication capacity and required processing power. Together, this results in a better availability of energy, fewer outages and less power losses. Also, more privacy sensitive data can be used without moving the data around, preserving privacy. You will explore methods from embedded systems, optimization, and data science.

Job requirements

- A Master of Science degree in Computer Science, (Applied) Mathematics, Electrical Engineering, Embedded Systems, Sustainable Energy Systems or equivalent skills for the project.

- Knowledge of energy systems and control theory is a plus.
- Strong analytical, mathematical, and programming skills.
- Excellent teamwork skills and communication skills in spoken and written English.
- Creativity, positive attitude, and perseverance.

Our offer

- We offer you a PhD position in a challenging multidisciplinary project. The university offers a dynamic ecosystem with enthusiastic colleagues and contacts with industry and society.
- A four-years fulltime PhD position.
- A gross salary between € 2.443 and € 3.122 per month.
- You will be working at the office of Alliander in Arnhem for two days a week.
- An annual holiday allowance of 8% of the gross annual salary, and an annual end of year bonus of 8.3%.
- A solid pension scheme.
- Minimum of 29 leave days in case of full-time employment.
- Professional and personal development programs.
- The University of Twente is situated on a green and lively campus with lots of facilities for sports and other extracurricular activities.

Contact and application

For more information, you are welcome to contact prof. dr. Johann Hurink (j.l.hurink@utwente.nl, +31-534893447) Applications including a CV and a motivation letter can be send via email to j.l.hurink@utwente.nl.