InnoEnergy Skills Institute

Data Science for Energy Engineers

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This certification provides a broad introduction to the many use cases of data science in the energy domain. Taking a hands-on approach, it leads learners through the entire data science pipeline for concrete energy use cases.

Over the certification, learners will learn how to analyse, visualise, forecast, and optimise energy demand using a number of different tools in Python. They will also gain hands-on knowledge about practical tools of the trade for sharing analysis results with other stakeholders via dashboards and tracking results of their own experiments using state of the art tools.

Learning outcomes

Upon completion of the certification, learners will be able to:

- Ask better questions about energy data (and answer them).
- Understand the industrial context in which these data science algorithms are applied.
- Possess practical skills to load, explore, analyse, and visualise various energy datasets.
- Make energy forecasts using machine learning models, while also understanding their limitations and how they build on time series and statistical principles.
- Know how to optimise the behaviour of energy flexible resources.
- Track their experiments using state-of-the-art tools.
- Present the results of their analysis in a manner accessible to both specialists and non-specialists.

Certification structure

The certification is delivered in a hybrid environment, including online self-paced lessons, making it easy for participants to learn without having to take time off work, and in-person face-face lab sessions.

The certification consists of five self-paced online courses and eight in-person face-to-face lab sessions and is structured as follows:

Course 1: Introduction to Energy Data Science

- Learn how to load various energy datasets and visualise them for patterns as well as deal with issues such as missing values.

Course 2: Introduction to Forecasting

- Understand core forecasting principles, and how to apply them to energy datasets.

Course 3: Advanced Forecasting

- Learn how to make more advanced forecasts with machine learning models, while also understanding their limitations.

Course 4: Optimisation

- Learn how to apply a number of different techniques to optimize behaviour of energy flexible resources.

Course 5: Data Science Bonus Content

- Understand how to see the bigger picture surrounding individual algorithms in energy data science.

Instructors

The certification is led by experts from the EIT InnoEnergy ecosystem. Instructors on this certification are:

Hussain Kazmi

FWO postdoctoral research fellow at KU Leuven. His current research interests include large-scale data-driven forecasting and optimisation, as well as how human behaviour, climate change, and market design will affect the global energy system in the future. He also worked as a Senior Data Scientist in the energy industry, in computer vision, telecommunications, geophysics, and smart grids. The unifying theme across all of these has been a fascination with real-world data, and the endless possibilities it offers.

Lars Nordström

Professor at KTH. He is head of the division of Electric Power and Energy Systems at KTH and deputy head of the school of electrical engineering and computer science, with specific

responsibility for faculty development. His research and teaching are focused on issues at the crossroads of control, communication, and power systems. His research interests include future architectures, functionality and quality aspects of Information and communication systems used for power system control, operation, automation and protection. He is the author of 100+ scientific papers in journals and international conferences and a senior member of the IEEE, CIRED and Cigre.

Attila Bálint

PhD Candidate at KU Leuven. Experienced Data Scientist with a demonstrated history of working in the information technology and energy industry. Strong engineering professional with a Master of Science double degree focused on Energy Engineering from Universitat Politècnica de Catalunya and École Polytechnique.

How will you learn?

This is an online certification and has five self-paced online courses

Is it right for you?

This certification is designed for energy domain students and professionals who are interested in learning how data science workflows can help streamline existing workflows and enable new services. As a result, it should be useful for students, researchers, and practitioners alike looking to incorporate data-driven decision-making into their skill set.

The principles taught in the certification readily generalise to the broader energy sector, and should be of interest to practitioners at energy aggregators, system operators, and utilities etc. It may also be of interest to data scientists looking to transition into the energy (or sustainability) domain.

Prerequisites: In order to be able to follow and benefit from this certification, learners would need:

- Understanding of core concepts in energy and power engineering.
- Proficiency in a programming language, preferably Python (e.g., familiarity with control commands and loops, etc.). Optionally, exercises can be provided for learners who do not have a background in Python so that everyone starts the certification at a similar level.
- Experience with advanced concepts such as object-oriented programming or deployment is not required.