DY 13: Big Data and Artificial Intelligence (joint session SOE/DY)

Time: Monday 17:45–18:15 Location: H18

DY 13.1 Mon 17:45 H18

Revealing interactions between HVDC cross-area flows and frequency stability with explainable AI — •Sebastian Pütz[1,2], Benjamin Schäfer[3], Dirk Witthaut[1,2], and Johannes Kruse[1,2] — [1]Forschungszentrum Jülich, Institute for Energy and Climate Research - Systems Analysis and Technology Evaluation (IEK-STE), 52428 Jülich, Germany — [2]Institute for Theoretical Physics, University of Cologne, 50937 Köln, Germany — [3]Karlsruhe Institute of Technology, Institute for Automation and Applied Informatics (IAI), 76344 Eggenstein-Leopoldshafen, Germany

The energy transition introduces more volatile energy sources into the power grids. In this context, power transfer between different synchronous areas through High Voltage Direct Current (HVDC) links becomes increasingly important. Such links can balance volatile generation by enabling long-distance transport or by leveraging their fast control behavior. Here, we investigate the interaction of power imbalances - represented through the power grid frequency - and power flows on HVDC links between synchronous areas in Europe. We use explainable machine learning to identify key dependencies and disentangle the interaction of critical features. Our results show that market-based HVDC flows introduce deterministic frequency deviations, which however can be mitigated through strict ramping limits. Moreover, varying HVDC operation modes strongly affect the interaction with the grid. In particular, we show that load-frequency control via HVDC links can both have control-like or disturbance-like impacts on frequency stability.

DY 13.2 Mon 18:00 H18

From sample management to workflow integration: Semantic research data management in glaciology. — •Florian Spreckelsen[1], Daniel Hornung[1], and Johannes Freitag[2] — [1]IndiScale Gmbh, Göttingen — [2]Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Bremerhaven

Organizing data from a diversity of sources, from acquisition to publication, can be a tough challenge. We present implementations with the flexible open-source research data management toolkit CaosDB in the glaciology department at the Alfred Wegener Institute (AWI) in Bremerhaven. CaosDB is used in a diversity of fields such as turbulence physics, legal research, animal behavior and glaciology. CaosDB links research data, makes it findable and retrievable, and keeps data consistent, even if the data model changes.

At AWI, CaosDB keeps track of ice core samples and to whom samples are loaned for analyses. It made possible additional features such as: A revision system to track all changes to the data and the sample state at the time of analysis. Automated gathering of information for the publication in FAIR-DO meta-data repositories, e.g. Pangaea. Tools for storing, displaying and querying geospatial information and graphical summaries of all analyses performed on each ice core. Automatic data extraction and refinement into data records in CaosDB to minimize manual users interaction. A state machine which guarantees certain workflows, simplifies development and can be extended to trigger additional actions upon transitions.

We demonstrate how CaosDB simplifies semantic data in science.