



Institute for Automation and  
Applied Informatics (IAI)

## Bachelor's/Master's Thesis

# Transformer Networks for Energy Time-Series Forecasting

Matching electricity demand becomes increasingly difficult for transmission system operators (TSOs) because renewable energies, which are more volatile than traditional fossil fuels, are harder to schedule. Resulting mismatches could lead to unstable energy systems and higher costs. To reduce the occurring mismatch, TSOs forecast time-series data like electrical demand, wind, and solar power generation.

For time-series forecasting, recurrent neural networks (RNNs) are often used but they generally need a lot of computational power. However, Google Brain recently proposed a novel architecture called „Transformer“ that achieves similar results like state-of-the-art approaches for translation tasks but with less training costs [1].

This thesis aims to firstly give a theoretical overview of transformer networks and their components. Secondly, this thesis should identify suitable transformer networks for energy time-series forecasting based on related work. Finally, this thesis should implement at least one suitable model and compare it to relevant benchmarks to investigate the potential of the transformer networks for energy time-series forecasting.

### Requirements:

- Familiarity with Python and its ecosystem (NumPy, Pandas, Matplotlib)
- Knowledge in basic statistics
- Experience with Git as well as structuring and documenting code
- Interest in implementing new approaches for energy forecasting
- Experience with Tensorflow or PyTorch is an advantage

[1] Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A., Kaiser, L., & Polosukhin, I. (2017). Attention is All you Need. In *Advances in Neural Information Processing Systems*. Curran Associates, Inc.