Institute for Automation and Applied Informatics (IAI)

Earliest start: from now

Master's Thesis

Time Series Super-Resolution and its Uncertainty Quantification based on Probabilistic Diffusion Models

The aim of the RESUR project (Robust Energy Systems and Resource Supply) is to improve the robustness and security of the energy system supply. To achieve this goal, the differences in the granularity of models must be overcome so that co-simulation of different models is possible. In energy system co-simulation, the time granularity difference between different models is a long-standing challenge. Our previous work successfully used Generative Adversarial Networks (GAN) and Transformer models to achieve super-resolution reconstruction of energy time series without the need for high-resolution real data, effectively bridging the granularity gap in the time dimension of data.

To further promote the development of this field, this master's thesis aims to explore a more cutting-edge generative model -Probabilistic Diffusion Models-. We hope that the new model will not only surpass existing methods in terms of fidelity and detail restoration of generated data, but also significantly simplify the training process and introduce the Uncertainty Quantification assessment of the generated results for the first time, which is crucial for risk assessment and robustness analysis of energy systems.

Tasks

1. Next-Generation Generator Development
2. Training Framework Simplification
3. Frequency Domain Analysis Integration
4. Uncertainty Quantification

We offer

- Opportunity to participate in pioneering research project.
- Professional guidance and support.
- Flexible working hours and a pleasant working environment.
- The opportunity to participate in international conferences and exchange programs.

Contact

- Xuanhao Mu, M.Sc.; xuanhao.mu@kit.edu; KIT Campus North

Xuanhao Mu, M.Sc.
Research Group Web-based Informations Systems
E-mail: xuanhao.mu@kit.edu

Institute for Automation and Applied Informatics (IAI)
Karlsruhe Institute of Technology, Campus North
Hermann-von-Helmholtz-Platz 1
76344 Eggenstein-Leopoldshafen