Master- and Bachelor Theses in

Interpretable Machine Learning and Digital Twins in High Throughput Based Experimentation

The i-MEET Institute (Materials for Energy and Electronics Technology) is focused on novel materials and processing methods for Organic and Perovskite Solar cells. High Throughput experimentation is used to optimize the Solar cell performance and lifetime, but also to understand the underlying physical principles.

Machine Learning (ML) Methods for Optimization can therefore not be used as “Black Box” algorithms but must allow to connect the data driven ML approach with the model-based thinking of humans. This is called Interpretable ML. We are currently building Interpretable ML workflows with potential for dramatic performance enhancement in device optimization and knowledge creation:

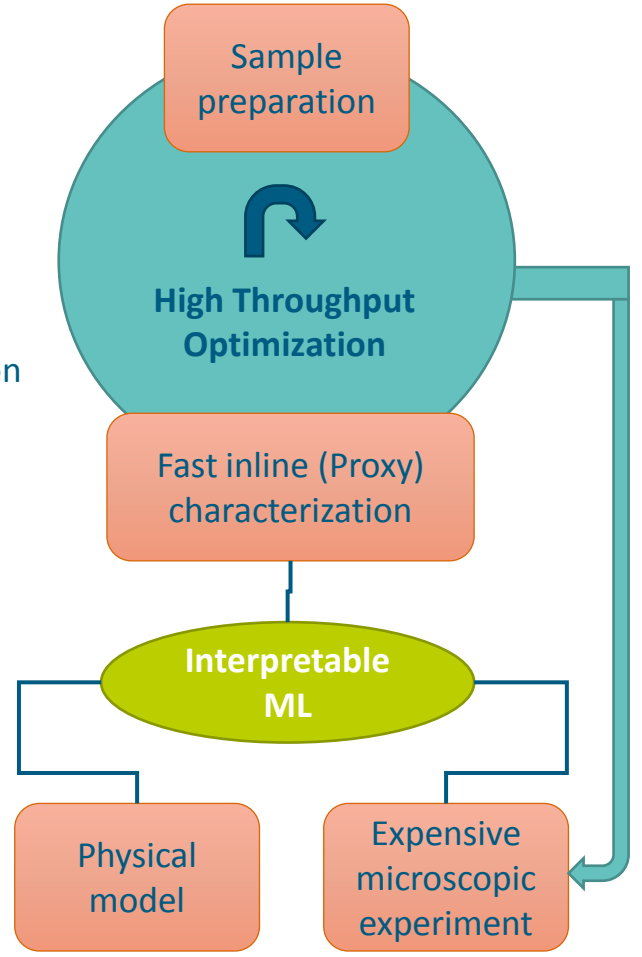
- **Image-based Power prediction of Solar Modules**: assessing the Physics learned by Convolutional Neural Networks – both commercial modules and minimodules for research
- **Digital Twins of Devices and Proxy Experiments**: obtaining microscopic structure using non microscopic experiments (Optical / Imaging / Dynamic experiments)

We offer the opportunity for **Masters and Bachelor theses** in Machine Learning and device simulation

Qualification:

- Student of Materials Science, Nanotechnology, Energy Technology, Process Engineering, Physics or comparable require an examinor from their department.
- Keen interest in materials development and solar power
- Working knowledge of Python and / or Matlab™
- Self-driven and ambitious

Note: Students of MWT, NT, Energy Technology, Advanced Materials & Processes (MAP) can be directly examined. Students from other disciplines require an examinor from their department.



Recent Publications:

Du et al., Elucidating the Full Potential of OPV Materials Utilizing a High-Throughput Robot-Based Platform and Machine Learning, **Joule** (2020) https://doi.org/10.1016/j.joule.2020.12.013

N. Gasperini et al., Adjusting the Energy of Interfacial States in Organic Photovoltaics for Maximum Efficiency **. Nature Communications** (2021) https://doi.org/10.1038/s41467-021-22032-3

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