Universität Stuttgart
Institute for Acoustics and Building Physics

Deep Learning Surrogate Models of PV-integrated Shading

Bachelor- / Masterthesis

Background

The subject of this work is PV-integrated shading solutions, such as those depicted in Figure 1. Changing the slat angle not only affects the workplace illuminance or glare, but also the solar gains and the electricity yield. All these effects depend on the slat angle and the weather conditions. This includes a non-smooth and non-linear dependence on the position of the sun. Due to the effect in several domains, optimization-based control concepts (e.g. MPC, RLC) are favoured, which, however, require a compact surrogate model.

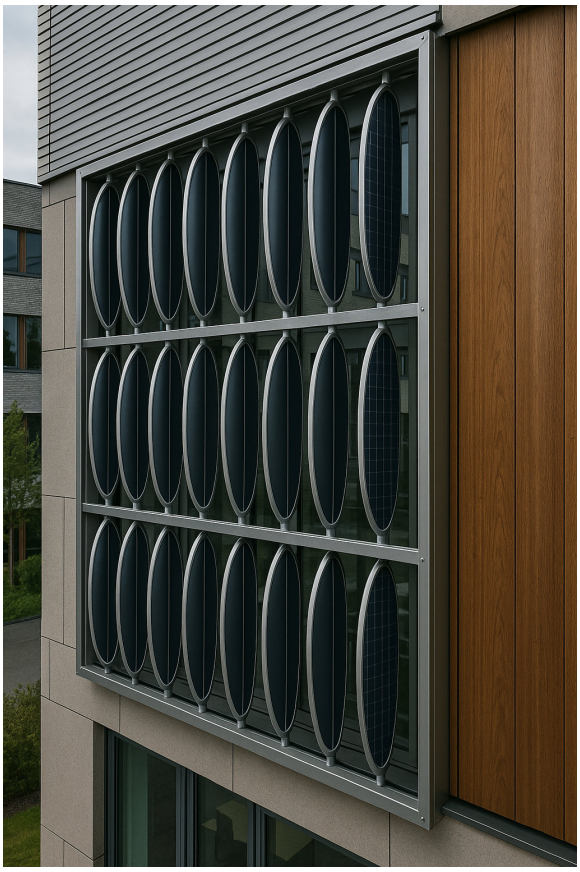

Figure 1: Schematic representation of PV-integrated shading

Task Description

This work begins with a literature research on the previous surrogate model and control approaches of PV-integrated shading devices. Subsequently, different deep neural network structures are developed and compared. MATLAB is the preferred environment for this. The training data required is made available using an existing Rhino3D Grasshopper plugin from parametric design. With appropriate aptitude, this surrogate model can then be used to develop an optimization-based control.

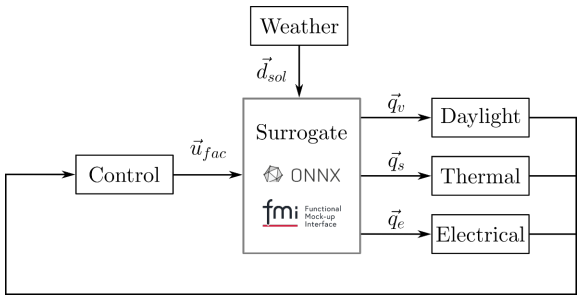

Figure 2: System dynamics with the surrogate model and its interaction to the domain-specific models.

Requirements, Supervision, and Contact

You should have knowledge of machine learning methods and a good experience in programming with MATLAB or Python. If this position interests you, please send your CV, current transcript of records, and your preferred start date. The position is available immediately. For any inquiries, please do not hesitate to get in touch.

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