



Hybrid Workshop, May 18 & 19, 2022 – Fraunhofer IWM / MS-Teams

## Data-driven modeling and optimization along the processing-structure-properties chain for materials and process design

In future manufacturing, the design of materials to exactly match application purposes and the design of processes to produce workpieces with desired material microstructures and properties plays a crucial role. Sophisticated materials and process designs not only enable the production of highly performant products but also reduces production costs and makes production more sustainable for example by avoiding defect products. To tackle this challenging materials science problem, the application of data-driven methods from the highly dynamic field of machine learning are promising.

In the ongoing DFG research project **Taylored Material Properties via Microstructure Optimization: Machine Learning for Modeling and Inversion of Structure-Property-Relationships and the Application to Sheet Metals**, we committed ourselves to push forward the development of data-driven methods for materials and process design by bringing together the communities of materials science, of data-driven modeling and machine learning, specifically the communities working on data-driven materials design and process design.

### Organizational matters

- Fraunhofer Institute for Mechanics of Materials IWM  
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- Programme management and organisation  
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- free of charge event

This workshop addresses the four major topics:

**Materials design**, incorporating the modeling and optimization of microstructure-property relations, as well as the inverse modeling of these relations using data-driven methods.

**Process design**, incorporating any kind of tools to design processes and process chains, such as applications of reinforcement learning and surrogate modeling of process simulation in order to reach targeted microstructures or properties.

**Process control**, incorporating process control approaches that link and optimize processing-structure-property relations, as well as issues like interoperability of data and process interfaces.

**Opportunities for data-driven methods in materials sciences**, incorporating the presentation of recently developed machine learning methods that are promising for future developments in materials and process design (addressing for example the modelling of uncertainty, generative models, optimal experimental design, the integration of domain knowledge).

For each session, invited keynote speakers will share their thoughts and give impulses. Besides, we encourage interested researchers to present their work and ideas on the above-mentioned topics (presentation, tutorials, live demos, ...).

The scientific committee consists of Dr. Dirk Helm, Prof. Dr. Norbert Link, Dr. Johannes Dornheim, Lukas Morand and Tarek Iraki.

**Abstracts can be submitted to**

**[lukas.morand@iw.fraunhofer.de](mailto:lukas.morand@iw.fraunhofer.de) until March 18, 2022.**