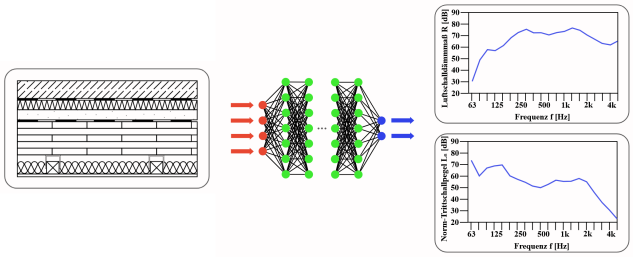
Chair of Vibroacoustics of Vehicles and Machines
School of Engineering and Design
Technical University of Munich

Master Thesis

Uncertainty-Aware Prediction of Mass-Timber Floor Sound Insulation

While timber construction is gaining popularity, predicting its acoustic performance remains a significant challenge. Wooden floor systems typically consist of multiple layers, whose interactions yield complex sound insulation properties. At present, reliable assessment often requires costly experimental validation. Based on this data, machine learning models are developed to predict the sound insulation of wooden floors from laboratory measurements; sparse data and the inherent uncertainty motivate quantifying the prediction uncertainty.



Prediction scheme for airborne and impact sound insulation of a mass timber floor assembly.

Your Task

A comprehensive set of measurement data has been collected and integrated into a *MySQL* database. Subsequently, feed-forward neural networks and tree-ensemble models have been optimized and trained in an initial comparative study to predict airborne and impact sound insulation.
In this thesis, you will elaborate on approaches to account for the aleatoric uncertainties inherent in the experimental training data, as well as epistemic uncertainties, e.g., arising from data sparsity, yielding a robust, interpretable predictive design tool.
Your contribution will play a crucial role in refining the existing predictive models and enabling a reliable assessment of the sound insulation of mass-timber floor constructions.

The thesis is structured as follows. Details are open to discussion:

- WP1 – Improvement of current embedding strategy
- WP2 – Quantification of epistemic uncertainty
- WP3 – Incorporation of measurement uncertainties
- WP4 – Evaluation and validation of the prediction accuracy

Please submit your application, including a brief statement of interest, your CV, and a transcript of records, to the contact listed below.

Your Skills

- Knowledge of Python/PyTorch
- Experience in probabilistic modeling and hyperparameter optimization
- High motivation and a structured working style

Contact

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