

Fast noise mapping: A machine learning approach for predicting traffic noise indicators

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Noise mapping has become a popular tool for assessing the impact of traffic noise on human health and wellbeing. Usually, models for estimating exposure of a population rely on a (standardized) simplification of the noise emission and propagation. Mapping is simplified by considering only the equivalent noise level since it removes all temporal information from the source prediction, the propagation, but unfortunately also from the impact assessment. Yet, it is known that noise events can play an important role in, e.g., sleep disturbance and temporal information are essential in the evaluation of outdoor soundscapes. Models for calculating spectro-temporal levels with a one-second resolution have been proposed, but these quickly become too slow for large scale exposure assessment. Here, a convolutional neural network (CNN) based on environmental characteristics is proposed as a fast alternative. The CNN-model is trained on thousands of detailed physical simulations with varying propagation conditions and traffic intensities on the surrounding roads. To increase the understanding of this machine learning model, Shapley values are used. They show the importance of different features in calculating indicators, e.g., loud events are mainly explained by close-by traffic, L50 by high intensity roads, also at larger distances.