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Evaluation of technical modelling approaches for data pre-processing in machine learning wind power generation models

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Machine learning algorithms are widely used for deriving predictions, being well applicable for wind power generation modelling as demonstrated in recent academic literature. However, current research mainly focuses on evaluating the performance of different algorithms while dismissing the possibility of integrating technical-physical modelling approaches as means of reducing computational intensity or improving model quality. The present study aims to clarify if technical-physical modelling techniques can be applied as a pre-processing step to decrease the computational intensity and to evaluate how pre-processing affects model quality. Therefore, we apply two machine learning algorithms with a range of pre-processing steps and compare the results in terms of model quality and total run time to models without pre-processing. The assessment of model quality is based on an equally weighted comparison of hourly correlation, normalised root mean squared error and normalised mean absolute error values. The model training period (2010) as well as the model prediction period (2011) comprises a one year time series of hourly wind power generation values for Germany in order to keep computational effort at an acceptable level. Initial model runs show ambiguous results, as some pre-processing methods increase both run time and model error. Consequently, no firm conclusion with regards to the effects of pre-processing on both model quality and computational effort can be drawn based on these preliminary findings, requiring additional model runs for confirmation.