Geophysical Research Abstracts
Vol. 20, EGU2018-12227, 2018
EGU General Assembly 2018

Tree-Based Boosting Models For Low-Visibility Forecasts at Different Lead Times

Sebastian J. Dietz (1), Philipp Kneringer (1), Georg J. Mayr (1), and Achim Zeileis (2)

(1) University of Innsbruck, Institute of Atmospheric and Cryospheric Science, Innsbruck, Austria (dietz.basti@gmail.com), (2) University of Innsbruck, Department of Statistics, Innsbruck, Austria

Low-visibility conditions require special procedures at airports which lead to capacity reductions. Accurate and probabilistic forecasts of such capacity reducing low-visibility procedure conditions help to minimize delays and maximize safety. This study investigates the accuracy of forecasts from 1 hour up to 15 days.

The statistical models used to generate the forecasts are boosting trees, which combine several decision trees by fitting iteratively a new tree to the residuals of the previous model and merging the new tree with the previous model. Boosting trees provide probabilistic forecasts and additionally select the most important input variables for forecast generation.

The boosting trees used in this study are trained with observations and climatological information at Vienna Airport, and outputs from the ECMWF numerical weather prediction model (NWP) – both separately and combined. Models that are based on observations only outperform the NWP output based models up to a lead time of 5 hours. However, models with the combined predictor variable setup perform best at each lead time.

The observation-based models and the combined ones outperform persistence at each lead time, even at one hour. Climatology is outperformed by the models up to the longest examined lead time of 15 days. The observation-based models converge therefore fastest to climatology. Observations contributing most to the forecast skill are persistence and dew-point depression. Low cloud cover and evaporation are the most important outputs from the numerical weather prediction model.