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# Applying artificial neural networks in visibility and cloud forecast at Budapest airport

Peter Kardos (1), Cathy Fricke (1), Aniko Varkonyi (2), Katalin Hadobacs (3), Zeno Gyongyosi (4), and Zsolt Bottyan (3)

(1) HungaroControl, Budapest, Hungary (kardos.peter@hungarocontrol.hu; frcsaat@gmail.com), (2) Eotvos Lorand University, Budapest, Hungary (kisaaa93@gmail.com), (3) National University of Public Service, Szolnok, Hungary (bottyan.zsolt@uni-nke.hu; katalin.hadobacs@gmail.com ), (4) University of Szeged, Szeged, Hungary (gyzeno@caesar.elte.hu)

Numerical weather prediction systems do not provide cloud and visibility information directly, these can be assessed during post processing in an indirect manner only. However accuracy of these forecasts is not sufficient for operational usage, therefore appropriate prediction of visibility and cloud ceiling is a really big challenge for operative forecasters at the airports, meanwhile these parameters are crucial for decision making in aviation industry and for supporting unmanned aerial systems (UAS) as well. Artificial neural networks provide a suitable statistical approach for supporting these forecasting tasks. Our research focuses on nowcasting and short term forecasting of visibility and low cloud base situations, which based on more than 10 years of high detailed airfield sensor data at the Budapest airport and 3 years of nested WRF numerical model domain output which was initiated by GFS forecast as initial boundary and lateral condition. The performance of artificial neural network highly depends on the details of network configuration, therefore choosing the suitable network topology, number of hidden layers and neurons, transfer function and the appropriate learning algorithm that tends to a convergent solution were crucial elements in our research. The results of best performing artificial neural network configurations have been compared to measurements and persistent prognosis in case of nowcasting approach, and some other available cloud assessments methods and recorded sensor data in case of short term forecasting. For evaluation categorical verification methods were preferred with the widely used indicators (POD, FAR) and skill scores (HSS, ETS), and finally some case studies were used to demonstrate the applicability of these new methods in near-operational environment.