Makani Walensee

Wind speed predictions at Walensee: comparing simple forecast models

Student

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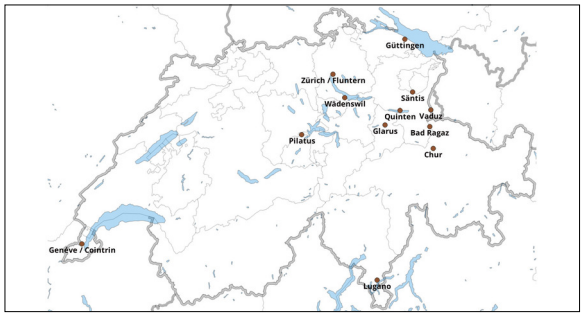
Objective: Wind is the fuel of windsurfing. Without wind, one of the greatest sports ever developed would not exist. This project is about making life easier for all wind sport enthusiasts to surf at the Walensee. To achieve that, different wind forecasting methods are developed and compared. The goal is to predict the wind speed at Walensee for the next three hours, every 10 minutes, resulting in 18 forecast values, the so-called Nowcasting.

Approach: The models are based on wind speed, wind direction, pressure, humidity, and temperature measured at numerous stations scattered throughout Switzerland. MeteoSwiss, the Swiss Federal Office for Meteorology and Climatology, provides the data at several stations. The Stations are selected according to their geographical conditions and available parameters. Most stations are located around Walensee, for example, Quinten, the reference station for wind speed. Stations such as Säntis, situated in exposed locations, were selected to capture the general weather situation in Switzerland. Other stations like Lugano and Zürich have been chosen because of their receptive location, which allows for capturing weather situations like Föhn and Bise.

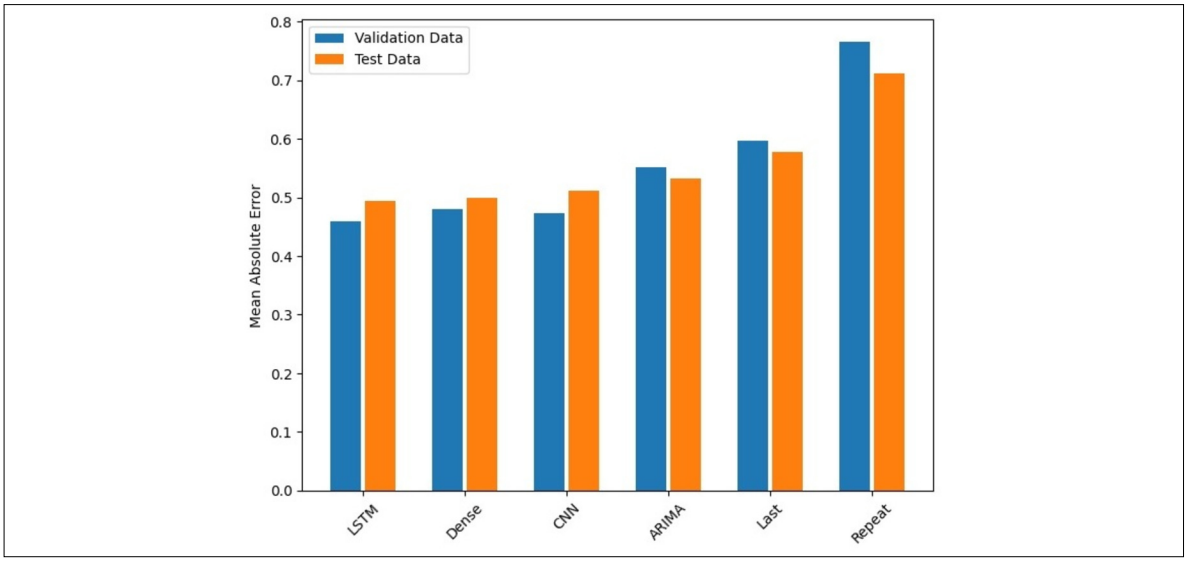
During the project, an ARIMA model, a simple dense neural network, an LSTM model, and a CNN model are trained to forecast the wind speed. Furthermore, two baseline models have been created to assess the performance of the complex models. These baseline models are used to determine how the complex models perform.

Result: As the first in a series of projects, this project focuses on exploring different simple models and how they compare. Based on the mean absolute error comparison, the best-performing model is the LSTM model. The other neuronal networks closely follow it. All deep neural networks perform way better than the baseline models. These findings prove that neural networks are the most reliable models to predict the wind speed at Walensee.

Locations of the stations
Federal Office of Topography swisstopo



Mean absolute error of all models
Own presentment



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Subject Area
Data Science