IJS, Odsek E6: Komunikacijski sistemi

Local prediction of weather parameters based on historical data

The aim of this project is to provide a short term local forecast of weather parameters using only provided historical data. This data is typically in the form of time series with 15 minute time steps. The goal of this project is to address the problem with multivariate ARIMA (or similar) statistical method to get a weather forecast along with error assessment.

Detailed task:

- A year or more of weather parameter observations are given in form of csv file(s).
- A python script is given that loads files and plots some of the parameters.
- First, select a Python library to perform modelling of the data using ARIMA or similar.
- Then experiment with the library to create some statistical models of the given data. Advice: use only a subset of the provided data for faster development, since complex models can be time demanding to train.
- Write a function to forecast the weather parameters up to 10 time steps into the future for any given time range of data, using a statistical model.
- Write a function to test the prediction - absolute accuracy can be calculated from the differences between the real values and the predictions, but the models can have their own error prediction too (there is no one way to present it), which is also to be tested.
- Write the testing framework, which will test any given model (must be a parameter so that different models can be tested) on a chosen subset of the historical data (the one given in csv files), and will return a measure of model accuracy. E.g. the model predicts temperature for 2 h in advance within 2°C error, 95% of the time (similarly for all the other parameters).
- Finally train the statistical model on all the historical data and test it on the same data using testing the testing framework. Then divide the historical data into training and testing sets (50% each), retrain the model and determine how much the performance of the model trained on less data worsened.
- Optimise the model to minimise both its error and the model complexity (for the latter, e.g. aim for lower numbers in ARIMA description).
- The result may be one or more models of various complexity that predict the given weather parameters.

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