

Forecast surface and dew point temperature with the help of Deep learning techniques (30 ECTS credits)

The professional service division at SMHI is looking for one or possible two student to a master thesis project. The master thesis project will explore the possibility to apply deep learning techniques to make (based on input from numerical weather prediction models) forecasts for dew point and road surface temperatures.

1 Background

Dew point and road surface temperature are parameters that are important when one tries to predict risk for icy roads. Today SMHI uses a numerical physics based model driven by data from a numerical weather prediction model (NWP) to predict the road surface parameters. Another approach is Model Output Statistics (MOS). MOS is a well-established method used both to improve forecast quality and create forecasts for parameters that isn't calculated by the NWP. In classical MOS one uses multiple linear regression. The covariates in the regression consist of a subset of the parameters produced by the NWP and the target is observations of the parameter one wants to forecast (for example road surface temperature). Road surface temperature has complex nonlinear dependencies to parameters such as cloudiness, temperature and solar height. Therefore it can be interesting to apply Deep learning techniques to see if they can capture the nonlinear dependencies between NWP parameters and road surface temperatures.

2 Goal

The goal is to implement and test a couple of deep learning architectures that predicts the dew point and road surface temperatures based on input from a numerical weather prediction model.

3 Task description

- Together with a meteorologist choose parameters from the numerical weather prediction model which are suitable as input.
- Suggest a couple of deep learning architectures based on literature study and maybe some small scale experimenting. Could be convolution neural networks, LSTM:s, dense networks, etc.
- Implement the suggested architectures (preferably in some Python framework such as Keras or Lasagne)
- Evaluate the forecasts produced by the suggested architectures.

4 Requirements

- Solid programming skills (preferably in Python)
- Solid skills in Linux CLI
- Solid applied math skills, especially in optimization
- Basic skills in machine learning algorithms

5 Contact information

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