31761 - Renewables in Electricity Markets

Assignment 3: Expectations

General considerations

Assignment 3 concentrates on renewable energy forecasting (wind energy). The assignment relies on a forecast competition over 4 weeks, during which are incentivized to use your learnings in renewable energy analytics, forecast verification, as well as basic techniques for forecasting and nonlinear regression. A large part of the grade relates to your ability to properly master the concepts introduced through the lectures and exercise sessions. Though, a part of the grade is also linked to the ranking in the forecast competition, in order to also provide an incentive to perform and a fair reward to those who put a lot of energy and time into it. The work to undertake involves a bit of mathematical modeling, implementation, generation and discussion of results, as well as presentation of the work in a short report.

The competition is organized in 4 stages, with the teams being ranked at every stages, even though only ranking at stages 2-4 will be used for the final ranking of the various teams. Stage 1 concentrates on a single day while stages 2-4 are for an entire month. For the ranking of the teams at each stage, the RMSE is calculated on a lead time basis, and the average RMSE over all lead times is obtained. It is this average RMSE that is used as a basis for ranking. Finally, the overall ranking over the 3 stages is obtained based on the average of the 3 average RMSE values for stagees 2-4.

The aim of Assignment 3 is to evaluate

- your understanding of the basics of renewable energy analytics,

- your ability to evaluate forecasts and have a critical eye on forecast quality,

- your ability to generate forecasts,

- your creativity in proposing approaches to forecasting.

I should add to that I also aim at evaluating your ability to deliver and discuss the outcome of your work in a synthetic manner, with this constraint of 10 pages on the report to force you to think of prioritizing the material and sorting what is most important and what can be placed in Appendices (or simply skipped).

In addition, my main objective with this third assignment is for you to think thoroughly about what to look for in data (weather forecasts, power observations, other?) in other to improve forecasts of renewable power generation. Some of your may have a very "engineering" and "physics-based" approach, aiming to model wind profiles, shadowing effects, etc. Others will embrace a fully data-driven approach, focusing on feature engineering, machine learning, etc. My aim is not to judge you on these choices themselves, but on how you justify those and use the data to decide whether these choices are good or not. Now that you have received detailed feedback on assignments 1 and 2, I also expect that your report is better constructed and presented.

Grading blocks for this assignment?

The various topics graded in Assignment 3 include (with the number of points assigned for each part between parentheses):

Description of forecast strategies (15 points): you should be able to describe the basics of the forecasting problem, how to use the data as input, what approaches they took to produce the forecasts, etc.

Evolution process and improvement (15 points): you should guide me/us through the evolution of your forecasting approach/strategy, and hopefully related improvement. I.e., the process should inform about how you made decisions through the various stages with the aim of improving forecast accuracy

Rigor and creativity of strategies (12 points): you ought to be rigorous in the way you generate your forecasts, make modeling decisions, verify them, etc. In addition, I expect that they use a bit of creativity there, either fueled by your basic knowledge in wind energy and/or supported by a data-driven approach e.g. with statistical and machine learning

Forecast verification (12 points): you were taught about how to verify forecasts, based on scores and diagnostic tools. I expect you to be able to use this toolbox to evaluate and discuss the quality of your forecasts throughout the competition

Analysis of results and discussion (13 points): you should be able to analyze and discuss the results you obtained, hopefully reflecting on your modeling choices and impact on the outcome at various forecast competition stages

Ranking (18 points): no need for you to do anything there, since the grade for this part if automatically given based on the ranking for the competition overall. First team: 18 points, and last team: 0 points.

Code (5 points): there the code that is used to produced the results is verified to ensure that is reflects the formulation proposed, and can plausibly produce those results

Presentation (10 points): the students should be able to prioritize the material to be presented in the report, make proper use of the English language, make right choices of illustrations, etc.

The total number of points is hence 100.