Internship report

Reuniwatt SAS, 14 rue de la Guadeloupe, 97490 Sainte-Clotilde
Tel : 06.92.64.43.13 / Fax : 02.62.92.10.20 / courriel : info@reuniwatt.com
Société par Actions Simplifiée au capital de 191.700€ RCS Saint-Denis 518 919 345

Contents

Abstract

For day-ahead forecasts, the combination of Numerical Weather Prediction (NWP) models and post-processing algorithms is the most effective method.
However, it is hard to extract from all the literature on the subject the best algorithm to use because of the lack of consistency in the different approaches.

During my Internship, my mission was to investigate the best algorithms according to the literature so as to improve the day-ahead irradiance forecasts.
My final results demonstrated improved metrics in comparison to the current algorithm used by Reuniwatt.

1 Introduction

1.1 Background and motivation of the intership project

This report is the result of my 6-month internship that took place in Reuniwatt, a leader in cloud observation and forecasting. My internship extended from March 1st to August 31st, taking place during the second semester of my academic gap. The main subject of the intership was the post-processing of the day ahead NWP irradiance forecasts. Despite their proven utility for day-ahead irradiance forecasting, NWP models predictions can still be improved thanks to post-processing. As i will show in **??**, many models have been investigated in the literature, and it's thus important to draw a clear benchmark of all the available state-of-the-art models.

1.2 Objectives of the internship

Hereafter the main objectives of the internship:

- Benchmark several models on the post-processing of a single NWP model.
- Sensitivity study of the models.
- Comparison of the results with the current model used by Reuniwatt for day-ahead forecasting.

2 Methodology

2.1 Data source

Verbois et al. demonstrated that using a large set of predictors can significantly improve the performances of post-processing models, while Suksamosorn et al. selected WRF forecasts of irradiance, temperature, relative humidity and the solar zenith angleas relevant inputs of the models.
The forecasted data is for each day the one relative to the origin 00:00 UTC of the day before. Our initial data source for the forecasts was GFS, and we opted for the following set of predictors, easily available for any location:

ghi_{GFS}	T^{2m}_{GFS}	θ	ϕ	ghi_{cs}
Irradiance forecasted	Temperature forecasted 2 meters above the ground	Zenith angle	Azimuth angle	Clear-sky irradiance

Table 1: Set of predictors.

Verbois et al. advises researchers to analyze theirs models' performances over several years but I was at this point limited by the Reuniwatt API, thus I opted initially for learning during 2020 and testing during 2021. The four inital

2.2 Metrics

2.3 Models investigated

2.4 Model performances evaluation strategy

3 Results and discussion

3.1 Post-processing a single forecasting NWP model

3.2 Showcase of the hybrid model

4 Conclusions and perspectives

4.1 Results summary

4.2 Suggestions for future improvements

4.3 My learnings from the internship

References

S. Suksamosorn, N. Hoonchareon, and J. Songsiri. Post-processing of NWP forecasts using kalman filtering with operational constraints for day-ahead solar power forecasting in thailand. 9:105409–105423. ISSN 2169-3536. doi: 10.1109/ACCESS.2021.3099481. URL https://ieeexplore.ieee.org/document/9494359/.

H. Verbois, Y.-M. Saint-Drenan, A. Thiery, and P. Blanc. Statistical learning for NWP post-processing: A benchmark for solar irradiance forecasting. 238:132–149. ISSN 0038092X. doi: 10.1016/j.solener.2022.03.017. URL https://linkinghub.elsevier.com/retrieve/pii/S0038092X22001839.