OPTIMIZING WRF INPUT PARAMETERS USING EXPLORATORY DATA ANALYSIS

Malcolm Ng¹, Hadrien Verbois¹, Robert Huva¹, Wilfred Walsh¹

¹Solar Energy Research Institute of Singapore (SERIS), Singapore

Increasing penetration of distributed renewable energy means that reliable supply and demand forecasting is required for electricity spot and futures pricing. This is particularly true for solar resource assessment and forecasting, where both supply and demand are dependent on the intermittent nature of solar irradiance. Operational forecasting of solar irradiance in the day-ahead time horizon can only be achieved using Numerical Weather Prediction (NWP) models such as the Weather Research Forecasting model (WRF). However, WRF requires fine-tuning of a multitude of input parameters (features) encompassing atmospheric physics, fluid dynamics etc., much of which often involves expert analysis. Moreover, each run of the WRF model is computationally expensive and time-consuming. The process of exploratory data analysis (EDA): pre-processing, data visualization, and feature engineering can speed up the discovery of relevant parameters by applying greater weights to the most relevant features. We utilize EDA to systematically discover parameters most relevant to local climatic conditions to minimize forecast error metrics. Results show improved forecasts of solar irradiance for Singapore can be found in a more timely manner using WRF with EDA and feature engineering.

Figure 1: Entity Relationship Diagram (ERD) for EDA purposes showing the flow of information in the context of WRF where ‘namelist’ controls the configuration and ‘outputs’ include solar irradiance, for example.