IEEE-CIS TECHNICAL CHALLENGE ON PREDICT+OPTIMIZE FOR RENEWABLE ENERGY SCHEDULING

EVALUATION

V1.0, July 02, 2021

https://ieee-dataport.org/competitions/ieee-cis-technical-challenge-predictoptimize-renewable-energy-scheduling

Note that the Leaderboard table is updated every 5 minutes. **In case you submit a wrongly formatted submission, you will be listed at the top of the table with an empty row**.

1 Evaluation of Forecasts

The forecasts of the 12 time series (energy demand of 6 buildings and power production of 6 solar panels) are evaluated using the Mean Absolute Scaled Error (MASE, Hyndman and Koehler, 2006), a commonly used error measure for forecast evaluation, which is defined as follows for a given series:

$$MASE = \frac{\sum_{k=M+1}^{M+h} |F_k - Y_k|}{\frac{h}{M-S}\sum_{k=S+1}^{M} |Y_k - Y_{k-S}|}$$

where M is the number of instances in the training series, S is the length of the seasonal cycle of the dataset, h is the forecast horizon, F_k are the generated forecasts and Y_k are the actual values.

Generally, the MASE measures the performance of a model compared with the in-sample average performance of a one-step-ahead naive or seasonal naive benchmark. For this dataset, we consider a 28-day-ahead seasonal naive when computing the MASE.

The MASE values are individually calculated for each series and finally, we calculate the **mean of the MASE** values across all 12 series which is used to rank forecasting submissions.

We provide an R script **mase_calculator.R** which contains an implementation of our calculation of the mean MASE.

2 Evaluation of Schedule

The schedule will be evaluated on two factors. In the first place, the schedule will be checked for feasibility. Secondly, for feasible schedules, the energy cost and schedule benefit in terms of $ value will be computed.

Feasibility

Minimally, a schedule must assign a time period to every *recurring* activity. The recurring activity schedule must respect the following constraints for every activity r_i.

- The starting time period assigned lies within the week with the first Monday of the month (i.e., between 288 and 864 for October 2020),
- Starting time $\geq$ 9:00,

- Finishing time (starting time plus duration) $\leq$ 17:00, and
- For every preceding activity $r_j \prec a_i$, day of the week of $r_j < r_i$.

For every *once-off* activity that is scheduled (i.e., given a start time in the schedule), the precedence constraints need to be satisfied.

- For every preceding activity $a_j \prec a_i$,
  - activity a_j is also scheduled, and
  - day of the month of $a_j < a_i$.

For every battery, the schedule has to respect the capacity of the battery, such that the state of charge $0 \leq SoC_t \leq capacity$ for all time periods t.

Objective

For a feasible schedule, we compute the objective value in terms of the cost of the schedule, which is to be minimized. The cost of the schedule depends on three parts:

- The total energy cost computed against the wholesale price e_t,
- The peak load tariff taken over the whole month,
- The value of the once-off activities scheduled $d_i \in \{0, 1\}$, whether in or out of office $o_i \in \{0, 1\}$.

The objective O is computed as follows:

$$O = \sum_t \frac{0.25 l_t e_t}{1000} + 0.005(\max_t l_t)^2 - \sum_{a_i} (d_i \cdot (\text{value}_i - o_i \text{penalty}_i))$$

We provide java code in the file **Optim_eval.zip** which contains an implementation of a schedule evaluator.

3 Other Evaluation Criteria

At the end of the competition, and looking at the aspects explained above, the Technical and Scientific Committees will shortlist the top 5 submissions. Shortlisted authors will be asked to provide a final description of their methodology (4 pages in IEEE format, more details will be provided at the time).

Final submissions will be carefully assessed according to the following criteria:

- Performance of the final submission, in terms of cost (for the Predict+Optimize prizes), or in terms of forecasting error (for the forecasting prize).
- Novelty of the proposed approach and appropriate use of Computational Intelligence techniques if any (not required!). The Scientific committee will be asked to rank the shortlisted solutions independently and this will be used to compute a score.

Note that use of data other than the one provided is not allowed a priori. If you want to use additional data, write to the organisers who will decide if the additional data source is adequate, and will then make this data source available to all participants in the competition. Otherwise, we will not consider your submission.