

Exercise – 5

Published on: 13.05.2024

Deadline: 20.05.2024 – 1:59pm

Submission Instructions(s):

- Clone the Exercise GitHub repository:
<https://github.com/ETCE-LAB/ETCE-Exercises/>
- The exercise is given to you in the form of a jupyter notebook. You can either install jupyter on your personal system, or use <https://jupyter-cloud.gwdg.de/> (TIP: Jupyter Cloud allows you to clone the exercise repository so you don't have to upload the jupyter notebook and other files manually)
- Programming language: Python 3.10+
 - **You only need to modify the „solution.ipynb“ file.** More detailed instructions on where you need to insert your code can be found in this file.
 - The final cell in the solution.ipynb file grades your solution.
 - This will give you feedback on your solution.

To submit your solution, upload your modified ‚solution.ipynb‘ file to Moodle.

Task Description – IoT Processing – Energy sellers

In E04, you gathered weather data from different sources (sensors) and aggregated them into a single data set. Now, the energy sellers will use that data to predict their energy output and sell and serve as many customers as possible. To do so, your task is to use the resulting data set from E04 as an input. The timestamps of the data set begin with 2021-04-10 02:00:00.000; we assume all later timestamps represent a weather prediction in the future.

1: Use the input data to predict the solar panel output for all timestamps after 2021-04-10 02:00:00.000 based on the "weather <-> energy output" mapping as listed below. We assume our solar panel farm has a maximum output of 50kW. Between 9 pm and 6 am, the solar panel does not provide any output, no matter the weather (night). Calculate the output of the solar panel farm for each timestamp and the accumulated produced amount of energy for the observed period. Also, list the average output percentage of the solar panel over the whole time period.

Mapping:

Solar Farm output % is linear in cloudiness

- Clouds=0% => Solar Farm outputs at 100% Capacity
- Clouds=100% => Solar Farm outputs at 10% Capacity

2: Wind Farm Output Capacity: 50W.

Do the same for wind energy using the mapping below

Mapping:

Wind Farm output % is linear in wind_speed

- Wind Farm cut in speed = 3m/s
- Wind Farm rated speed = 11m/s

PS: Please keep in mind that wind energy does not depend on the time of the day, e.g., daytime or nighttime. More detailed instructions can be found in solution.py