TU Clausthal

Exercise – 5

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Deadline: 29.05.2023 – 1:59pm

Task(s):

- Download the handout zip archive here: https://sync.academiccloud.de/index.php/s/kqckr4Bat5f82hx
- Programming language: Python 3.10
- You can use this Virtual Machine for a pre-installed environment: Link (Password: `5cnN59dzVEm5atc`)
- Please watch the "Python-Exercise-Tutorial" summarizing how to do the python programming exercises.
- General Instructions
  - Unzip the handout zip archive
  - The handout contains a Pipfile. You can install the dependencies for the exercises by running `pipenv install`. (You might have to install pipenv and pyenv first)
  - Activate the python virtual environment using `pipenv shell`.
  - In the first sub-directory, you will see two files:
    1. solution.py
    2. driver.py
  - **You only need to modify the „solution.py“ file**. More detailed instructions on where you need to insert your code can be found in this file. The automated grading mechanism can grade your solution only if you follow the structure provided in the „solution.py“ file.
  - For each timestamp, if data from multiple sources is available for the same field in the data structure, please compute the average.
  - You can use „driver.py“ to verify whether your program would pass the grading: `python3 driver.py`.
  - This file will give you feedback on your solution.
- Create a **zip** file of your submission:
  zip -r lab04-<Your StudIP Username>.zip lab04 Makefile
  - *Remember that your solution zip file should have **exactly** the same file format as the handout zip file.*
- To make it easier, you can just run `make zip` in the top-level handout folder to automatically create a zip archive with the correct directory structure.

- You can make a copy of the produced zip file named ''lab04-submission.zip'' and run ''make'' to check if your file can pass the automatic grading.
- To submit your solution, upload the zip file to the in the timed submission folder in StudIP, „E05-Submissions“.

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