Assignment Module 2.5 - Python

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Description: Develop your own small program using the waterfall model.
Files to upload:

1. A pdf file with the documentation
    a. requirements
    b. design
    c. verification
2. A text file with the python source code of your program
3. Additional data files if needed

Help: Send me an email to hermann.schranzhofer@tugraz.at

Assessment

Doc of the problem (<1/2 page)	3
Doc of the design (<1 page)	3
Doc of the tests (<1/2 a page)	3
30 < code lines < 150	2
At least one loop	2
At least one decision if	2
Import at least one library	2
Use at least one array	2
Make at least one diagram	2
Read data from a file	2
at least one function with an interface	2
Total Points	25

Weather Data analysis

1. Documentation of the problem

Input: Data in file “WeatherData.xlsx” This is a table with time in hours, global radiation, diffus radiation, ambient air temperature and humidiy.

Output: Analysis of the data by computing some basic statistics, classifying the data in cloudy and sunny hours and using data visualisation.

The classification of the data into sunny and cloudy hours is based on the global radiation. When the global radiation assumes a value greater than 300 W/m2 then the hour gets the value “sunny hour”. Otherwiese is it a “cloudy hour”. A comparison operator is needed to determine if a hour falls into the classe sunny or cloudy hour.

2. Documentation of the design

```
BEGIN

IMPORT pandas, numpy, matplotlib

FUNCTION classify_weather(global_rad, threshold)
  IF global_rad > threshold THEN
    RETURN "Sunny"
  ELSE
    RETURN "Cloudy"
  ENDIF
END FUNCTION

FUNCTION analyze_solar_data(filename)
  READ Excel file filename INTO data

  CONVERT columns to arrays:
    time, global_rad, diffuse_rad, temperature, humidity

  CREATE empty list weather_type
  sunny_count ← 0
  cloudy_count ← 0

  FOR each value g in global_rad DO
    condition ← classify_weather(g)
    ADD condition TO weather_type

    IF condition = "Sunny" THEN
      sunny_count ← sunny_count + 1
    ELSE
      cloudy_count ← cloudy_count + 1
```

```
    ENDIF
  END FOR

  ADD weather_type column TO data

  CALCULATE:
    avg_global ← mean(global_rad)
    max_temp ← max(temperature)
    min_humidity ← min(humidity)

  PRINT sunny_count, cloudy_count
  PRINT avg_global, max_temp, min_humidity

  PLOT bar chart of Sunny vs Cloudy hours
  PLOT line chart of global_rad and diffuse_rad vs time
  PLOT scatter chart of temperature vs humidity

  RETURN data
END FUNCTION
```

3. Documentation of the tests

The plots and calculation can be verified in excel. See WeatherData_tests.xlsx.