ADVANCED PYTHON HOMEWORK 10

a nefarious plot

Every task is worth 4 points, choose one.

Lab teacher's notes: Testing does not make much sense in these exercises, but please document your code/decisions/results well and try to spend some time on having the output look esthetically nice – as nice as they should look if you want to include them in a research presentation or a thesis.

Please use the classical submission format for the exercises, e.g. `ex1-Lastname.py` *for exercise 1. Also, the following sentence applies to all homework exercises: If possible, implement the data retrieval as part of your program.*

Exercise 1. The currently known facts about the pandemic suggest that each following *wave* usually starts in a cold season of the year, whereas we observe a fall in the number of cases in a warm season.

Using a meteorological data of your choice, as well as data about infection numbers (in Poland), compare on one graph the temperature as well as the infection rate in both of the two time intervals, with specific details chosen by you:

  A. In a time interval of a *infection wave* (you can choose which wave);
  B. In a time interval with less infections/restrictions.

Both time intervals should be depicted on a separate plot. If possible, implement the data retrieval as part of your program.

Exercise 2. Aside from data analysis of historical infections, we could also try some data prognosis. There are already a 100 year old models specifically designed for this, called *compartmental models*. We provide the following two references:

  • Wikipedia site on the models in English;
  • A presentation of the models in Polish.

Your task is to select one of the popular models and test its veracity on some (actual) infection data. Create a plot with the actual data values as well as the prediction by your model, on a time interval of your choice.

Lab teacher's note: It is up to you how you do the fitting on the model, but you should try to set the constants of the model to match the initial data (let us say for the current wave), and then present a prognosis of the upcoming number of cases.

Exercise 3. If somebody dislikes the topic of the pandemic, it is certainly possible to choose some dataset independently, transform it with `pandas` and visualize using `mathplotlib`. Make sure to thoroughly specify within the comments, what your thesis was, where the data comes from, and what is the conclusion of the plot/data analysis.

Lab teacher's note: The freedom given by this exercise is not an invitation to just do something easy and get full points for a few lines of code. Your self-selected task should make use of some real-world data and some meaningful thesis, and we expect the difficulty to match Exercise 1 or 2.