Task 6 Recurrent neural networks - Machine Learning

1. Download the dataset on my personal website (weather_in_cities.zip). Choose the dataset as described below.
2. Write a Python program that implements a recurrent neural network model trained on a time series to predict the weather temperature (T) in the cities of Russia. Important notes: **A) Your model must include an LSTM layer (one or multiple) and predict values by using the window method. B) Train the model by time frame excluding year 2020 (i.e. 2011-2019 or 2012-2019 depending on the dataset).**
3. Conduct an experiment to improve your model to increase its quality. Estimate the quality of the model by using regression metrics (R2, MSE, MAE). Experiment with different model hyperparameters and network architectures (different number of layers and their types) and find the better result, if possible.
4. Choose a week in year 2020, starting from your birthday. Use the model to predict the weather for this entire week as following: predict the temperature value for one time step by using your whole lookback window, use the predicted value and part of the lookback window to predict the next time step, use two last predicted values to predict the third step and so on, until you get the temperature values for the entire week.
5. Make a graph with the predicted temperature values and actual temperature values from year 2020 and compare them.
6. Write a short report and conclusions for the work.

For the help with this task you may either use the book "Deep Learning with Python" by François Chollet (Глубокое обучение на Python, Франсуа Шолле) - chapter 6 in particular), or use the Internet (example link).

To choose the dataset, refer to your number in the attendance journal. If your number is:

- 1, 7, 13 and so on: Kaliningrad_weather_19102020_15102011.csv
- 2, 8, 14 and so on: Khabarovsk_weather_15102020_15102012.csv
- 3, 9, 15 and so on: Sochi_weather_19102020_15102011.csv
- 4, 10, 16 and so on: tomsk_weather_2011_2020.csv
- 5, 11, 17 and so on: Volgograd_weather_15102020_15102012.csv
- 6, 12, 18 and so on: Yakutsk_weather_19102020_01102012.csv