Homework 2 (deadline: Oct. 31)

The Goal of this Homework:

Use Convolutional Neural Network (CNN) and several meteorological fields to predict monthly precipitation rate over the Beijing region. Specifically, you need to predict the monthly precipitation rate during 2021-2023 over the Beijing region (111E-121E, 35N-45N). Hint: you can improve the prediction skill either through the input meteorological field data or CNN configuration.

Homework Requirement:

1) understand the example python code,
2) do your best to improve the prediction skill by reducing RMSE value in the end of the code,
3) write down your investigation about this problem and explain your ideas why your method would improve the prediction.

Please also note that

1) you can find an example python script and meteorological field data in the homework folder,
2) you can choose to download other meteorological field data from the ERA5 website (monthly/hourly, pressure levels/single level). To download data, you have to first register this website, click "Download" button, Select "Reanalysis", Variable, Year, Month, Geographical area and so on. It is recommended to pick "NetCDF4 (Experimental)" data format so that you can read the data by import netCDF4 in python. Several useful datasets are listed below,

   https://cds.climate.copernicus.eu/datasets/reanalysis-era5-pressure-levels-monthly-means?tab=overview
   https://cds.climate.copernicus.eu/datasets/reanalysis-era5-single-levels-monthly-means?tab=overview
   https://cds.climate.copernicus.eu/datasets/reanalysis-era5-pressure-levels?tab=overview
   https://cds.climate.copernicus.eu/datasets/reanalysis-era5-single-levels?tab=overview

3) Your training data should not include precipitation data during 2021-2023 over the Beijing region,
4) You should only use the variable mtpr in "mtpr_ERA5.nc" as your target data,
5) Please do not change the seed value, seed_everything(0, workers=True), in the python code,
6) Besides, those who get the best results (the lowest RMSE) in a reasonable way will receive a small gift as a reward.