Quant Challenge - Qualifier Task

You are a team of Risk Analysts supporting an American credit institution that is active in the market of loans given to agricultural businesses.

Your new project is to assess the climate risk of the bank's investments in agriculture, specifically its loans to farmers in the state of Minnesota. Farmers are expected to repay their loans from the potential profit they achieve from their business. A significant drop in productivity endangers the existence of the farmers' business, therefore, leads to a higher chance for loan defaults, and thus a larger expected loss for the bank.

Specifically, the bank is worried about mis-estimating future crop yields on land in Minnesota due to the impact of climate change on agriculture. Therefore, the bank wants you to build a model that predicts the potential loss of productivity on plots of land that were purchased with loans from the bank.

You are given a database of historical crop yields, weather data, as well as future scenarios of climate change, to be used for forecasting.

- Crop data
- Weather data
- Climate data

Your task is to infer from these data how different circumstances influenced the productivity of farmland in Minnesota in the past and build an engine that can predict future crop yields for a given future climate trajectory.

A few example climate trajectories and random forecasts are enclosed in the database. Your engine should take input and produce output in the same formats. [Crop yield forecast files]

You can employ any quantitative methodology to construct your engine. In addition, should you find it necessary, you are free to use any further free and publicly available information on the internet (datasets, articles, etc.) that you believe would help your forecast. Make sure to properly reference any such sources. Also, keep in mind the required input and output formats defined above.

The data sets contain data about 3 different crops: corn, oat and soybean. Please start with corn, and in case you have further time, you can turn to oat and then to soybean for extra points.

Your submissions should include:

- a PDF document explaining your methodology, tests and results. The document will be read by your project lead at the bank, who has a quantitative background. The length of the document should be approximately 4-10 pages (A4 or letter sized). The language of the document should be English.
- all source code you used to build your engine and make your predictions
- your predictions for the example climate scenarios, in the required format

Evaluation will be based on

- the reasonableness of your justification for various choices regarding data treatment and **model development** (max 65 points) [data imputation, amount of data they are able to use, features they generate, models they try, how they choose the "best" model, how they set hyperparameters, model performance, etc...]
- **the quality of your documentation**, including but not limited to clarity, style, quality of visuals and tables, etc... (max 35 points)
- **the number of crops you build a model** for (max 10 extra points for each additional crop being modelled beyond corn)