Predictioneer (Problem Statement)

Introduction:

In the pursuit of preserving precious water bodies, AZeotropy is challenging participants to build a machine learning model that can predict the **water availability** by understanding the unique characteristics in different waterbodies (water springs, lakes, rivers and aquifers).

Accurate predictions of water availability can help to preserve these precious resources and ensure a sustainable water supply for all. Model should be able to capture the influence of different **features** on water availability, such as rainfall, temperature, and historical water levels. The model should also be applicable to new waterbodies that have not been seen before.

Water is essential for life, but it is becoming increasingly scarce due to population growth and climate change. Accurate predictions of water availability can help us to manage this precious resource more effectively.

Challenge:

The challenge is to determine how features influence the water availability of each presented waterbody. To be more straightforward, gaining a better understanding of volumes, they will be able to ensure water availability for each time interval of the year.

The model should be able to capture the influence of different **factors** on water availability, such as rainfall, temperature, and historical water levels. The model should also be applicable to new waterbodies that have not been seen before.

The desired outcome is a notebook that can generate mathematical models, for category of waterbody (aquifers, water springs, river lake) that might be applicable to each single waterbody.

Potential Applications:
The model could be used to help water utilities predict demand and ensure that they have enough water to meet the needs of their customers. It could also be used by farmers to plan their irrigation schedules and avoid crop losses due to drought.

Additionally, governments and businesses could use your model to develop water management policies and assess water risks, respectively.

The submission comprises of **three** parts:

Part I:
Predicted water levels for the day/month after the deadline (**December 25, 2023**) to (**February 10, 2023**) in an excel or CSV file.

Part II:
Model postulation behind the predicted water levels with solid correlations in a **MATLAB / Python / R** or Excel file.

Part III:
- The logic behind the code/model summarized in the form of bullet points or a flow-chart
- Any references used for constructing the model or ideating on the logic
- Discussion on how the model can be applied to new waterbodies that have not been seen before.

(submit files as a word or pdf file)

Submission Requirements:

To participate in the competition, you will need to submit the following:
- A **Python/R/MATLAB/Excel** script that implements your model.
- A written report that describes your model and its performance.

Evaluation Criteria:

The points weightage for the three parts of the problem statement are as follows:

Part I (40 %)
The accuracy of the results will be assessed using **Root Mean Squared (RMS)** values between the actual water volume and predicted water volume in each water body

$$RMSE = \sqrt{\frac{\sum_{i=1}^{N} (Predicted_i - Actual_i)^2}{N}}$$

Part II (30 %)
The marks for this part will be allotted for the format and efficacy of the work of the code.

Part III (30 %)
This part will be graded on the overall presentation and the problem-solving approach. In this section, creativity will be put to the test. It will be desirable to predict the occurrence of crucial activities and processes in environment and their effect on water availability.

Participation Procedure:

- A group of **2 to 4** members are allowed per team. One of the members of the team must be a **chemical engineering** student.
- No participant can register in more than **one team**. In such an instance, both teams will be subjected to **disqualification**.
- Help material on the fundamentals of **Python**, usage of **Google Collaboratory** and necessary **Python packages** will also be provided.

Certification Prizes:

- The top **5 teams** will be awarded **cash prizes** worth **20K INR** and the **top 10 teams** will receive a **certificate of merit.**
- The rest of the teams making a valid final submission and qualifying all the eligibility criteria will receive a **certificate of appreciation.**

NOTE: The final decision-making authority lies with team AZeotropy. Participants also consent to the free use of their submissions by the team AZeotropy. Proper attribution shall be given to the authors in case their submissions are published on the symposium date.

In case of any queries related to the problem statement, participants can contact:

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