CAPSTONE PROJECT PROPOSAL
DISASTER MANAGEMENT

(The Extreme Rainfall Forecast Dashboard)

Generasi Gigih 2.0

Arranged by: Group DA-DM4

Team members:
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A. Problem Statement

The impact of climate change that occurred in Indonesia resulted in several areas experiencing flood events that did not follow the general flood pattern. On the other hand, information about rainfall predictions is needed by various sectors to develop programs and carry out their activities. Therefore, a rainfall prediction system is needed to support the activities of these sectors.

Through this project, we will build a dashboard to predict extreme rainfall for the next 6 months by using monthly rainfall intensity data from 2012-2022 obtained from BMKG to determine whether the above rainfall is getting more extreme or not.

Therefore, the early warning dashboard which is the output of this project is expected to provide benefits to help predict rainfall over the next 6 months and can help prevent future disasters, and can provide counseling to farmers affected by extreme rainfall about the problem. Agriculture and farming.

B. Project Goals & Success Metrics

This project aims to predict how the rainfall will be over the next 6 months so that farmers will use these predictions to support the planting period and minimize crop failure losses. RMSE and MAPE values will be the success metrics used in this project to make these predictions.

1. Root Mean Squared Error (RMSE)

Root Mean Square Error (RMSE) is the standard deviation of the residuals (prediction errors). RMSE is a measure of how concentrated the data is around the line of best fit. Root mean square error is commonly used in climatology, forecasting, and regression analysis to verify experimental results. RMSE has the following formula:

$$\sqrt{\frac{\sum_{i=1}^{n}(Xt - Ft)^2}{n}}$$

Where,

- Xt : actual value in period t
- Ft : forecast value in period t
- N : sample size

2. Mean Absolute Percentage Error (MAPE)

According to Pakaja (Pakaja et al., 2012), the Mean Absolute Percentage Error (MAPE) is calculated using the absolute error in each period divided by the actual observed value for that period. Then, average the absolute percentage error. MAPE is an error measurement that calculates the size of the percentage deviation between the actual data and the forecast data. MAPE value can be calculated by the equation:

$$MAPE = \frac{1}{N}\sum_{t=1}^{N}\left|\frac{E_t - A_t}{A_t}\right|$$

Where,

- N : number of times the summation iteration happens
- At : actual value in period t
- Et : forecast value in period t

Forecasting ability is very good if it has a MAPE value of less than 10%, and has a good forecasting ability if the MAPE value is less than 20% (Putra, 2015).

C. Product Description

- The project that we made contains information about rainfall, air temperature, humidity, and duration of sunshine. Data on rainfall is obtained from the BMKG station, then the data is collected over the past 30 years. The data obtained, will be analyzed and visualized in the form of a dashboard. We address the dashboard to farmers to provide information that can later be studied to determine the yields or crops to be planted.
- Our project features information about rainfall, air temperature, humidity, duration of sunshine, and weather alerts addressed to farmers.

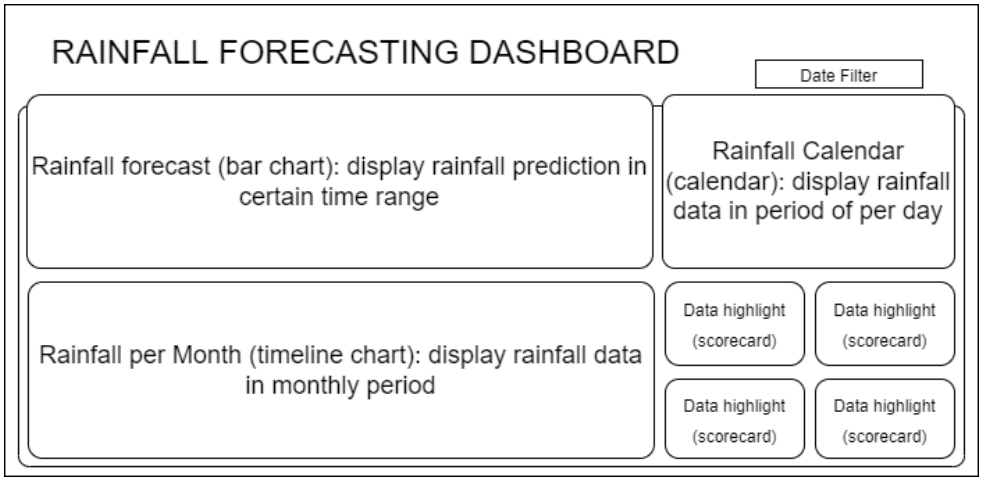
D. Target User & User Journey

The main target for this dashboard is farmers with an age range of 18-40 years old who need information about potential rainfall to determine what to grow in the coming season. In addition, this dashboard also provides information for the general public who need information about rainfall prediction.

User Journey

Awareness		Consideration		Decision		Execution
Wants an information about rainfall.	➡	Read and understand the information of rainfall from the dashboard.	Take into consideration what to plant and grow based on presumed rainfall in the coming season.	Determine what to grow for the season.	➡	Carry out seed and soil preparation for planting.

Dashboard Mockup



E. Potential Difficulties

Potential difficulties that we might expect in building the product is difficulty getting data sets available on the internet. High-quality data is one of the most valuable commodities in a researcher's toolkit. In contrast, dodgy data sets drain researcher resources and limit effectiveness. Talking about this disaster management project has a very broad and complex topic. Thinking from the project that we raised, the extreme rainfall forecast dashboard requires large enough data to perform time series/forecasting analysis. There are limitations to accessing online data from the BMKG web, so we cannot get decades of rainfall data as we need for this project. The first way to overcome this is by submitting official data collection to the institution (BMKG) to obtain a monthly dataset of extreme rainfall that has occurred over the past 25-30 years. Another alternative is to use satellite data but we have to master the technical scraping text which is quite advanced to get access to and use this data. With that, we need an even longer time to complete this project.

Non-technical problems come from internal teams who are still struggling to carry out effective discussions. Lack of knowledge related to climatological issues is also an inhibiting factor in the discussion. Therefore, we try to always communicate our difficulties to each other and we ensure this project is on the right track by always consulting the progress with our mentor.

F. Detailed Work Plan

- **Work Division**
  - *Team manager:* Indah Reski Pratiwi
  - *Data analysis & statistical modeling:*
    1. Indah Reski Pratiwi
    2. Gilang Ardi Bhaskara Alauddin
    3. Gifari Rachmawan
  - *Data visualization:*
    1. Salsabilla Tiaratama Herin Wiraksa
    2. Melania Justice Panggabean

■ Project Timeline

Project Name: The Extreme Rainfall Forecast Dashboard
Project Manager: Indah Reski Pratiwi

ACTION	RESPONSIBLE	START	END	STATUS
Conduct first meeting with mentor	Project manager	28/05/22	-	Completed
Create project proposal	All members	23/05/22	29/05/22	Completed
Submission of dataset retrieval to institutions	Project Manager	29/05/22	05/06/22	In Progress
Data preprocessing	Data analysis & statistical modeling	05/06/22	08/06/22	Not Started
Conduct progress meeting with mentor	Project manager	09/06/22	-	Not Started
Descriptive analysis	Data visualization	10/06/22	13/06/22	Not Started
Time series/forecasting analysis	Data analysis & statistical modeling	14/06/22	21/06/22	Not Started
Extreme rainfall forecast dashboard	Data visualization	22/06/22	01/07/22	Not Started
Conduct final progress & evaluation meeting with mentor	Project manager	02/07/22	-	Not Started
Project submission	Project manager	03/07/22	-	Not Started