📌 Climate Change Modeling: Prediction & Scenario Analysis

1️⃣ Introduction

🌍 This project focuses on predicting climate change trends using machine learning and analyzing different scenarios based on CO_2 emissions and engagement levels. The model is designed to simulate various future scenarios and provide insights into climate change discussions and engagement levels.

2️⃣ Data Exploration & Preprocessing

📊 2.1 Data Sources

📌 The dataset contains features related to climate discussions, engagement levels, and other relevant factors.

📌 Features include likesCount, commentsCount, text-based features, and more.

⚙️ 2.2 Preprocessing Steps

✔️ Flattening Data: If input data is 3D, it is reshaped into a 2D format.

✔️ Feature Consistency: Ensuring the training and test sets have the same number of features.

✔️ Handling Missing Values: Any missing values are handled during preprocessing.

3️⃣ Feature Engineering

🔍 Extracting key features from the dataset.

🔍 Creating new features for scenario-based modeling.

4️⃣ Model Training & Evaluation

🤖 4.1 Model Used

📌 A Random Forest Regressor was trained using the preprocessed dataset.

📌 The model was evaluated using test data to ensure accuracy and reliability.

🛠️ 4.2 Training Steps

1️⃣ Preprocess the training data.

2️⃣ Train the Random Forest model on the dataset.

3️⃣ Save the trained model using joblib.

📉 4.3 Model Performance

✅ The model was tested on unseen data, and predictions aligned with expected climate change trends.

5️⃣ Scenario-Based Predictions

Three scenarios were simulated to predict different future trends:

🔵 **Baseline Scenario:** Assumes current CO_2 trends remain unchanged.
🔴 **High Emission Scenario:** CO_2 increases significantly, engagement increases.
🟢 **Low Emission Scenario:** CO_2 is reduced through mitigation efforts.

📌 For each scenario:
✔️ Feature values were adjusted according to scenario parameters.
✔️ Predictions were generated using the trained model.

6️⃣ Results & Insights

📊 The high CO_2 emission scenario showed a significant increase in climate discussions and engagement.
📉 The low CO_2 emission scenario showed a reduction in climate-related conversations.
🔍 The baseline scenario followed the expected current trend.

📈 Visualization of Results

📌 A line graph was generated to compare actual vs. predicted trends under different scenarios.