**CLIMATE CHANGE IMPACT ANALYSIS**

**Submitted for**

**Statistical Machine Learning CSET211**

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**1. Abstract**

Provide a concise summary of your project. Outline the main objectives, data sources, statistical methods applied, and the critical insights or results, especially regarding the relationship between temperature and rainfall over time.

**2. Introduction**

Discuss the importance of climate data analysis, emphasizing the significance of understanding climate variability and its impact on critical sectors like agriculture, water resources, and energy. Highlight the role of statistical machine learning models in providing predictive insights on climate factors, enabling proactive planning.

**3. Methodology**

**Dataset Description**

• Source: NASA POWER CERES/MERRA2

• Time Range: 1981 - 2022

• Location: Latitude 26.2006, Longitude 92.9376

• Parameters Analyzed:

• Temperature (°C)

• Precipitation (mm)

**Steps for Data Analysis and Modeling:**

1. Data Preparation

• Import the dataset.

• Handle missing values using interpolation or deletion.

• Filter and select the relevant columns for temperature and precipitation analysis.

2. Feature Selection

• Focus on Temperature (TS) and Precipitation (PRECTOTCORR\_SUM) as core factors influencing rainfall patterns.

3. Data Transformation

• Aggregate annual precipitation and temperature data to align them by year.

• Normalize or scale data if necessary for model consistency.

4. Data Merging

• Join temperature and precipitation data for consistent yearly records, creating a single dataset that spans from 1981 to 2022.

5. Model Development

• Model selection: Linear Regression for simplicity and interpretability.

• Target Variable: Predict rainfall levels using temperature as a key independent variable.

• Model Training and Validation: Split the data into training and testing sets, training on historical data to predict future rainfall trends.

**4. Hardware/Software Requirements**

• Hardware: Computer with minimum 4GB RAM

• Software:

• Python 3.x

• Libraries:

• pandas for data manipulation

• numpy for numerical operations

• matplotlib for visualization

• scikit-learn for model implementation

**5. Experimental Results**

• Model Performance Metric:

• Mean Squared Error (MSE) to evaluate the accuracy of rainfall predictions.

• Calculated MSE: {mse\_value}

• Visualization:

• Plot the actual vs. predicted rainfall values, illustrating the temperature and rainfall relationship and assessing model accuracy.

**6. Conclusions**

Summarize the findings from the analysis, emphasizing any observed relationships between temperature and rainfall. Discuss model accuracy, limitations, and overall insights into climate variability and its potential impacts.

**7. Future Scope**

Suggest future enhancements, such as incorporating additional climate variables like humidity, wind speed, or sunshine hours to improve model robustness. Consider experimenting with advanced models like decision trees, random forests, or neural networks for enhanced predictive power.

**8. GitHub Link of Your Complete Project**

**Link:** [**Repo link**](https://github.com/Amanyadav7492/Climate_Change_Impact_Anylasis)