Project Title: Comprehensive Climate Impact Prediction Model (CCIPM)

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Project Proposal:

Introduction:

The climate change is global problem that touches upon all the aspects of human life and the ecosystem stability. The project will be an interdisciplinary collaboration to anticipate the climate change outcomes on agricultural yields, the health of people and the resilience of the economy. The CCIPM utilises the latest in machine learning technology, along with a vast pool of information, to create intelligent reporting that feeds policy makers working towards sustainable development plans.

The devastating impact of climate change on farming, health, and business operations has much broader consequences compared to the extreme weather conditions, rising sea levels, and different types of precipitation. The precise predictive models which give the analysis of the multisided impacts of the region from a complex perspective are inevitably the basis of the effective mitigation and adaptation strategies. The project will integrate clime complex data with socio-economic indicators to depict the likely future based on various climate scenario, which will play an important role for the planners, policymakers, and the communities.

Project Objectives:

• To establish a multifaceted modelling platform coupling artificial intelligence with trend prediction concerning the climate change repercussions on the most vulnerable social institutions.

• In this regard, we must explore the correlations between climate indicators, like heat, rainfall, and temperature, and agriculture performance, public health markers and economic parameters.

• For mapping out danger areas and suggest chosen strategies, measuring the extent of impact and forecasting mitigation actions can be used.

• Demonstrating the impact of the disease through visual dashboards, which will help stakeholders to forecast the future epidemic the data.

Datasets and Sources:

The project will utilize several open-source datasets from reputable international and governmental organizations:

Climate Data (NASA EarthData, NOAA NCEI):Climate Data (NASA EarthData, NOAA NCEI):

In conducting the impact assessment, historical and forecast climate data including; temperature anomalies, precipitation, and extreme weather events will be used to understand climatic changes and serve as the impact models' input variables.

Agricultural Data (FAO - FAOSTAT):Agricultural Data (FAO - FAOSTAT):

Datasets agriculture will hold the produce volumes crop, land allocation the statistics and the extent of irrigation, by which the suite of these variables and the predicted climate variability could be correlating to the forecasting of future agricultural productivity.

Health Data (WHO - Global Health Observatory):Health Data (WHO - Global Health Observatory):

The data health-related, that is, disease prevalence, mortality rates, health facilities' sufficiency, climate data will be analyzed to figure out future environmental health challenges that will be affected by climate change.

Economic Data (World Bank - World Development Indicators):Economic Data (World Bank - World Development Indicators):

It goes without saying that a number of economic parameters such as growth in GDP, a change in inflation levels and a sub-sector analysis of the economy will be used to appraise the economic effect of climate change.

Detailed Description of Datasets:

Climate Data:

The data shall cover aspects as it follows: mean global temperatures, precipitation patterns, and the frequency of climate change-related extreme events. We will attempt to find out abnormal structures and trends and take use of these models to prepare for future.

Agricultural Data:

Some important indicators are increase in yields for a seed type, land area used for farming, and changes in farming cultures. The datasets thus obtained will be analyzed to assess them for vulnerable places of change of climate factors.

Health Data:

This prevalence will cover the rate of vector borne and waterborne diseases, heat – related illnesses and the other health sector data of a general populace including. The target serves at the forefront to comprehend how ecological health is primed to deviate with the shifting of weather variables.

Economic Data:

We will be reviewing the macro and microeconomic indicators as part of the assessment process. The macroeconomic data series stems from GDP growth rates, a breakdown of its economic sectors along with capital that the country dedicates to fight climate change. Microeconomic data will emphasize economic activities in low level such as those geographically areas closely related to climate change.

Research Questions:

•Farmer's yields depend directly on climate. Therefore, their concern must be the projected impact of climate change on crop yields in the major agricultural areas?

•Suppose the climate externalities got altered, how are they going to shape the patterns of the spread of infectious diseases and the general health of the public?

•What are going to be the economic consequences for the climatic barrier in different levels starting from domestic to the international economies?

•Is there a way to locate such thresholds or critical points? How much do the ramifications of climate change become more intense when there is an increase in their levels?

Methodology:

Data Preprocessing and Integration:

Data from diverse sources will be gathered, missing values will be analised and imputed or removed with suitable techniques. Data integration will involve fetching data from various file types such as.csv,.xlsx or.tar and api endpoints, merging datasets on common key values such as geographical identifiers, time colums, country codes etc.

Exploratory Data Analysis (EDA):

We will perform EDA to uncover trends, patterns, and relationships within each dataset and between climate, agricultural, health, and economic data. We will try to make meaning of trends and patterns we'll encounter and refine our assumptions in each step. Hopefully, by the end of this step, we'll have a ground intuition of how various aspects of these data affect each other.

Feature Engineering:

New features will be created to encapsulate the interaction effects between different types of data. For example, we may create interaction terms between temperature anomalies and crop yields or between economic growth rates and frequency of extreme weather events. We might recursively visit feature engineering step after we make some predictions and analise the results.

Model Development:

A variety of machine learning models, including regression models and ensemble methods, will be developed and trained on historic data to predict future scenarios. Different choices regarding the split of the data will be tried depending of the distribution of the data which will be analized comprehensively based on statistical theories we've learned in this class. We'll try different models and analise the results we obtain. After that we might conclude on the best performing machine learning model or an ensembe of various models. Models will be evaluated on their predictive accuracy, using suitable metrics for each model and we will also evaluate them based on their interpretability and computational efficiency. Models' parameters will be studied comprehensively in the documents of the libraries that we use and we'll iteratively tune this hyperparameters.

Hypothesis:

Our central hypothesis relies on the assumption that not only we can quantify the impacts of climate change inflicted on the key areas of human activity such as agriculture, health and economic stability, but also they can be predicted utilising statistical analysis and learning techniques.

Conclusion:

Our model will utilise machine learning techniques to gain more insight about one of the most pressing issues of 21st century: climate change and potential climate crisis. By producing predictions on how climate variability affects key areas of human activity, hopefully, the CCIPM will give us valuable insights for questions which we ask about how the future of humanity will be affected by the ongoing changes in climate. This project will be a rigorous and rewarding learning experience for us considering the interdisciplinary nature and technical challenges we will encounter along the way. We expect to be in the constant need of requiring new knowledge and refining the ones that we already posses.