CLIMATE CHANGE INDICATORS

Analyzing Climate Change Indicators to Address Global Environmental Challenges (SDG 13: Climate Action)

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Project Concept

The project aims to analyze climate change indicators to understand global environmental challenges and propose actionable solutions aligned with Sustainable Development Goal 13 (SDG 13): Climate Action. It seeks to mitigate climate change impacts by analyzing key factors and trends through advanced data analysis and machine learning techniques.

Problem Statement

Climate change is a critical global issue, leading to severe environmental and socio-economic impacts. The project addresses the challenge of climate change by analyzing precise data on key indicators and proposing effective interventions to mitigate its effects.

Objectives

1. **Data Collection and Analysis**: Gather and analyze climate change data to identify trends and sources.
2. **Indicator Identification**: Pinpoint major climate change indicators, including temperature, CO2 emissions, humidity, precipitation, sea level rise, and wind speed.
3. **Trend Analysis**: Understand temporal and spatial trends in climate change indicators.
4. **Predictive Modeling**: Develop models to predict future temperature and CO2 emission levels.
5. **Solution Proposals**: Suggest actionable solutions and policy recommendations.
6. **Impact Assessment**: Evaluate the potential impact of proposed solutions on achieving SDG 13.

Data Sources

- **Kaggle**: Climate change datasets including temperature, CO2 emissions, humidity, precipitation, sea level rise, and wind speed.
- **Additional Column**: UNDP data library for Data Verification.

Dataset Features

- **Country and Location**: Geographic data for global analysis.
- **Indicators**: Levels of temperature, CO2 emissions, humidity, precipitation, sea level rise, and wind speed.
- **Time**: Temporal data including date and time of recordings.

Tools for Analysis

- **Python**: For data cleaning, preprocessing, and initial analysis.
  - Libraries: numpy, pandas, matplotlib, pyplot, seaborn
- **Power BI**: For data transformation, predictive modeling, and dashboard visualizations.
- **Scikit-learn**: For machine learning algorithms.

Hypothesis

Implementing stricter environmental regulations and promoting sustainable practices will significantly reduce the adverse impacts of climate change over the next decade. Specific temporal and spatial trends in climate indicators can be identified and addressed through targeted interventions.

Methodology

1. **Data Collection**: Gather climate change data from Kaggle and other relevant sources.
2. **Data Cleaning and Preprocessing**: Use Python (numpy, pandas) to address missing values and standardize formats.
3. **Exploratory Data Analysis**: Conduct EDA using Python libraries (matplotlib, seaborn) to visualize data with scatter plots, histograms, pair plots, and correlation analysis.
4. **Data Visualization**: Use seaborn and matplotlib for advanced visualizations.
5. **Feature Scaling**: Apply scaling techniques to prepare data for modeling.
6. **Train-Test Split**: Split the data into training and testing sets.
7. **Machine Learning Models**:
   - **Logistic Regression**
   - **K-Nearest Neighbors (KNN)**
   - **Naive Bayes**
   - **Decision Tree**
   - **Random Forest**
8. **Model Evaluation**:
   - Create confusion matrix for each model.
   - Calculate accuracy, precision, F1 score, specificity, positive predictive value, true positive rate, and false positive rate.
9. **Solution Development**: Propose feasible solutions and assess their impact.
10. **Reporting and Presentation**: Compile findings and create visualizations and dashboards in Power BI for comparative analysis.

Expected Outcomes

1. **Comprehensive Analysis**: Detailed analysis of climate change indicators and trends using Python and Power BI.
2. **Predictive Models**: Reliable models for predicting temperature and CO2 emissions for the next 10 years.s
3. **Actionable Solutions**: Data-driven policy recommendations to mitigate climate change.
4. **Impact Assessment**: Evaluation of proposed solutions' impact on achieving SDG 13.
5. **Awareness and Engagement**: Increased public and policymaker awareness about climate change impacts and mitigation strategies.

By addressing climate change through advanced data analysis, machine learning, and evidence-based solutions using Python and Power BI, the project aims to contribute to global efforts in creating sustainable and resilient environments, supporting the objectives of SDG 13: Climate Action.