Climate Change Predictions – ClimateWins

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Project Overview

Objective

- To help predict the consequences of climate change around Europe and the world by using machine learning models.

Data sets and limitations

- The data set contains weather observations from 18 different weather stations across Europe, which contain data ranging from 1960 to 2022. Recordings exist for almost every day with values such as temperature, wind speed, snow, precipitation, cloud cover, sunshine, humidity, pressure and global radiation.
- This data is collected by the European Climate Assessment & Data Set project.
- This data set may contain biases due to technological advancements over time. Early measurements might lack accuracy, rendering the data unreliable and biased, which would affect the analysis results.
- Machine learning models trained on region-specific data may not generalize well due to climatic and geographic variations. This could exacerbate regional biases, leading to unequal preparedness for climate events.

Hypothesis

1. There is a significant upward trend in average temperatures across Europe, which can be predicted for future years to indicate a clear impact of global warming.

2. There is fluctuations in climate variables such as precipitation and wind speed, which are strongly correlated with the increased frequency of extreme weather events like hurricanes and typhoons.

3. There is long term change in humidity, pressure, and global radiation in certain regions, which are strongly correlated with shifts in local ecosystems, resulting in severe ecological disruptions such as increased droughts or flooding.

Hypothesis-1

There is a significant upward trend in average temperatures across Europe, which can be predicted for future years to indicate a clear impact of global warming.

- Linear regression is suitable for researching this hypothesis as it can model and predict continuous changes over time.
- This method can effectively analyze and quantify the rate of temperature increases over years, providing a clear, straightforward model that can forecast future temperatures based on historical data.

Hypothesis-2

There is fluctuations in climate variables such as precipitation and wind speed, which are strongly correlated with the increased frequency of extreme weather events like hurricanes and typhoons.

- Decision tree is useful for researching this hypothesis as it provides clear rules and thresholds that can be easily interpreted and applied for real-world decision-making.
- The tree structure allows it to capture significant splits in data that correlate strongly with the occurrence of extreme events, making it a practical choice for both predicting these events and understanding the conditions that lead to them.

Hypothesis-3

There is long term change in humidity, pressure, and global radiation in certain regions, which are strongly correlated with shifts in local ecosystems, resulting in severe ecological disruptions such as increased droughts or flooding.

- NNM is particularly suitable for researching this hypothesis because of its ability to handle complex, non-linear relationships among multiple variables.
- NNMs can effectively process and learn from large datasets comprising diverse environmental indicators such as humidity, pressure, and global radiation.
- Their layered structure allows them to identify intricate patterns and interactions within the data, making them ideal for forecasting ecological changes and assessing areas at risk of disruptions like droughts or flooding.

Summary

#	Hypothesis	Machine Learning Model	Next Step	Applications
1	There is a significant upward trend in average temperatures across Europe, which can be predicted for future years to indicate a clear impact of global warming.	Linear Regression	Fit a linear regression model to predict future temperatures.	Predicted temperatures for future years can serve as a clear indication of the impact of global warming.
2	There is fluctuations in climate variables such as precipitation and wind speed, which are strongly correlated with the increased frequency of extreme weather events like hurricanes and typhoons.	Decision Tree	Train the model using historical weather data to predict the occurrence of extreme weather events like hurricanes and typhoons.	Predict the occurrences of extreme weather events like hurricanes and typhoons to mitigate risks for people living in the affected regions.
3	There is long term change in humidity, pressure, and global radiation in certain regions, which are strongly correlated with shifts in local ecosystems, resulting in severe ecological disruptions such as increased droughts or flooding.	NNM	Train the model to predict changes in local ecosystems to identify areas at risk of increased droughts or flooding.	Predict shifts in local ecosystems, identifying areas at risk of severe ecological disruptions such as increased droughts or flooding to mitigate risks for people living in the affected regions.

Thanks

Do you have any questions?
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