

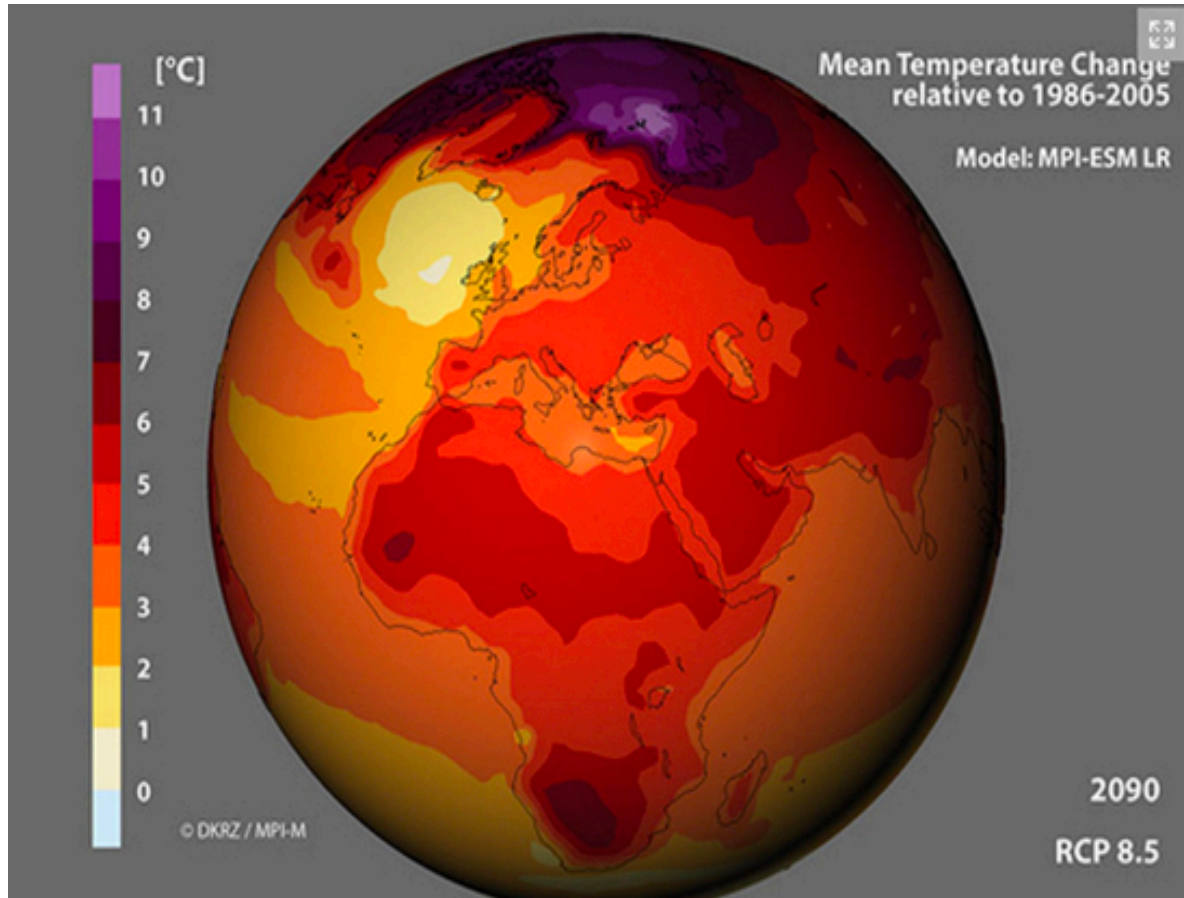


CLIMATE ACTION

Team Members

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Why should we care???



- Climatic changes like change in weather patterns, loss of ice cover, rise in temperature
- It is important to know what are the factors that are majorly responsible for loss of environment
- Need of assessing situations we would face in coming years if no actions are taken

What we aim to do???

A bit about data

- Climate attributes like temperature, sea level pressure, snow depth, precipitation etc, available from 1940 to 2020
- Dataset having other features like population growth, energy use, CO2 emission

Scope

- By combining these two datasets we plan to study what factors affect environment the most
- Predict change in trend of environmental features and what can we expect in coming years
- Countries responsible for affecting environment the most

Background research

- <https://climatedataguide.ucar.edu/climate-data-tools-and-analysis/trend-analysis>

This contributes to topic by studying the rate of change of temperature given a time-series and use the Student's t-test to study the statistical significance

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5393220/>

This study analyses the question whether a climate change is of natural origin or not. They used Monte Carlo simulations with the Holm–Bonferroni method to verify statistical significance of the same



What we will use . . .



DATA PIPELINES



SPARK

TO DISTRIBUTE BIG
DATA AND PERFORM
EFFICIENT
COMPUTATIONS
USING MAPREDUCE
ARCHITECTURE



TENSORFLOW

FOR FASTER
MATHEMATICAL
OPERATIONS LIKE
MATRIX
MULTIPLICATIONS



ALGORITHMS



HYPOTHESIS TESTING

VALIDATE THE
CORRELATION
BETWEEN
DIFFERENT
PARAMETERS
PERTAINING TO
CLIMATE AND
HUMAN ACTIONS

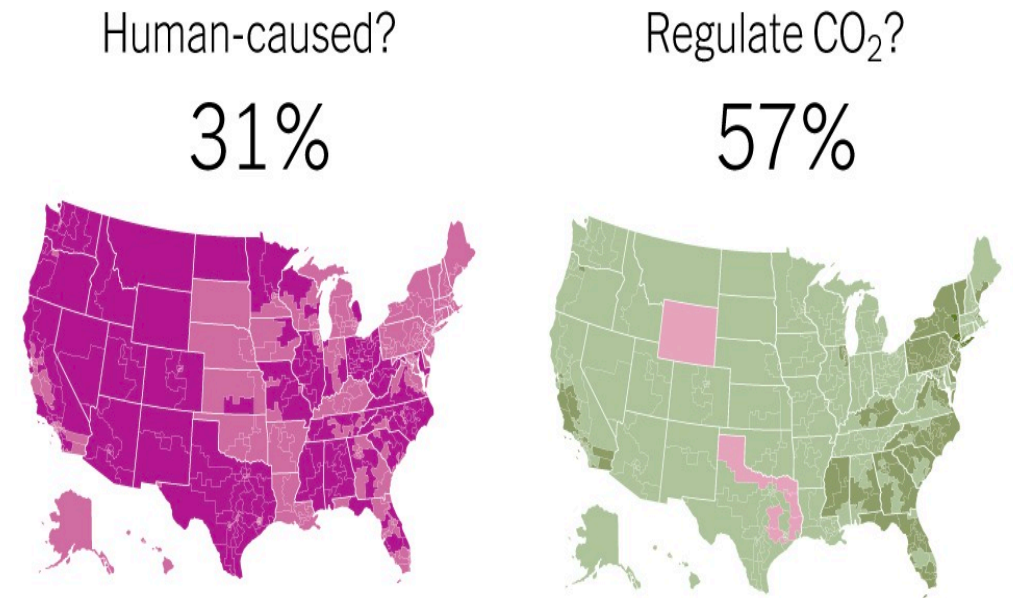


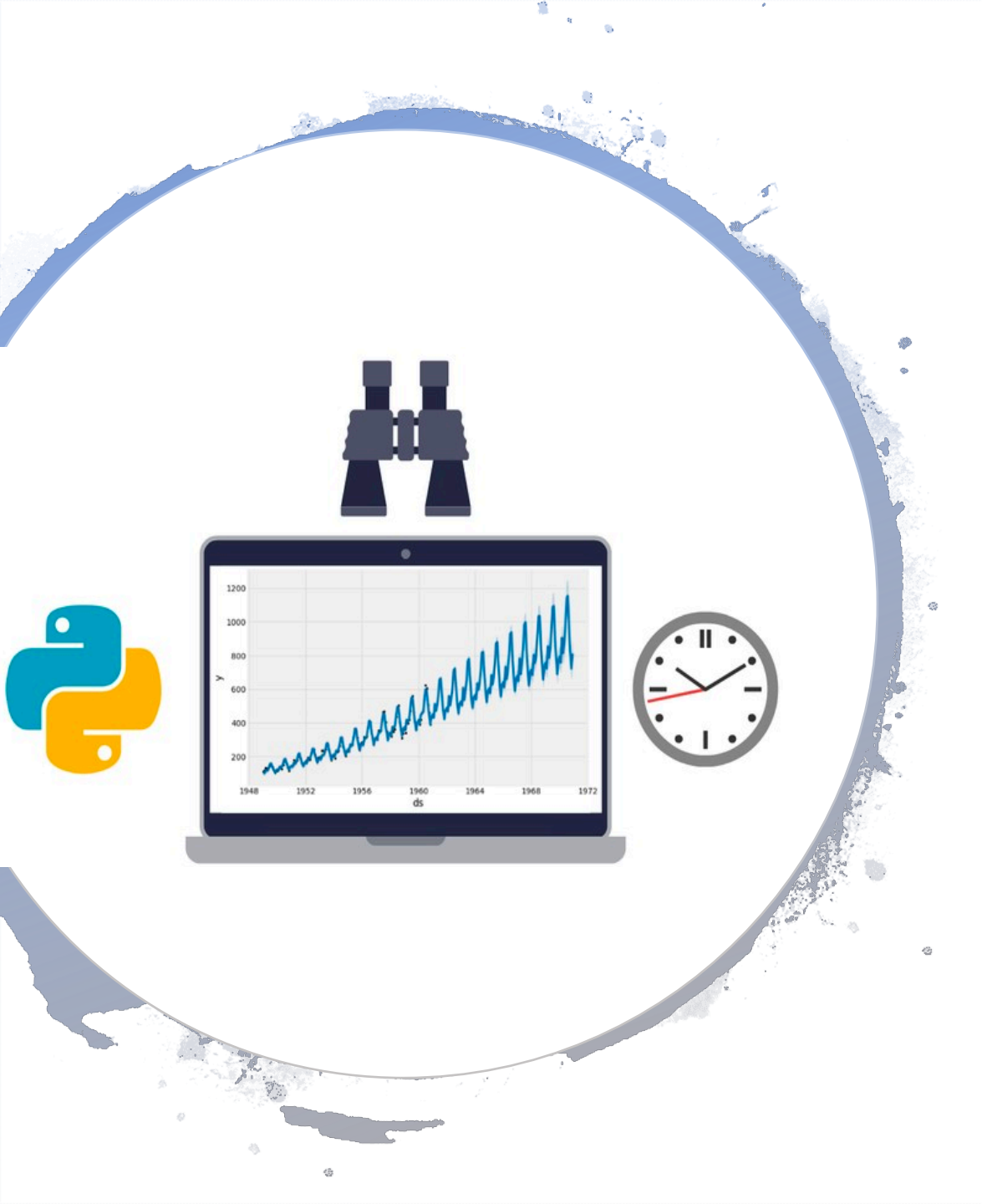
TIME SERIES

TO PREDICT
ENVIRONMENTAL
CHANGES IN
COMING YEARS

Hypothesis Testing

- Study impact of CO₂ emission, energy use and population on climate attribute like temperature, precipitation, snow level etc.
- Null hypothesis (H₀) : The above features have no significant correlation on climate attributes
- Conclude which action has most effect on environment
- Compute correlation between the parameters and verify the significance using t-test to determine if we should accept/reject the null hypothesis





Time-series

- Time series analysis and machine learning to predict level of temperature, snow level by Year 2050
- AR, ARIMA and Neural Networks are good to predict the future values on a time series data
- Split the data into test, train and validation set to calculate the error rate in our predictions

Big Data Frameworks



- **Spark:** Filter, merge data from different sources, aggregate initial data and perform analysis on it
- **TensorFlow:** Calculate correlation during hypothesis testing
- **ARIMA/AR:** For time-series analysis
- **Matplotlib/Seaborn:** Visualization of few important results and conclusions

Results (Preliminary Analysis)

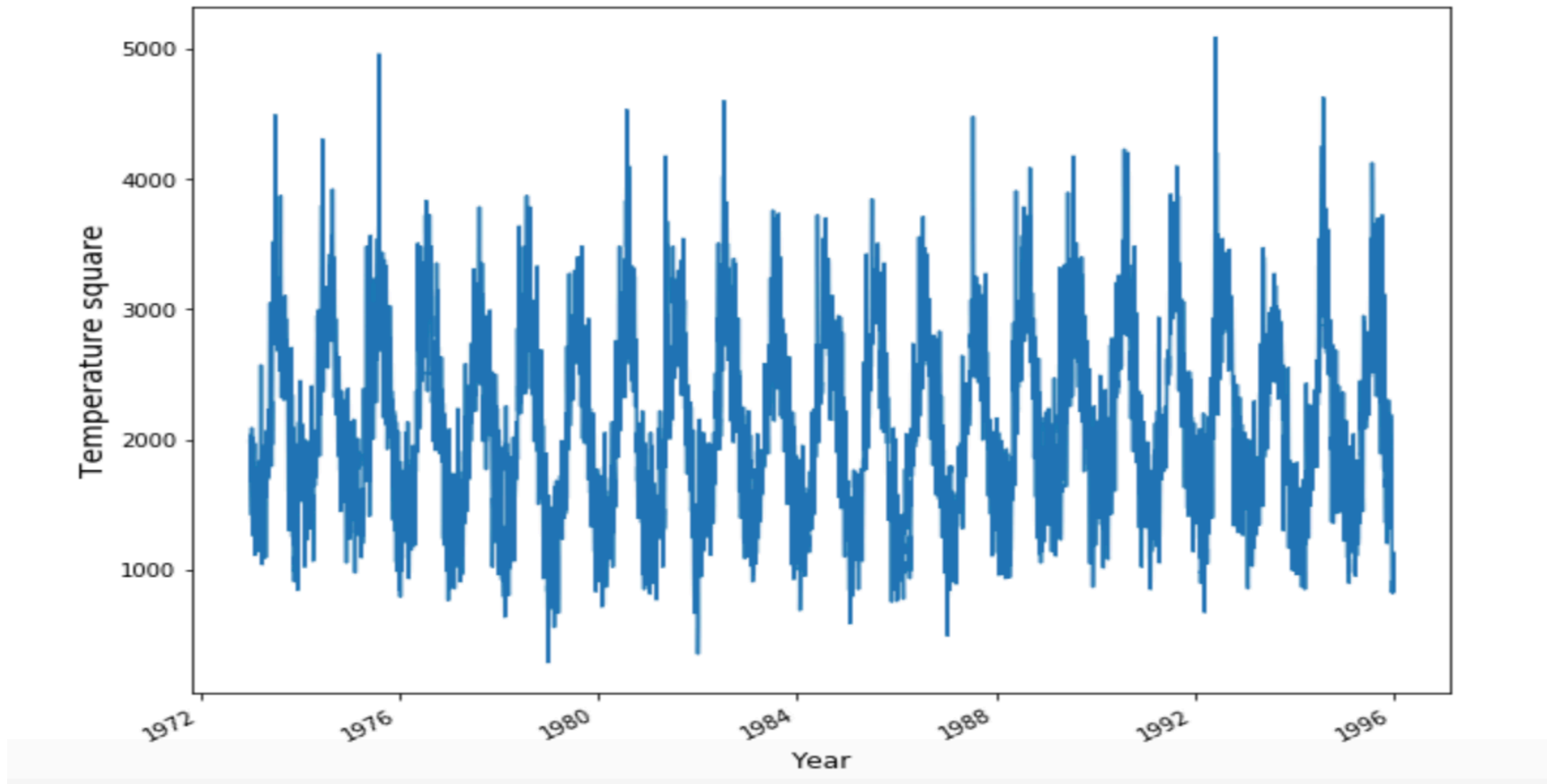


Figure: Mean temperature change over 15 years

Results (Preliminary Analysis)

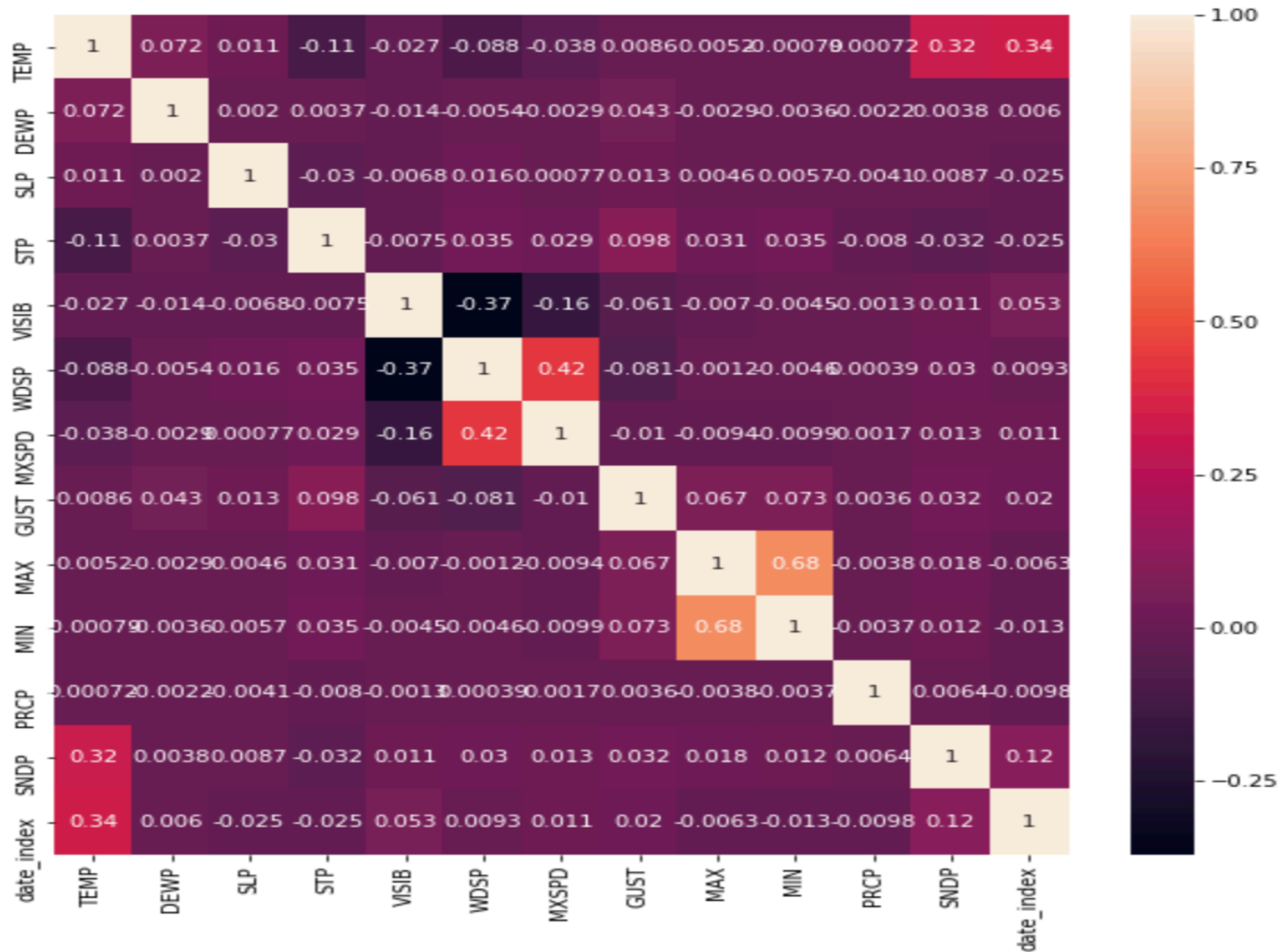


Figure: Correlation Matrix

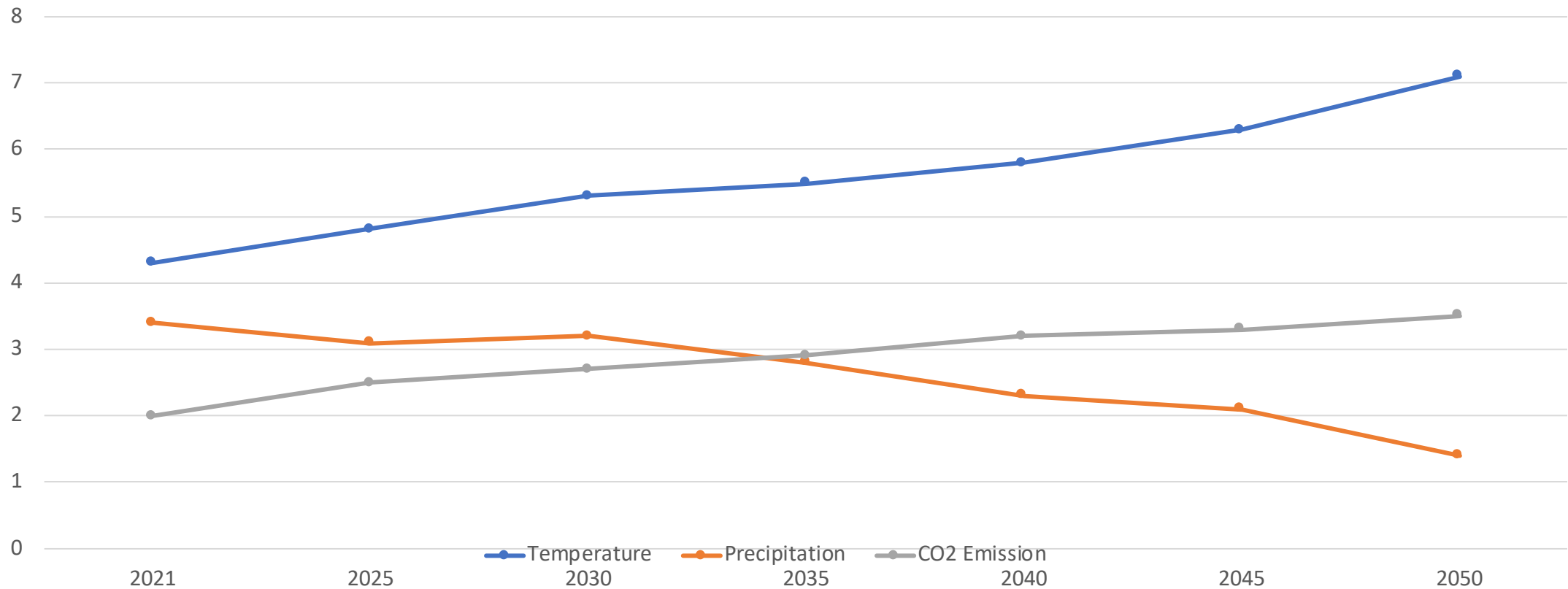
Results (Mock data)

Attribute X	Attribute Y	Correlation	t-statistics	p-value	Null Hypothesis : Accept/Reject
CO2 Emission	Temperature	0.567	0.76	0.35	Accept
Energy use	Precipitation	0.0212	0.64	0.06	Accept
Population	Snow fall	-0.0789	0.25	0.0025	Reject
CO2 Emission	Wind speed	0.0	0.22	0.0001	Reject
Wind speed	Precipitation	0.2258	0.35	0.09	Accept

Table : Hypothesis Testing

Results (Mock data)

Time Series prediction for climate trends



CONCLUSION



Analysing the major factors for climate change can help in mitigation of several environmental issues



It will help countries to take action to control human effects on climate



The trends of temperature, snow depth and other factors in the next 30 years can make us understand the depth of crisis

Image References

- <https://youmatter.world/en/definition/climate-change-meaning-definition-causes-and-consequences/>
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