CLIMATE DATA ANALYSIS OF INDIA USING VARIOUS NONPARAMETRIC METHODS AND NONPARAMETRIC SPATIAL REGRESSION WITH BOOTSTRAPPING APPROACHES

Project Plan

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Introduction

Climate change is one of the most pressing global challenges, and understanding its dynamics requires in-depth statistical analysis of climate data. By analyzing temperature, precipitation, and other environmental variables over time, we can detect patterns, trends, and variability that are essential for modelling future climate scenarios, eg. depending upon the terrain of the land specified by the latitude and longitudes. This project outlines key statistical techniques used in climate data analysis and illustrates their application using historical temperature data.

Dataset

Climate data : This data set contains the monthly and annual temperature of India according to the spatial grids i.e. latitude and longitude. Specifically this data is focused on the year 2022 and 2021. (The data has been hyperlinked with the text "Climate Data" previously.)

Purpose

The purpose of this project is to analyze climate data from India using a range of nonparametric statistical methods to capture patterns and trends without assuming specific parametric forms. By employing nonparametric tests, the project aims to evaluate randomness, detect changes in climate patterns, getting the idea of location and scale paramters and assess spatial variability across different regions. Additionally, using nonparametric spatial regression with bootstrapping, this analysis assess the perdiction of in climate trends across India. This approach is particularly useful in dealing with the nature of environmental data, providing more flexibility and accuracy in understanding climate dynamics.

Methodology

Literature Review :

- Review existing methods on nonparametric regression.

- Study the methods of Spatial Regression.

- Explore bootstrapping techniques and their application.

- Review environmental datasets commonly analyzed with nonparametric methods.

Data Collection and Preprocessing :

- Here we used the dataset of monthly and Annual temperature of India extracted from NASA database

- Preprocess the dataset (combining the dataset and filtering it, etc.).

Theoretical Development :

- Develop the theoretical framework for nonparametric spatial regression, and using nonparametric bootstrap method to obtain the confidence interval.

- Include relevant aspects from the course syllabus, such as:

  - Order Statistics: For the ranked-based inference.
  - Tests on Randomness: To check the randomness assumptions in the environmental data.
  - Various other nonparametric tests: test for location, test for scale etc.
  - Nonparametric Regression: The core aspect of the project.

Data Source

The data has been extracted from the NASA POWER projects data access viewer **Website**.