Algonquin College

CST 2213_300: Business Intelligence Programming 2: Advanced Concepts

Project Phase II

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Submitted by

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Project Goals & Objectives

Title

Comparing Global Warming & CO2 Emission Rates Across Countries

Introduction

By examining the correlation between average land temperatures, CO2 emissions, and national income levels between 1960 and 2013, the study seeks to identify trends in global climate change and answer the business question, have high, upper-middle, lower-middle and low-income countries warmed at different rates since 1960? Using Python and Streamlit for interactive data visualization, the project combines socioeconomic and environmental statistics to offer insights into climate changes.

Objectives For Phase II

- Examine the changes in CO2 emissions and average temperatures throughout years, both globally and by socioeconomic group.
- Identify correlations between temperature and CO2 emissions.
- Apply simple linear regression to explore if CO2 emissions can predict temperature.
- Build an interactive dashboard/webpage using Streamlit for visual exploration.

Data Collection & Cleaning

- Global Land Temperatures by Country – Kaggle
- World Bank Country & Lending Groups – Kaggle
- CO2 Emissions - Kaggle

Data Cleaning

- Loaded the csv(s) into Jupyter notebook for data cleaning.
- Filtered data from 1960 to 2013 for consistency.
- Removed null values.
- Standardized country names across all three datasets.
- Merged datasets on country and year.
- Created a final cleaned dataset: global_temp_income_co2_1960_2013.csv for visualization and analysis.

Exploratory Data Analysis

Data Insights

- Countries with high incomes have higher CO2 emissions but relatively lower average temperatures.
- Lower-middle-income countries are seeing a steep increase in temperature.
- CO2 emissions increased sharply after 1990 no matter the income groups.

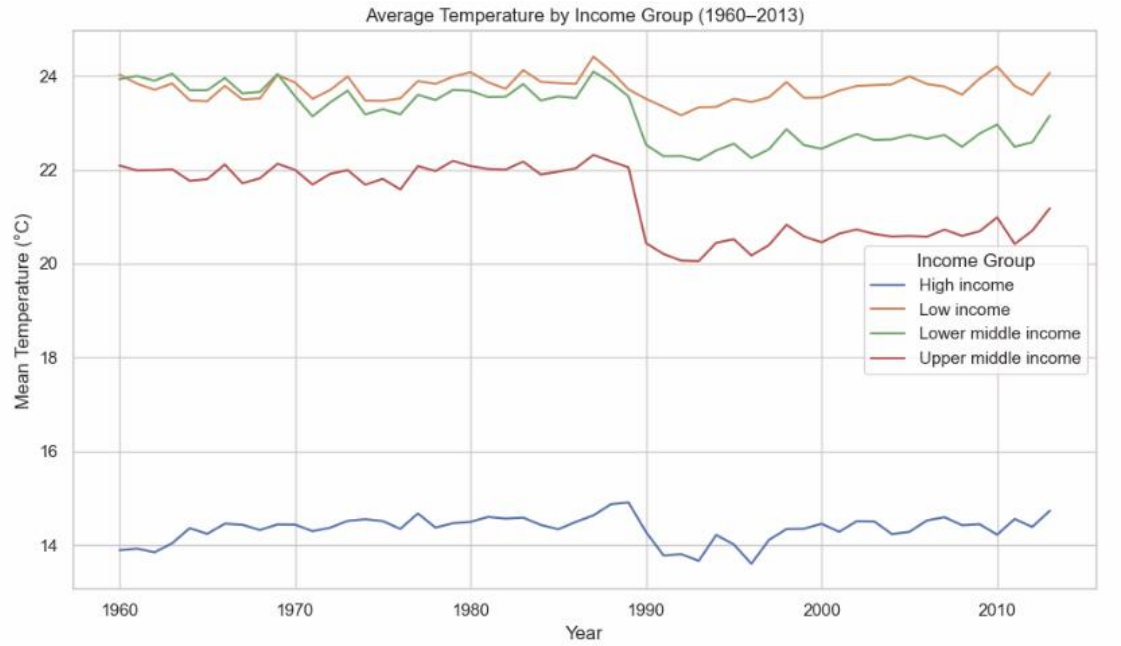

Figure 1: Average Temperature by Income Group

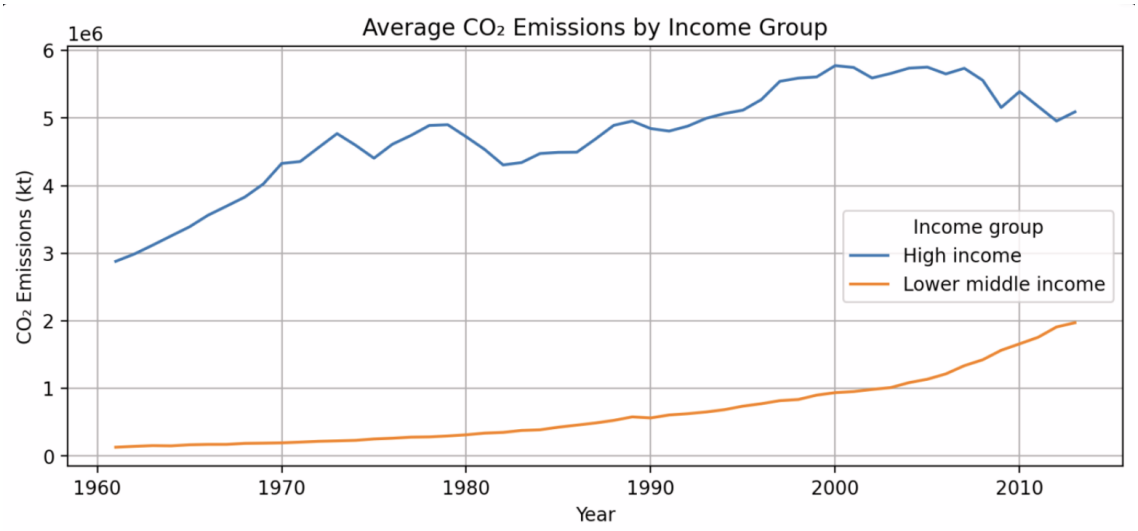

Figure 2: Average CO2 Emissions by Income Group

Modelling

A simple linear regression model was built using CO2_kt to predict MeanTemp.

Results

- Regression Coefficient: -1.64
- Intercept: 19.73

- R^2 Score: 0.034

Interpretation: CO2 emissions alone do not strongly predict mean temperature.

System Architecture

Flow

- Import datasets (CSV)
- Clean and merge data
- Perform EDA and regression analysis
- Render visuals in Streamlit

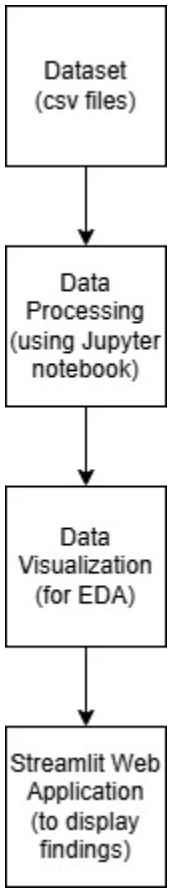

Figure 3: System Architecture Diagram

Feature Implementation

- Interactive selection of countries and income groups on the webpage.
- Dynamic line charts and scatter plots on the webpage.

- Temperature and CO2 visualization by year.
- Sidebar filters in Streamlit.

References

Global land temperatures by country. (2021b, July 1). Kaggle. *https://www.kaggle.com/datasets/vijayvvenkitesh/global-land-temperatures-by-country*

World Bank Country and lending groups. (2019, November 17). Kaggle. https://www.kaggle.com/datasets/taniaj/world-bank-country-and-lending-groups

CO2 emissions. (2023, February 28). Kaggle. https://www.kaggle.com/datasets/ulrikthygepedersen/co2-emissions-by-country