Concepts and Technology of AI

AI: Regression Analysis Report

Individual Coursework

University Student ID: 2461811

Student Name: Prajwal Dulal

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Contents

1. Introduction

Artificial intelligence (AI) has galloped towards a dizzying pace. Although AI capabilities make headlines, they further the cause of technology in a fantasy world, making the decisions people make opaque. Decisions made and decisions made possible in the ever increasing freedom are fundamental to the development of human beings whose end is to get people to live worthwhile lives and lives that they have reason to live worthwhile lives. An AI world is an abound of options the usage of which is not only a human endeavor, but also a way to move it forward. To the future, the question of the development of AI is not that it can do something human-like, but how human-like it is perceived to be and the mobilization of imaginations of people to restructure economies and societies to maximize it. (UNDP, Human Development Report 2025 | Human Development Reports, 2025) As opposed to attempting to make futile predictions about the future, the Human Development Report of this year poses the question of what decisions may be taken to ensure that we see new courses of development of every nation on the horizon, we can all have a chance to prosper in the AI world.

2. Problem 1A – Single Year HDI Exploration (2022)

2.1 Methods / Approach

In Problem 1A, the observations that are provided in this problem were scanned just to provide the observations in the year 2023. The cases of missing, duplicate, inconsistent country names, or numerical data that were retained as text were included in the data cleaning steps (UNDP, Human Development Report 2023-24 | Human Development Reports, 2024). A new column called HDI Category was created using the UNDP's thresholds to classify countries into four groups: Low, Medium, High, and Very High human development. The HDI values were described using basic descriptive statistics, and methods were used to rank the HDI values of nations with high and low HDI values. Gross national income (GNI) per capita was used to further break down the countries with HDI values above 0.800.

2.2 Key Results

- **The 2022 HDI analysis's condensed statistics were:**
- **Standard Deviation: 0.153;**
- **Mean HDI: 0.723;**
- **Median HDI: 0.740**

Switzerland performed exceptionally well across all health, education, and income indicators, as evidenced by its highest HDI score (0.967). Somalia had the lowest ranking (0.380), indicating significant development challenges. The following categories of the HDI were used to rank the countries:

• 71 countries have a very high HDI.

• 54 countries with a high HDI

- **44 countries have a medium HDI;**
- **35 countries have a low HDI.**

These categories make it easier to distinguish between the differences in development across different countries.\

2.3 Visualizations and Tables

A table of top 10 country HDI > 0.800 by the GNI per capita indicated that countries with very high HDI also have high income levels. Nevertheless, the correlation is not completely linear, which demonstrates that income is not the sole factor to determine outcomes of human development.

2.4 Interpretation and Analysis

The findings show that income and human development are strongly correlated, but they also emphasize the significance of non-economic factors like health and education. While some high-income nations may still lag behind in social indicators, others, like Switzerland and Norway, show balanced development across all HDI dimensions.

3. Problem 1B – HDI Trend Analysis (2020–2022)

3.1 Methods / Approach

The dataset for Problem 1B only contained the years 2020, 2021, and 2022. A comprehensive data-cleaning process was employed, which included removing duplicate rows, converting text-based numerical values, standardizing country names to ensure consistency across years, and eliminating missing values in important columns (country, year, HDI).

Boxplots were used to examine changes in distribution, and line plots were utilized for trend analysis. Scatter plots were used to analyze the connection between HDI and GNI per capita.

3.2 Key Results

While some developed and emerging economies saw minor improvements, the majority of countries' HDI values stayed largely stable over the course of the three-year period. The HDI grew gradually in major economies like the US, China, India, Germany, and Brazil, demonstrating resilience in the face of global upheavals during this time.

3.3 Visualizations and Explanations

Human development is a slow, long-term process rather than a quick improvement, as demonstrated by line charts that show the HDI's gradual changes over time. Boxplots for 2020–2022 show that the HDI varies moderately, with the majority of nations grouped between 0.6 and 0.8. Outliers, on the other hand, show the global disparity between extremely high and extremely low development levels. Although scatter plots show a positive correlation between HDI and GNI per capita, they also highlight the fact that human development is not always correlated with higher income.

3.4 Interpretation and Discussion

Global HDI levels are comparatively stable over brief periods of time, according to the trend analysis. While income growth helps to improve the HDI, investments in social equality, health, and education are also necessary for long-term progress.

4 Problem 2 – Advanced HDI Exploration (South Asia)

4.1 Methods / Approach

Problem 2 focuses on computes composite development scores using normalized indicators. To investigate the connections between HDI, life expectancy, and gender

development indicators, correlation analysis was used. The GNI-HDI gap analysis was used to evaluate the discrepancies between development outcomes and income.

4.2 Key Results

The Maldives had the best composite score in South Asia because of their high life expectancy and income. The HDI and life expectancy (0.928) and gender development (0.885) were found to have strong positive correlations.

4.3 Interpretation and Discussion

The results show that advances in gender equality and health greatly improve human development outcomes. (UNDP, Human Development Report 2023-24 | Human Development Reports, 2024) Effective social policies can help nations with modest income levels achieve respectable HDI scores.

5 Problem 3 – Comparative Regional Analysis: South Asia vs Middle East

5.1 Methods / Approach

This comparison was done to compare HDI statistics in South Asia and Middle East in 2022. Regional disparities were measured by using mean values, standard deviations and top-bottom rankings.

5.2 Key Results

- **South Asia: Mean HDI = 0.640, Std = 0.098**
- **Middle East: Mean HDI = 0.789, Std = 0.141**

Middle East has larger average HDI, but more variation, whereas South Asia has regular but low levels of development.

5.3 Interpretation and Discussion

The analysis puts a contrast on structural as well as economic disparities between regions. Whereas the Middle East countries enjoy a rise in the level of income, South Asia countries are more homogenous in their development patterns albeit at lower overall levels.

6 Conclusion

This report has brought to light global and regional trends in human development and this confirms that HDI is being driven by income, health, education and gender equality. Although the high-income countries take the first place in the world rankings, the regional analysis indicates significant differences and various development directions. The research suffers because of the use of secondary data and limited period. In general, the results point to the necessity to develop strategies of balanced development that are not solely economic growth to enhance the general human well-being.

7 References

UNDP. (2024, March 13). *Human Development Report 2023-24 | Human Development Reports*. Retrieved from United Nations Development Programme: https://hdr.undp.org/content/human-development-report-2023-24

UNDP. (2025, May 06). *Human Development Report 2025 | Human Development Reports*. Retrieved from UNDP: https://hdr.undp.org/content/human-development-report-2025

8 GIT HUB LINK:

https://github.com/rx1002/Concept-and-Technology-of-AI-Assignment.git

Appendix

Fig.1