HD-Vis: A visual analysis of global Human Development

Lorenzo Bianchi
Jessica Brandi
Gianluca Circelli

Visual Analytics – Project Presentation
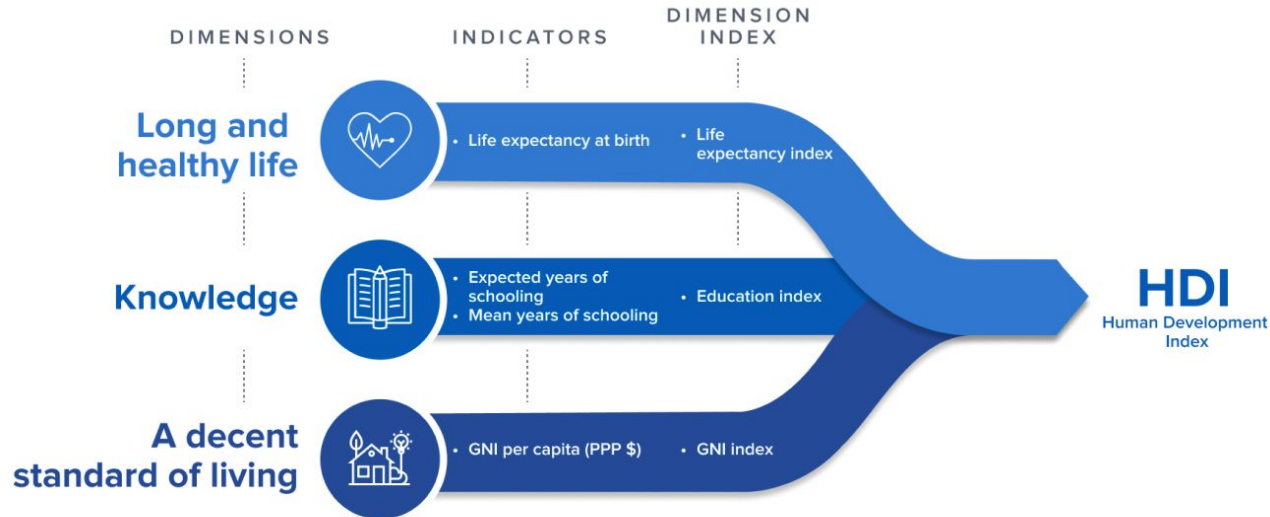Sapienza University of Rome

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Introduction

HDI overview

The **Human Devlopment Index** (**HDI**) was developed by the United Nations Development Programme (**UNDP**) as an alternative to traditional measures of economic growth, such as GDP, that fail to take into account the **welfare of a country's citizens**.

Related Works

Scientific papers related to the HDI

[1] "*Human Development Indices and Indicators: 2021 Statistical Update*": This paper provides a recent general overview of the human development trends and statistics across the world.

[2] "*The inequality-adjusted human development index: A constructive proposal*": proposes the Inequality-Adjusted Human Development Index (IHDI) as a more comprehensive measure of human development. The HDI fails to consider the distribution of these achievements within a country by not considering the inequality conditions.

[3] "*The Uses and Misuses of the Gender-related Development Index and Gender Empowerment Measure: A Review of the Literature*": The GDI is a valuable tool for identifying areas where gender disparities persist, and for tracking progress over time towards a more equitable and inclusive society.

Dataset

Dataset description

The dataset contains general **demographic country's information** and data related to the three macro-categories represented by the following **composite indexes** and their main **indicators**:

- **"Human Development Index (HDI)"** → "Life Expectancy at Birth", "Expected Years of Schooling", …

- **"Inequality-adjusted HDI (IHDI)"** → "Inequality in life expectancy", "Inequality in eduation", …

- **"Gender Development Index (GDI)"** → "HDI male", "HDI female"

| ISO3	Country	Human_Development_Groups	UNDP_Developing_Regions	HDI_Rank	GII_Rank	Human_Development_Index	Life_Expectancy_at_Birth	Expected_Years_of_Schooling
AFG	Afghanistan	Low	SA	180.0	167.0		456 61.4191	9.278809547
AGO	Angola	Medium	SSA	148.0	136.0		526 57.5961	9.560079575
ALB	Albania	High	ECA	67.0	39.0		766 78.0919	13.74845028
AND	Andorra	Very High		40.0	85.37647058823529		849 82.8975	11.67192
ARE	United Arab Emirates	Very High	AS	26.0	11.0	0.84	78.5168	12.82703864
ARG	Argentina	Very High	LAC	47.0	69.0		841 76.124	17.17383003
ARM	Armenia	High	ECA	85.0	53.0	0.75	73.3045	13.12232971
ATG	Antigua and Barbuda	High	LAC	71.0	85.37647058823529		783 77.1038	14.69311047
AUS	Australia	Very High		5.0	19.0		926 82.1336	22.47087818
AUT	Austria	Very High		25.0	12.0		905 80.8285	16.0272007

Visualizations

*Complete Dashboard*
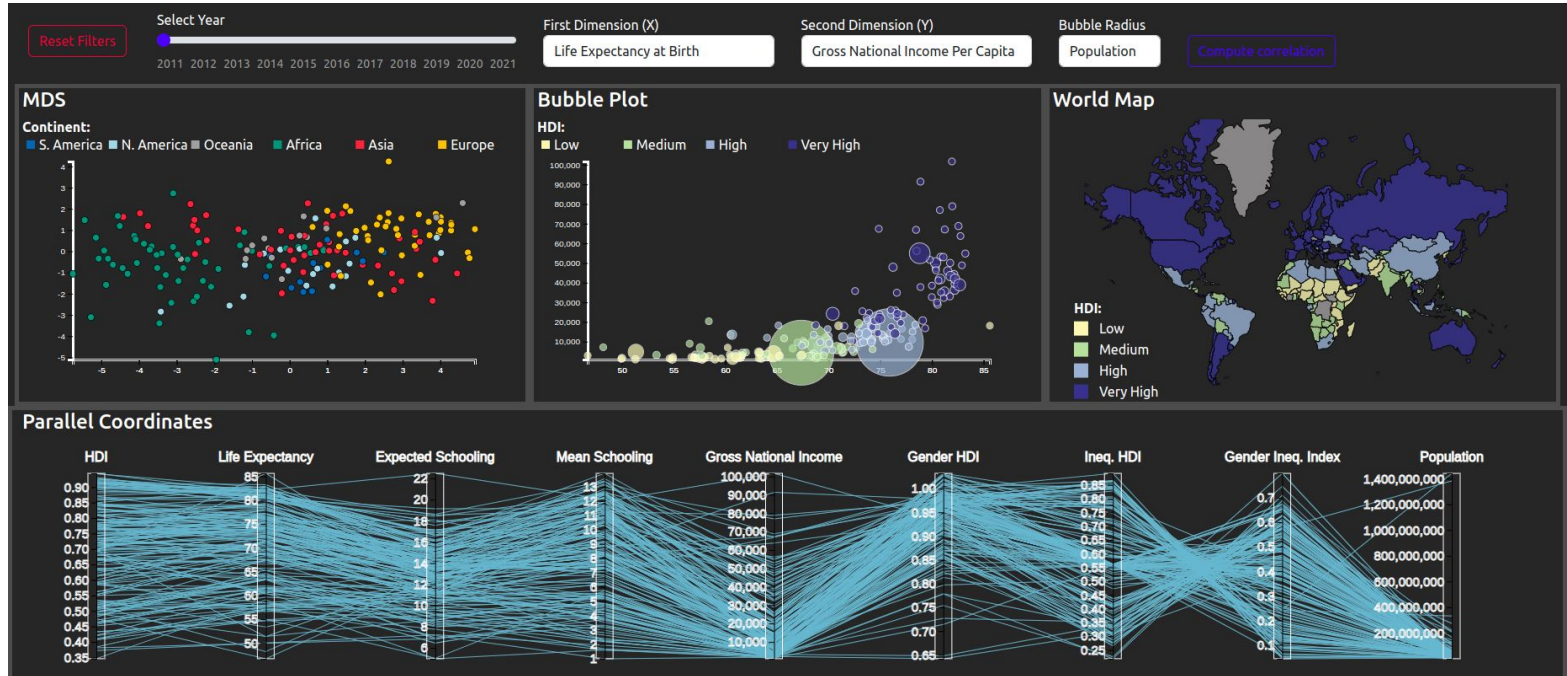
Visualizations

MDS Scatter Plot

- Used for **dimensionality reduction.**

- Represents and visualizes **dissimilarity** among data points.

- Useful to find **cluster** in the data or possible **outliers**.

- Supports **brush** and **mouseon** to interact with the country's data.

- Analysis of dissimilarity between **countries** in different **continents**, based on the **human development** indices.
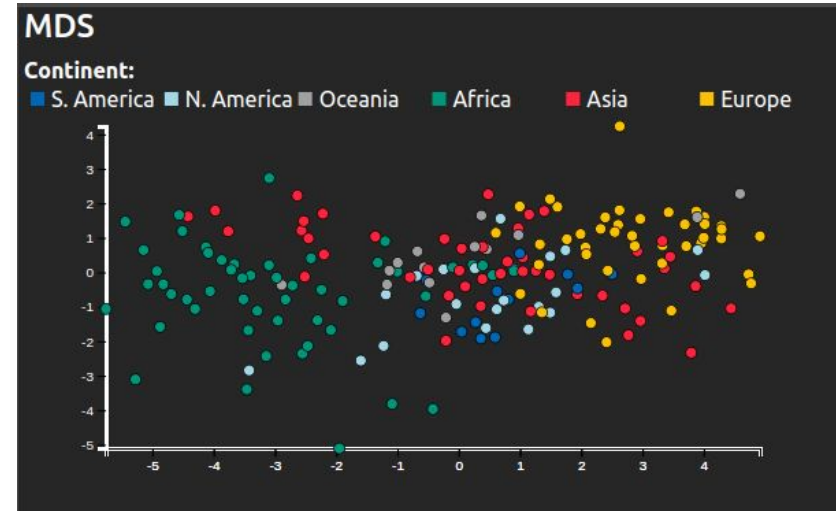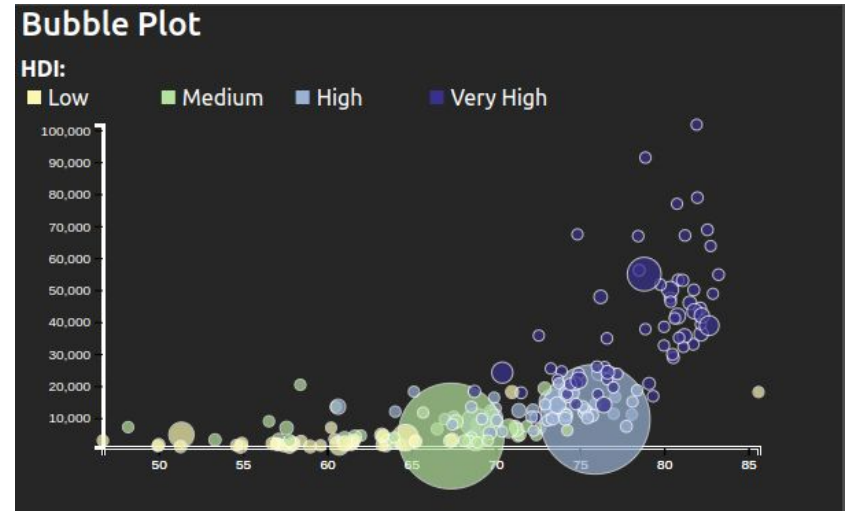
Visualizations

Parallel Coordinates

- Each axis represents an **index** contained in our dataset.

- The lines correspond to the **countries** intersecting each axis at its corresponding value of that index.

- Supports **brushing** on the axis to filter only certain lines (countries).

- Useful for identifying **patterns**, **clusters**, or **outliers** within the data.

- can help to highlight any **correlations** or relationships.


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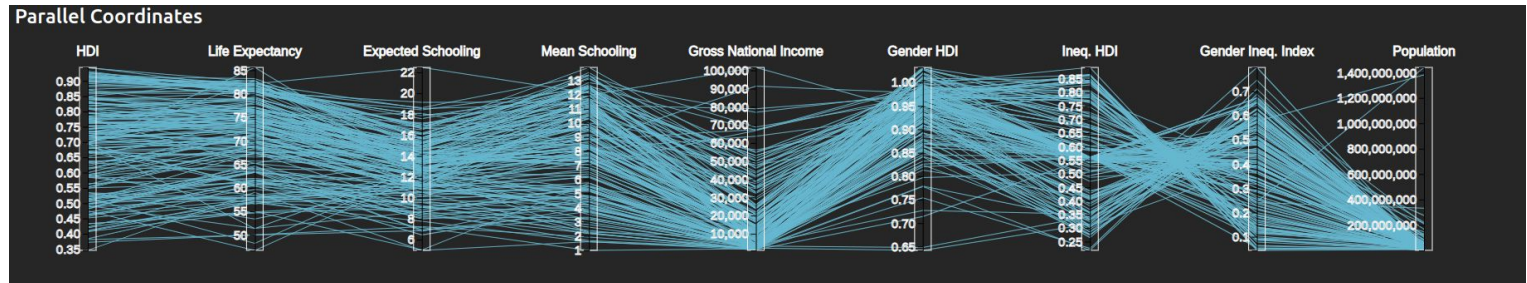
Visualizations

Bubble Plot

- User can choose the attribute on each axis and the radius of the bubble.

- Each bubble represents a single **country**.

- Default size of the bubble: country **population**.

- Colors represent the category of **human development groups** they belong.

- Supports **brush** and **mouseon.**

Visualizations

World Map

- The **world map** allows to visualize data through a color scale.

- Each color represents the category of **human development groups** to which each country belongs.

- It allows to see how human development is distributed across various countries around the world.

- It helps to identify **geographic trends or patterns** in the data.

- Supports mouseon.
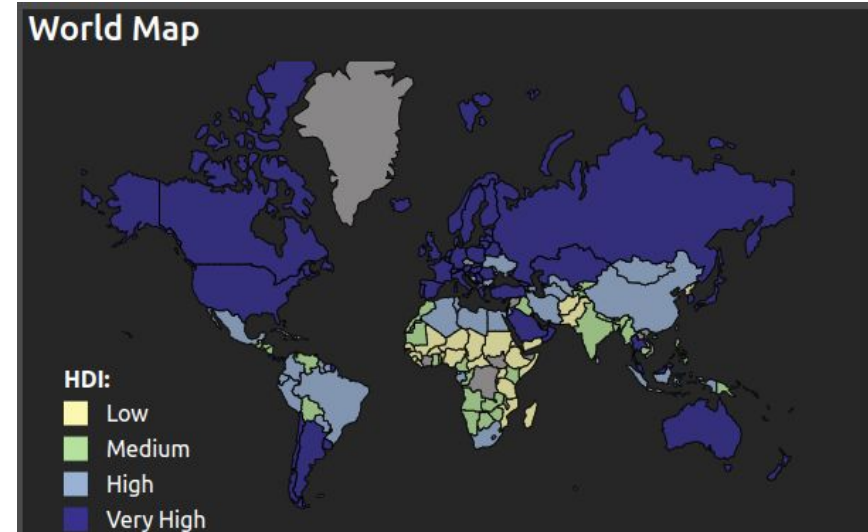
Analytics

Correlations

- The user can do a real time computation on the correlations between the various indices or indicators present in the dataset.

- Compute the Pearson correlation coefficient between mean year of schooling and inequality in education.

- The correlation coefficient is a measure of the linear relationship between two variables.

- The result is in the range [-1,1]: -1 indicates a perfect negative correlation, 0 indicates no correlation, and 1 indicates a perfect positive correlation.

- The user can compute the correlation coefficient also on the filtered data.

- Minimum and maximum correlation coefficents from all possible pairs of attributes.

Selected dimensions correlation: **0.69** | Min correlation is between **Life_Expectancy_at_Birth** and **Inequality_in_life_expectancy**: **-0.94** | Max correlation is between **Human_Development_Index** and **Mean_Years_of_Schooling**: **0.90**

Insights

*Correlations in bubble plot: Estwaini insight*

- Correlation coefficients provide insights on relationships between indexes in the data.

- High inequality in life expectancy mostly seen in African countries with low HDI, except for Eswatini and Lesotho from 2011-2014.

- Life expectancy in Estwain increased by almost 10 years from 2011 to 2021, but inequality conditions did not improve on average.
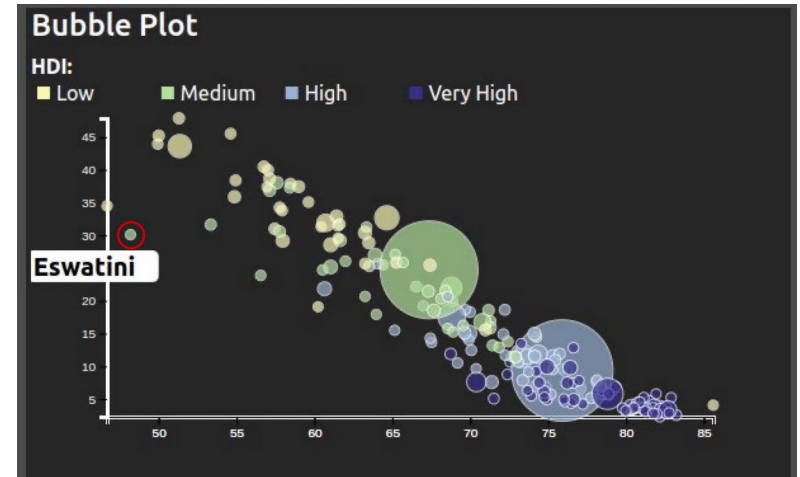
Insights

*Correlations in bubble plot: Egypt vs Portugal*

- Inequality in Education is negatively correlated with Mean Years of Schooling.

- As inequality in education increases, average years of schooling decrease.

- Egypt is more affected by inequality in education compared to other countries with similar Mean Years of Schooling (e.g. Portugal).
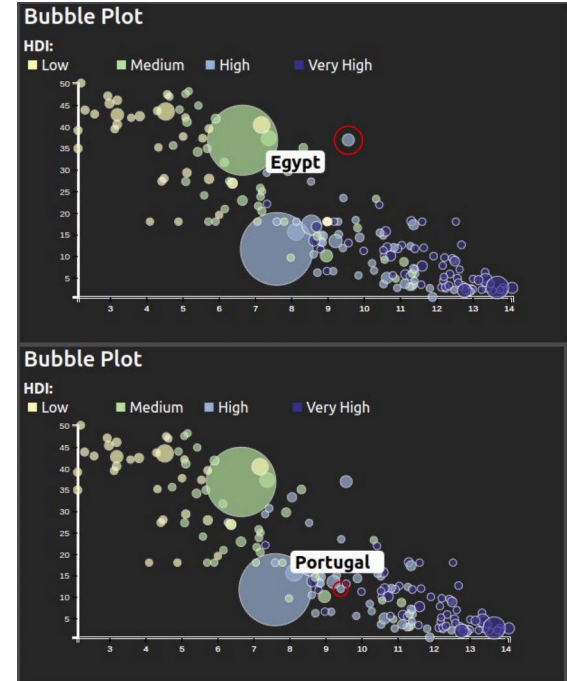
Insights

MDS Continent Clusters: The case of Luxembourg

- MDS plot shows how countries from different continents cluster together.

- High HDI European countries cluster together, with Luxembourg being most similar to Singapore and Hong Kong.

- Low HDI countries are mostly in Africa, except for Yemen, Afghanistan, and Pakistan, which are similar to Senegal and Gambia.
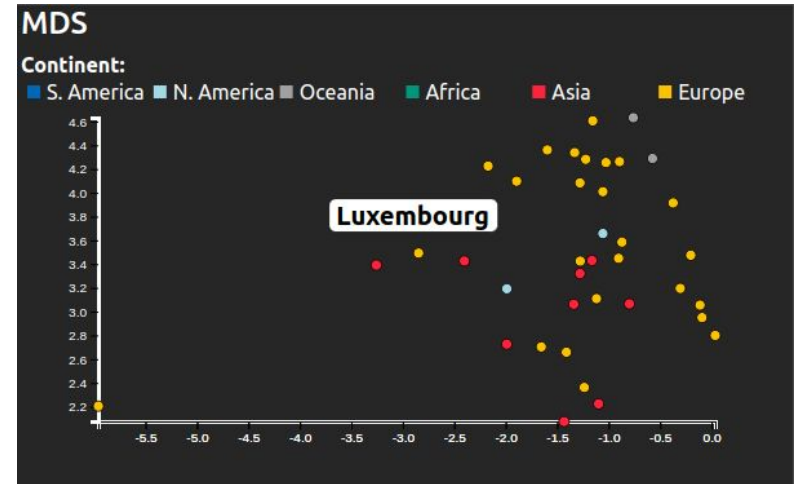
Live Demo

Thank you for the attention!