
Milestone 2: Project of Data Visualization - DAZ

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MVP page: [Click for MVP website](#)

1 Introduction

Our project aims to offer comprehensive analysis on global well-being by combining world happiness, quality of life datasets with human development index (HDR) dataset. These data visualizations will enable audiences such as the public and researchers to explore dynamic visualizations that reveal trends, differences, and insights shaping the state of nations around the world.

As a whole, three complementary datasets are used to create a comprehensive analysis of global well-being. The "Quality of Life Index by Country" and "Global Happiness Scores and Factors" provide insights into living standards and happiness factors, while the "Human Development Index (HDR) Dataset" provides long-term data on education, income and life expectancy. Together, they provide a multidimensional perspective on national well-being.

2 Visualizations

Our goals with data visualizations about this subject can be divided into 5 subsections:

1) The World in Transition : Show global changes in well being over time. To do this, we will implement Time-Lapse Choropleth Map to visualize how country-level metrics evolve, Global Metric Trend Animation over time to illustrate changes in trends for selected global metric.

2) Unveiling the Factors : Explore how indicators influence each other. This part will include a Scatter Plot Matrix for pairwise relationships, Radar Chart to compare countries within across multiple metrics, and a Parallel Coordinates Plot to reveal country profiles across multiple dimensions.

3) The Shifting Landscape : Identify key trends and affects over time including historical turning points. For this, we will first use a Time Series Dashboard for detailed trends based on selected metrics and countries. Additionally we will have Small Multiples Line Charts which will show the changes based on regions for the selected metric and significant historical events such as public war.

4) Country-Level Dynamics: Explore unique country and region level trajectories. This section combines an Interactive Bubble Chart to visualize variable interactions like GDP vs. Happiness along with MDS/PCA projections to visualize country clusters and distinctive development paths. For the region based analysis, we will use line chart by region to see the changes based on selected time interval and feature.

5) Further Insights: Investigate potential causal relationships. This includes a Sankey Diagram that shows how inputs like GDP, education, and healthcare investment flow through intermediate factors to influence outcomes such as Happiness and Quality of Life, and a bar chart for top 10 countries based on selected metric.

Additional details on the distribution of metrics for each country are available on the distributions page.

2.1 Minimum Viable Product

In our Minimum Viable Product, you can find the following charts:

- **Time-Lapse Choropleth Map:** Choropleth view of HDI across countries. Hover to see line charts for the selected time interval.
- **Global Metric Trend Animation:** Shows global metric changes over time. Limited with HDI for now.
- **Radar Chart:** Compare 2 countries based on selected features (2022 only).
- **Scatter Plot:** Explore the relationship between two metrics using a scatter plot. Limited with HDI in MVP.
- **Parallel Coordinates Plot:** Analyze multiple metrics across countries. Limited with HDI metrics for now.

- **Dynamic Time Series Chart:** Analyze the changes in time based on selected time interval, feature and country.
- **The Impact of Public War - Small Multiples Line Charts:** Visual insight into war's effect on development.
- **Interactive Bubble Chart:** Explore HDI metrics with hover detail.
- **MDS/PCA Projections:** Cluster countries based on HDI-related metrics.
- **Line Chart by Region:** Based on selected feature and year range.
- **Sankey Chart:** Visualizes factors behind Happiness and QoL.
- **Top 10 countries by selected metric and year:** Limited to HDI and year 1990.
- **Plots for distributions:** See the distributions of selected metrics for all available countries based on the selected year. These plots are shown on the distribution webpage.

You can find our sketches related to the charts we plan to have in our website under the sketches section. For MVP, you can use the link in the header.

2.2 Enhancement Ideas

As users scroll through the slides, a side panel could display simple explanations of important events—such as shifts in HDI scores and sudden changes in other metrics that are tied to historical or socio-political moments.

At the same time, we could implement cross-filtering across the different visualizations. This means that when a user selects a country or region in one chart (like the World Map or Bubble Chart), the related data in other visualizations (like scatter plots or time series charts) will automatically update, allowing for a deeper, multi-perspective analysis. This could be part also of a dedicated dashboard for full comparisons between two countries, where various visual elements work together to display the differences and trends.

Additional improvements include adding detailed explanations about the metrics (like SDGs goals for HDI, etc.), better supporting analysis across different datasets, and enriching the data with extra context such as images, videos, or historical/social sources. We could also offer multiple map layers and incorporate micro-interactions to improve the overall user experience. A quiz feature (e.g., "guess the ranking") could introduce a fun, gamified aspect, and users should also be able to navigate easily through the content using arrow keys.

3 Tools and Required Lectures

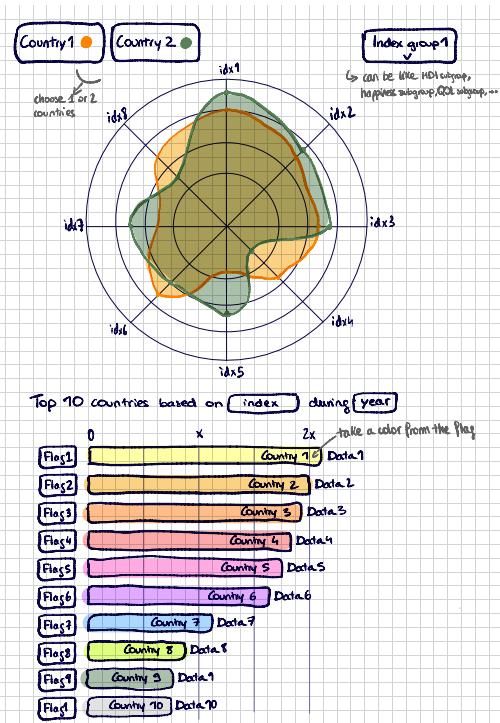
Our project relies primarily on D3.js for creating interactive visualizations such as choropleth maps, scatter plots, radar charts, and Sankey diagrams. Standard web technologies support layout, interactivity, and data handling. Additional libraries include d3-sankey for flow diagrams and Vanta.js for animated backgrounds. We also use ml-pca and ml-kmeans for the PCA plot with clustering. The required knowledge for implementing these tools is covered across several lectures:

- D3.js and Data Handling support most visualizations.
- Maps and Geographic Data inform the choropleth map.
- Interactions and Time-Series Data are essential for dynamic views.
- Design, Color, and Perception guide visual clarity.
- Upcoming lectures on Graphs and Storytelling will help enrich Sankey diagrams and dashboard narratives.

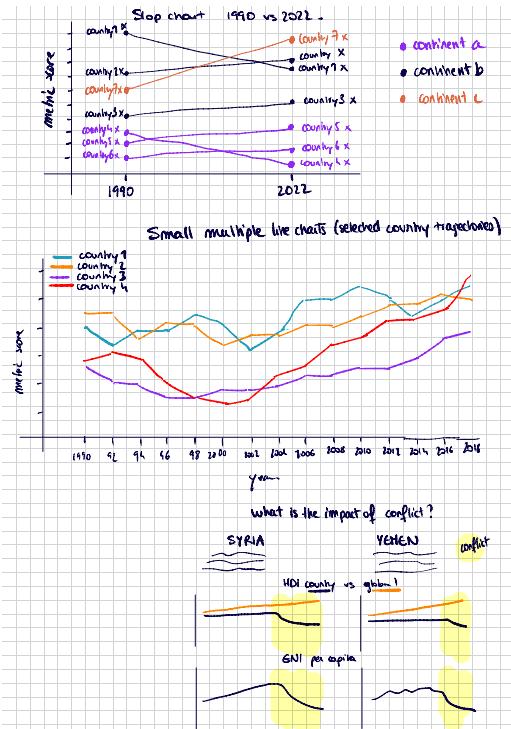
Together, these tools and lectures enable a coherent and engaging visualization platform for exploring global well-being.

4 Sketches

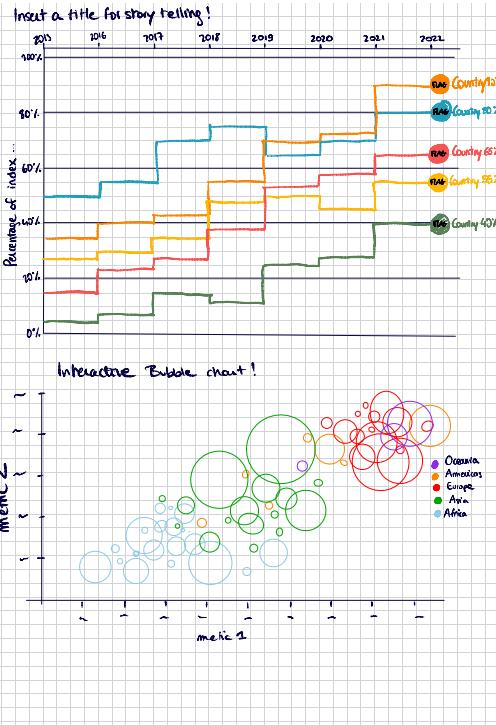
References



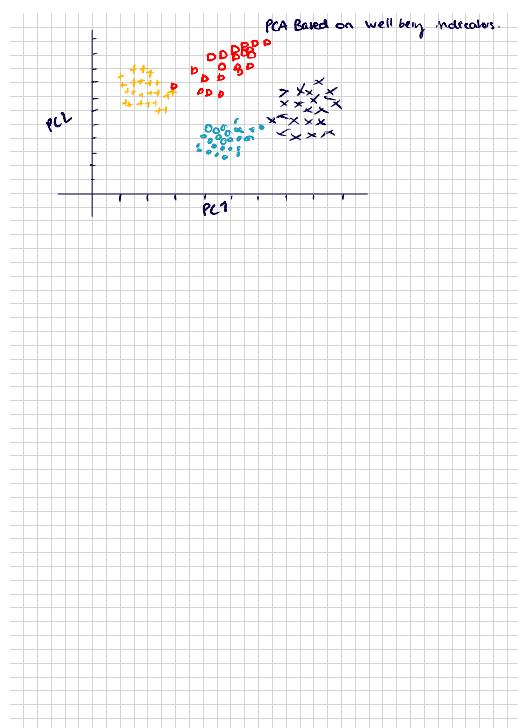
(a) Radar chart comparing two selectable countries across different metrics and the top 10 countries based on a criteria during a year.



(c) Slop Chart for a given metric for different continents, Small multiple line charts showing selected country trajectories and the impact of conflict on HDI and GNI per capita from 1990 to 2022 for selected examples.

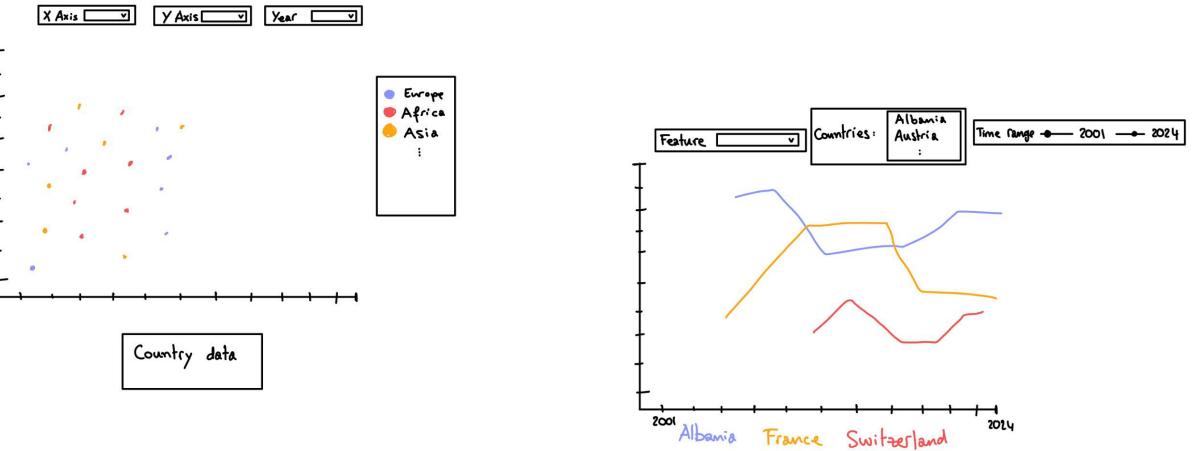


(b) Race chart showing the progression of countries across different regions from 2015 to 2022 for a chosen metric and Interactive Bubble Chart for a chosen metric where you can see the correlation between two other metrics, colored by continent.



(d) PCA based on well being indicators or other indicators with clustering.

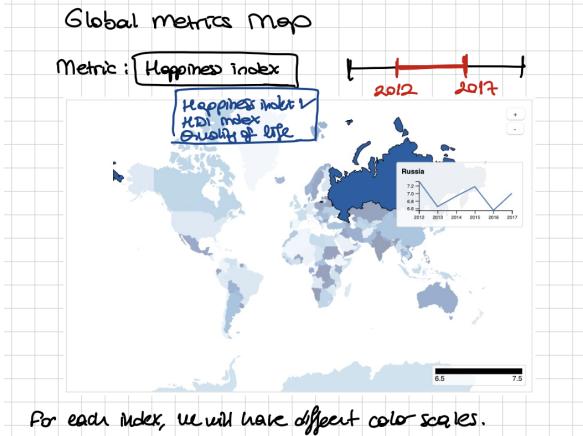
Figure 1: Some sketches of the plots we want to do.



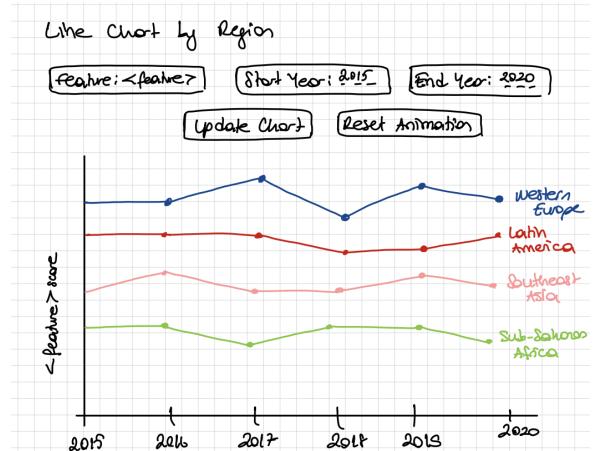
(a) Sketch of the interactive scatter plot visualization. Users can explore relationships between two selected variables (X and Y axes) for a given year. Each point represents a country, colored by continent, with a legend and hover-enabled country data display.

(b) Sketch of the interactive time-series visualization. This chart displays the evolution of a selected metric for multiple countries over a specified time range. Users can choose the feature, countries of interest, and adjust the timeline to observe comparative trends.

Figure 2: Design sketches of two interactive visualizations used in the project.

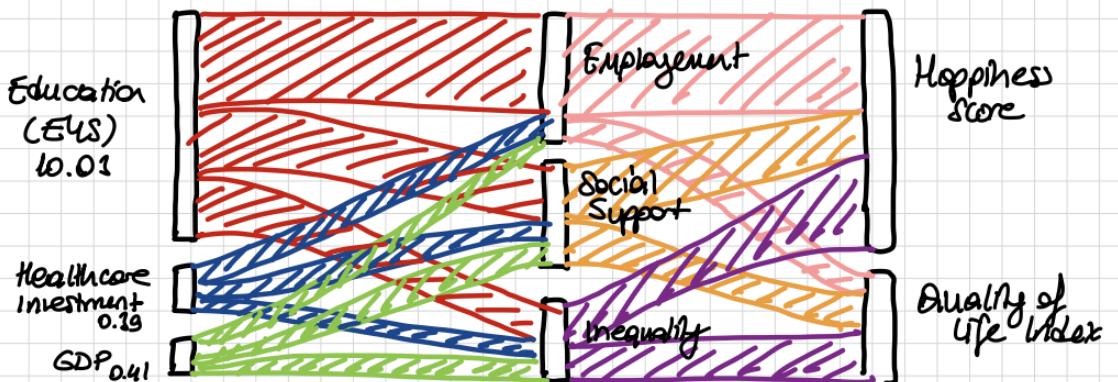


(a) A global visualization showing the distribution of key well-being metrics across countries. Darker regions indicate higher levels of the selected metric.



(b) Line chart comparing trends across different world regions over time.

Factors Behind Happiness and Quality of Life Sankey Chart



(c) Sankey diagram illustrating the contribution of various factors (education, health care investment, and GDP to overall happiness and quality of life. The width of each flow represents its relative impact.

Figure 3: More sketches of the visualization we plan to make.