Process Book

Overview

The goal of our project is to visualize historical hurricane data in a way that makes the paths, intensities, and temporal patterns easy to explore. Hurricanes are complex phenomena with long-term trajectories and changing intensities, so a static chart doesn't communicate enough. We wanted an interactive visualization that lets users see how storms evolve over time and across geography. We chose a map-based visualization because the spatial component is essential to understanding hurricane movement, and we supplemented it with interactive controls that let users filter storms by year and category.

Questions

Initially, our core questions were:

.What do hurricane paths actually look like over time?

. Are there visible patterns in where hurricanes travel?

After building the first prototype, the map became cluttered with many overlapping paths. This led us to new questions:

.How can we let users isolate only the storms they care about?

.What dimensions (year, category, storm name, etc.) are most important for filtering?

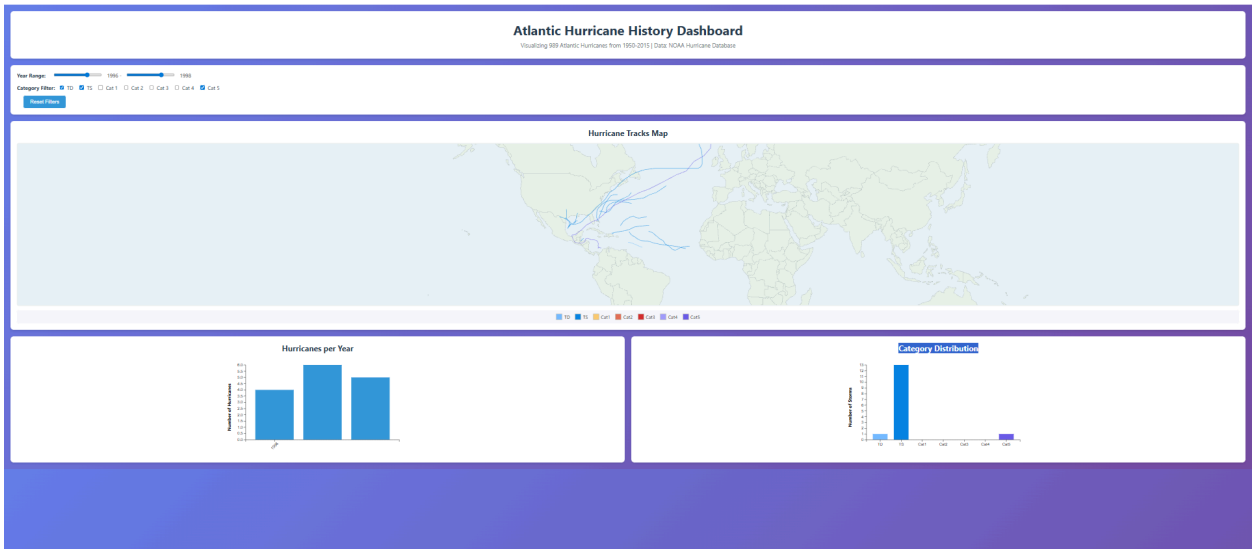
This is where we decided to introduce sliders (for year) and toggle buttons (for hurricane category).

Initial Approach

In our initial design, we started with a single map where all hurricane paths were drawn in the same color, creating a uniform but visually dense display. We paired this with a simple sidebar listing the names of all storms, hoping users could reference the list to understand what was shown on the map. However, without any interactive features or visual differentiation between storms, the map quickly became cluttered and difficult to interpret. The combination of overlapping lines and the lack of visual hierarchy made it clear that this first version did not effectively support exploration or comparison.

Refined Approach

In our second approach, we removed the sidebar entirely to simplify the interface and reduce distraction, allowing the map and filters to take central focus. We added a year slider and category toggle buttons, in order to reduce clutter and let users control the amount of data shown. To provide a more clear summary of the filtered dataset, we added two bar charts beneath the map: Category Distribution, which shows how many storms of each category appear under the current filter settings, and Hurricanes Per Year, which updates dynamically to reflect the number of storms in the selected time and category range. These charts give users an immediate sense of the dataset's composition without requiring them to interpret the map alone. This revised design offers a cleaner layout, more useful high-level insights, and a more focused interaction flow compared to the original sidebar-based version.



Implementation

All visualizations were implemented in D3.js, even if static versions were used at first.

D3 Geo Projection:
Used a standard world map projection to place all points accurately.

Paths:

Each hurricane path is drawn as an SVG polyline.

Path Interaction:
Hover → highlight path
Click → persistent selection (optional if you added this)

Filters:

D3 slider for selecting year
Button for selecting

Data

Our main challenge was ensuring the data was structured in a way that D3 could easily bind to polylines on the map.

Source: Hurricane dataset provided for the project (or insert your dataset source here).

Cleaning: We removed incomplete rows, standardized coordinates, and grouped points by storm ID.

Format: Each storm consists of sequential latitude/longitude points along with date/time and category values.

Related Works

We looked at existing hurricane visualizations for inspiration:

.NOAA hurricane path maps

.New York Times interactive hurricane trackers

.Examples shown in class of geographic data visualized using D3's geo projections

These informed our decision to use a map projection and polylines to represent paths.

Summary

Overall, our visualization revealed several meaningful patterns in the hurricane data and demonstrated how interactive controls can make complex datasets easier to explore. We observed that hurricanes tend to follow consistent corridors across the Atlantic, and stronger

storms often take different paths than weaker ones. The ability to filter by year made seasonal and temporal variations much more apparent. In terms of performance, the filtering tools greatly reduced visual clutter, and the interactions—such as highlighting storms—made it easy to track individual paths. The final design remained readable and intuitive even when many storms were displayed. Looking forward, the visualization could be improved by adding animated storm tracks, richer tooltips with detailed storm information, and additional filtering options such as storm name or basin.