Interactive Visualization of Pokémon Data: Final Report

Aditya Manthri (anm97), Leina Li (ll736)

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1 Introduction & Usecases

In the expansive universe of Pokémon, visualizing and comparing Pokémon attributes effectively enhances understanding and strategic planning for players and enthusiasts. This project aims to create an interactive visualization application leveraging a dataset of Pokémon attributes, enabling users to explore, compare, and understand Pokémon in a more intuitive and engaging way.

2 Dataset Source and Attributes

The dataset used in this project, titled *pokedex.csv*, was sourced from Kaggle, a platform for predictive modeling and analytics competitions. The dataset can be found at `https://www.kaggle.com/datasets/abcsds/pokemon` and comprises various attributes associated with each Pokémon. These attributes include the Pokémon's name, base stat total (BST), individual stats such as attack power and defense power, types, abilities, and other relevant information that provides a comprehensive overview of each creature's capabilities and characteristics.

2.1 Dataset Attributes

The *pokedex.csv* file contains several key attributes for each Pokémon:

- **Name:** The name of the Pokémon.
- **Base Stat Total (BST):** A cumulative total of all the Pokémon's base stats.
- **Attack and Special Attack:** Measure of a Pokémon's offensive capability.
- **Defense and Special Defense:** Measure of a Pokémon's defensive strength.
- **Types:** The Pokémon's elemental types, can be dual typed.
- **Abilities:** Special abilities that provide various advantages in battles.
- **Generation:** The Pokémon game series generation to which the Pokémon belongs.

The dataset's extensive nature allows for a multidimensional analysis and visualization of Pokémon characteristics, offering insights into the evolution of Pokémon traits across different generations and the strategic implications of their abilities and stats.

3 Storyboard and Interactions

The project began with developing storyboards to outline key interactions based on the need for easy exploration, searching, and comparison of Pokémon. Initial designs aimed to visualize the increase in average Base Stat Total (BST) across generations. However, the focus shifted to creating a tool for efficiently searching and comparing Pokémon. The final design incorporated the following interactions:

- **Scatter Plot Visualization:** This visualization was chosen for its ability to show distribution and trends clearly. It plots Pokémon by generation and total base stats, with color coding by type. As stated above, it was originally to show how the stats have increased over generations showing a power creep in the recent generations (perhaps to keep newer players more engaged). However we decided that the scatterplot is a good way to represent all 1000+ pokemon on a single screen. There are some caveats which we will discuss about in later sections.

- **Type Filters:** Checkboxes for each Pokémon type enable users to filter Pokémon based on their types, which is essential for users seeking to build a balanced team or to understand type distributions.

- **Filter Methods:** The "ALL", "OR", and "AND" radio buttons offer different levels of granularity in data filtering. "ALL" displays all Pokémon, "OR" allows for Pokémon to be filtered by any of the selected types, and "AND" requires all selected types to be matched, catering to both broad and narrow exploration approaches. The reason for this filter is that you must be able to choose pokemon having dual typings which is very useful for casual pokemon players.

- **Search Filters:** A search bar was integrated to offer direct lookup capabilities for users who know exactly which Pokémon they are interested in, enhancing the tool's efficiency.

Circle Selection: The circles in the scatterplot represent individual Pokémon. When a user clicks on a circle, the visualization highlights the selection by increasing the size of the circle. This visual feedback confirms the user's action and makes the selected Pokémon stand out for further analysis.

Bar Chart Comparison: The bar chart comparison was introduced to offer a detailed juxtaposition of two selected Pokémon. It allows users to make side-by-side comparisons of their base stats, providing a clear and concise way to evaluate their strengths and weaknesses in relation to each other, a tool thats very useful for competitive pokemon players.

4 Rationale for Visualization Choices

- The design choices for the visualization tools were made with user experience at the forefront. The scatterplot was chosen for its ability to convey complex data in a simple format, allowing users to instantly perceive the distribution and clustering of Pokémon attributes across generations.

- The use of the circle's size as a means of highlighting selected Pokémon in the scatterplot provides a direct and unobtrusive method to indicate selection while maintaining the overall integrity of the visualization.
- The bar chart comparison extends the functionality of the tool by allowing users to compare detailed attributes of selected Pokémon. This comparative analysis is crucial for users who wish to delve deeper into the statistics of their Pokémon, such as when planning for battles or optimizing team composition.

5 Final Interactive Visualization Application

The final application integrates a scatter plot and bar chart comparison tool, augmented with a search feature for direct Pokémon lookup, enhancing usability.

5.1 Application Screenshot

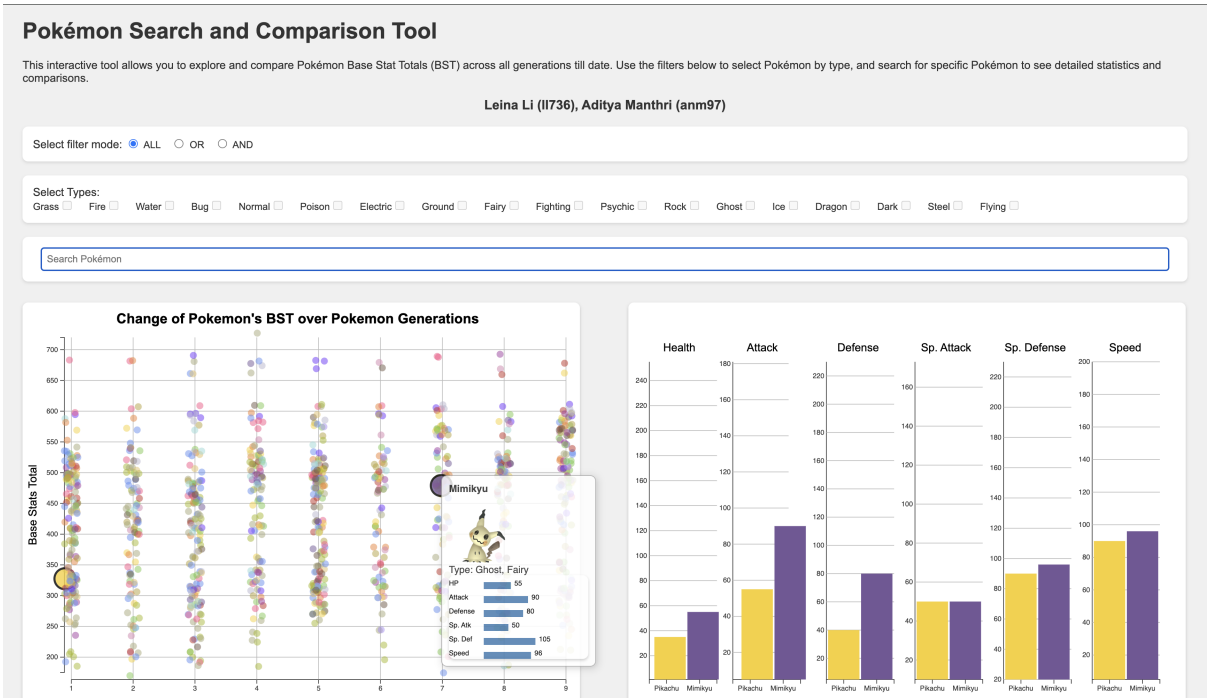

Figure 1: Screenshot of the Pokémon search tool application.

6 Development Process and Evolution

The development of our interactive Pokémon visualization tool underwent several phases, from conceptualization to the final product. Each stage was critical in shaping the tool's functionalities and user experience.

Storyboarding

The project commenced with storyboarding, where we mapped out the user journey and the intended interactions with the visualization. Initial concepts were sketched, focusing on the primary objective of making Pokémon data accessible and engaging. Our storyboards included a basic scatterplot for visualizing Pokémon stats, a filtering system, and a comparative analysis component.

Prototyping

With storyboards in hand, we created prototypes to experiment with data representation and interactivity. Early prototypes were rudimentary, serving to validate our design assumptions and interaction models. Feedback from these prototypes led to significant refinements in data presentation. Us being fairly familiar with pokemon and its competitive scene, we captured what a user would feel necessary and useful to have in a pokemon search tool.

Final Implementation

(refer to the sections above.)

7 Interaction Issues and Trade-offs

In the development of interactive visualizations, several trade-offs must be carefully managed to deliver an optimal user experience. One significant challenge encountered in this project was the issue of overlapping data points. With a dense dataset such as Pokémon attributes, points representing individual Pokémon often overlap, especially when many have similar or identical values. This overlap can make it difficult for users to distinguish between different data points and to select a specific Pokémon for further analysis. The following list elaborates on this and other key issues:

- **Overlapping Points:** To address the challenge of overlapping points, a jitter effect was applied along the x-axis. This slight horizontal dispersion of points reduces overlap, allowing users to visually separate Pokémon that would otherwise be indistinguishable due to occupying the same position on the scatterplot. While effective, this approach may introduce a perception of imprecision in the data placement, which was mitigated by providing the option to zoom in for a more detailed view. The zoom feature allows users to closely examine areas of dense data concentration, ensuring that even with jitter, the accuracy of data representation is maintained.

- **Missing Pokemon/ Faults with DB:** The tool strives to maintain a fluid interaction experience without compromising on the dynamic features such as live filtering and searching. Achieving this balance requires the database to be completely filled up with no room for errors. Therefore we had to cleanup the data manually to filter out all the faulty names so that the image rendered correctly.

- **Usability vs. Complexity:** While aiming to provide in-depth insights into the Pokémon dataset, it was crucial to keep the interface simple and intuitive. This

balance ensures that both novice users and seasoned Pokémon enthusiasts can effectively use the tool.

- **Data Overload:** The visualization is designed to prevent user overwhelm by providing a clear and structured presentation of data. However, care must be taken to not oversimplify and lose valuable insights.

8 Contributions

The development of the interactive visualization tool was a collaborative effort, with each team member bringing unique skills and perspectives to the project. Below is a rough distribution of the contributions of each member and the aspects of the project that demanded the most time and effort from us:

Leina Li

- Designed and implemented the interactive scatterplot.
- Added interactivity features to the circles within the scatterplot.
- Developed the filtering logic that allows dynamic data exploration based on user input.
- Created the bar chart component for detailed comparative analysis.
- Enhanced the bar chart with interactive features.
- Integrated descriptive titles and labels for data comprehension.

The most time-consuming tasks for Leina were constructing the bar chart due to its complexity and ensuring accuracy, along with the extensive debugging required to refine the interactivity elements. Total time spent would be around 9 hours.

Aditya Manthri

- Led the brainstorming sessions to design the overall user experience and interface layout.
- Sourced and cleaned the Pokémon database, ensuring the data was accurate and well-structured for visualization.
- Implemented the search functionality, enabling users to find specific Pokémon efficiently.
- Integrated the "OR" filter logic, allowing users to apply flexible filter combinations.
- Incorporated visual elements such as Jittering and Pokémon images within tooltips for an enriched user experience.

Aditya spent the most time on the initial brainstorming to set a solid foundation for the tool's design, developing the search and filtering logic, and refactoring the code. Total time spent would be around 9 hours.