Visual Journey in the World of Pokémon

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Project Repository: Visual-Journey-in-the-World-of-Pokémon

➢ Background and Motivation

The Pokémon world has captivated audiences globally for decades, featuring complex interactions between species, their attributes, and combat strategies. My motivation for choosing this project is deeply connected with a childhood fascination with Pokémon. This Project will allow me to blend my interests by exploring Pokémon data deep within, analyzing things like power, health, and types. This project's visual aspect will unveil patterns and relationships in the data that would be hard to tell by exploring raw data.

➢ Project Objectives

The primary questions we aim to answer with my visualization are:

1. **Can Pokémon stats be visualized in a way that is easily understandable, even for those without prior interest or knowledge?**
2. **Which Pokémon types are effective against which other types?**
3. **Which Pokémon types are the strongest in battles?**
4. **What are the evolutionary trends across different Pokémon generations?**

- **Learning Outcomes**: This project will offer insights into the relationships between Pokémon stats, type effectiveness, and battle outcomes. It will help us visualize and understand key stats that lead to battle success.
- **Accomplishments**: Our goal is to build an interactive visualization tool that answers these questions, allowing users to explore Pokémon stats, type matchups, and battle results.
- **Benefits**: The visualization will help benefit Pokémon fans and gaming enthusiasts by providing them with insights into how Pokémon attributes influence game strategies.

➢ Data

We will be utilizing three datasets sourced from Kaggle for our analysis and visualization.

1. **The Complete Pokemon Dataset (kaggle.com)** This dataset contains the names, Poke Dex number, their generation, abilities physical stats like height and weight, their typing, their defence multiplier against each type etc.

2. **Pokemon Images Dataset (kaggle.com)** This dataset contains images of all Pokémon, useful for adding visuals to the project.
3. **Pokemon Dataset with Team Combat (kaggle.com)** This dataset contains Battle data with IDs of two combatants and the winner which is useful for analyzing battle outcomes.

- **Data Processing**

We anticipate performing data cleaning and preprocessing. Key steps include:

1. **Handling Missing Data:** Addressing any missing values in the Pokémon stats to ensure data integrity.
2. **Deriving Quantities:** Normalizing features that denote the amount of damage taken against an attack of a particular type. Further we would groupe them into categories such as "Effective," "Not Effective,"

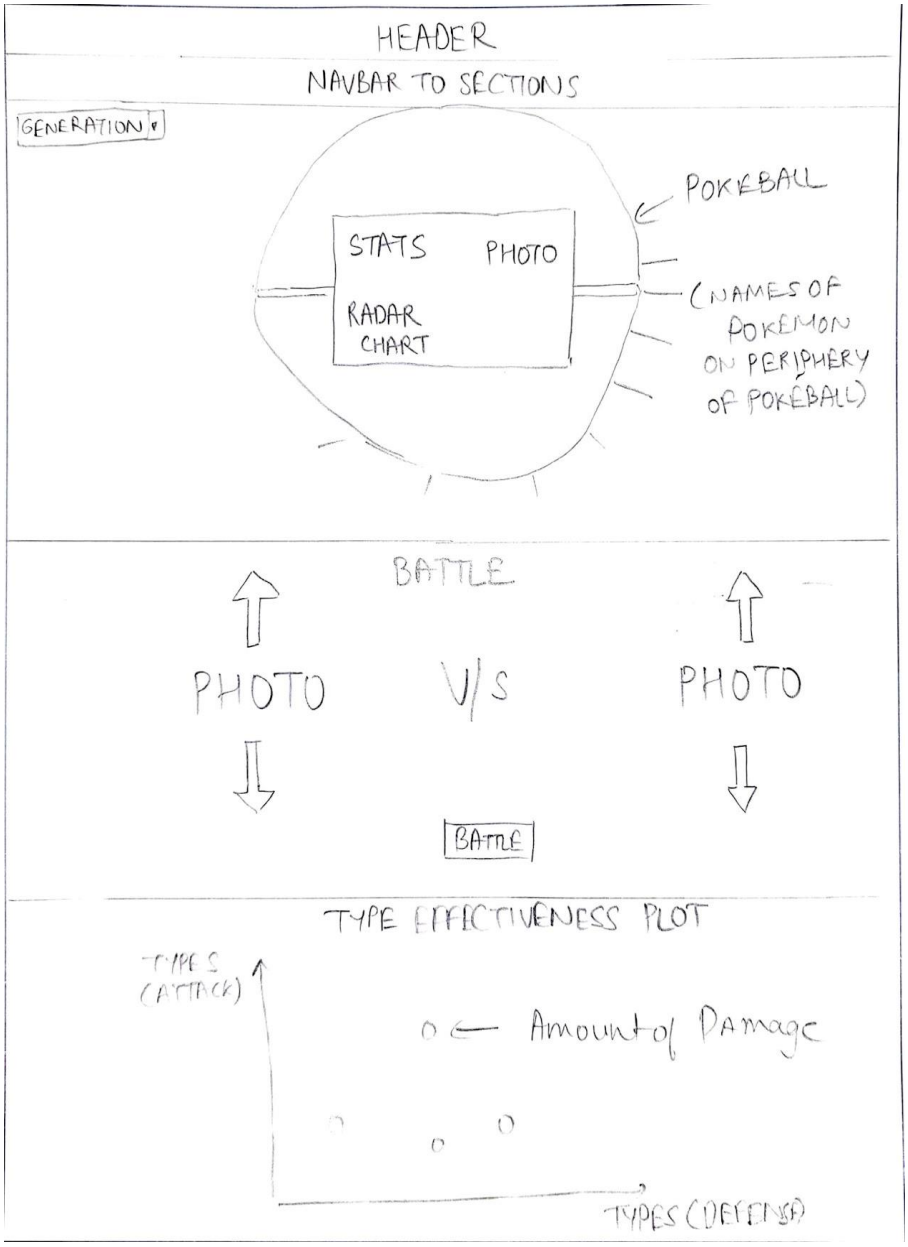
We would be utilizing Python libraries like pandas and NumPy for efficient data manipulation and preprocessing

- **Visualization Design**

To effectively display our data, we explored three alternative prototype designs for our visualization and then merged the best elements into a final design. In our design, we present a list of Pokémon in a table format, which offers an intuitive and familiar way of browsing. Pokémon stats are visualized in a histogram within the table. When a Pokémon is selected, a detailed breakdown of its stats (e.g., defense, attack), types, height, weight, and other key attributes is displayed using radar charts and box plots, focusing on special defense, special attack, defense, attack, and speed. The next section will showcase battle comparisons, followed by a type effectiveness matrix to visualize Pokémon type interactions.

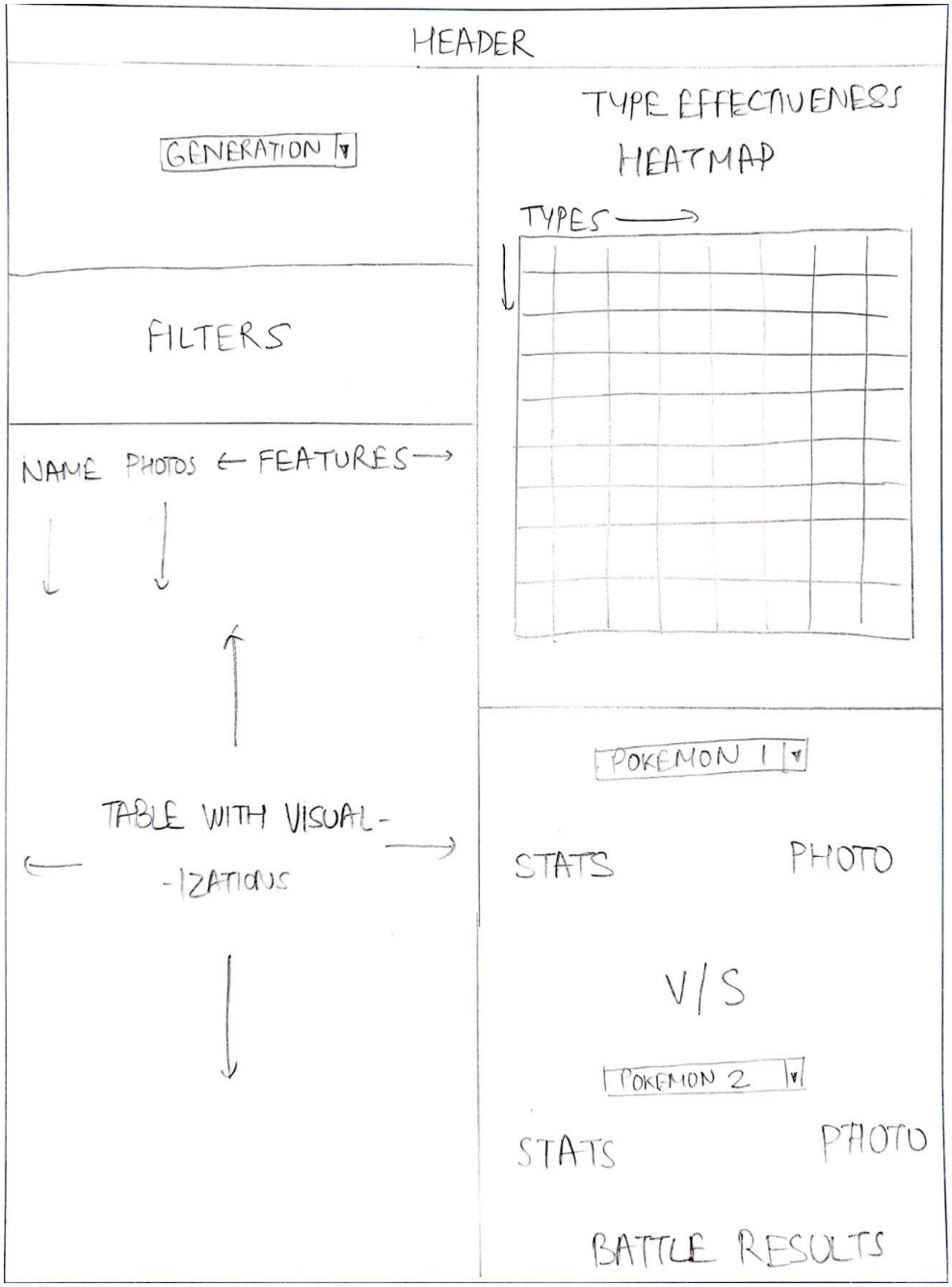
Below is an overview of the three prototypes and our final design, along with the reasoning behind our choices of visual encodings.

Prototype 1: Pokéball-Inspired Interface



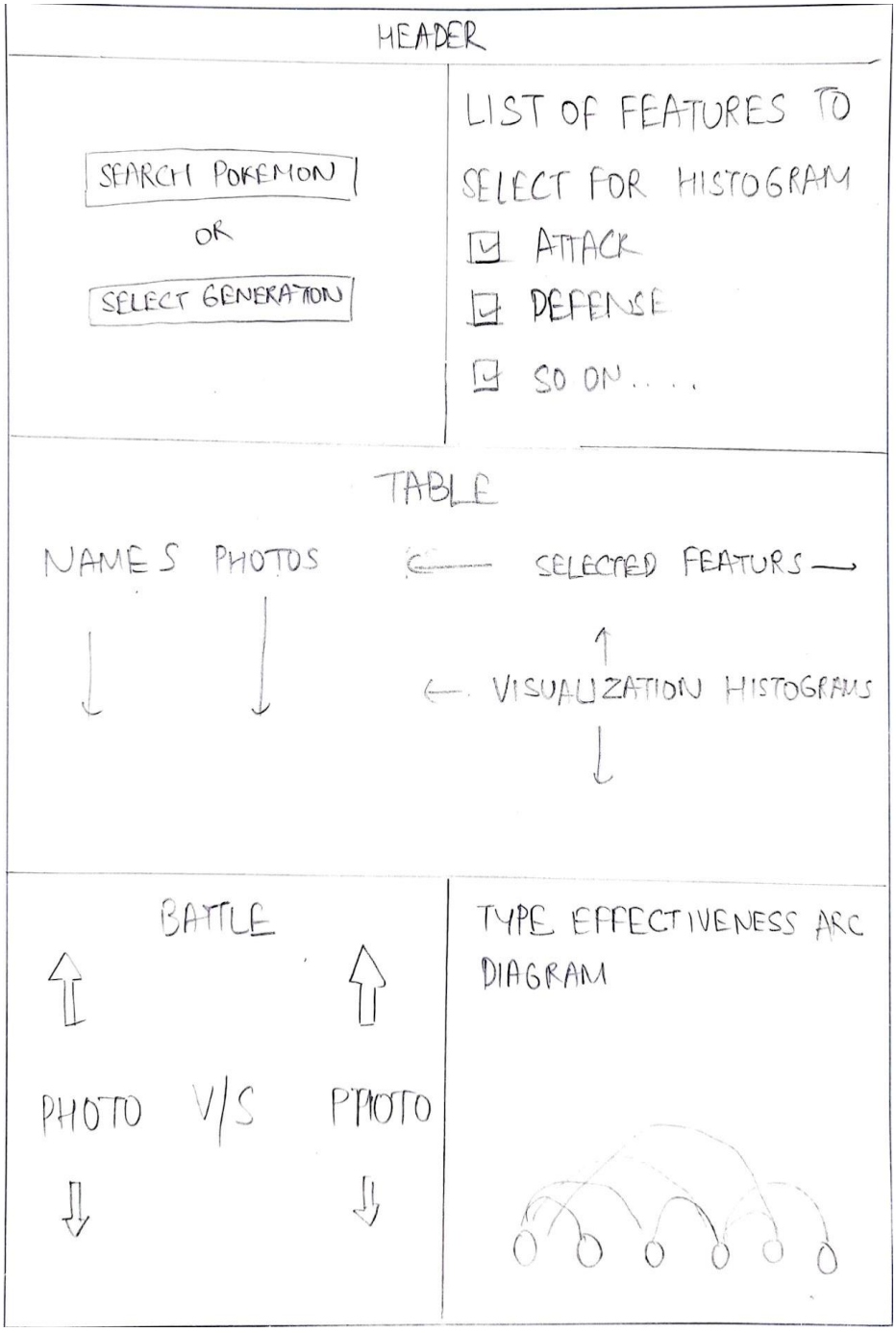
In our first prototype, we envisioned a Pokéball-themed layout where users are presented with a list of Pokémon from selected generations. Upon clicking a Pokémon's name, an information card appears, displaying the Pokémon's stats, photo, and a radar chart to visualize its key attributes like attack, defense, and speed. The next section of the webpage features a battle simulator. Users can cycle through Pokémon from the selected generation, view their stats, and simulate battles based on these statistics. The final section of this design incorporates a type effectiveness chart presented as a scatter plot. This visualization allows users to compare the damage output of different Pokémon types against each other and assess their overall effectiveness in battle. This design emphasizes simplicity and intuitive interaction.

Prototype 2: Split View Layout with Filters



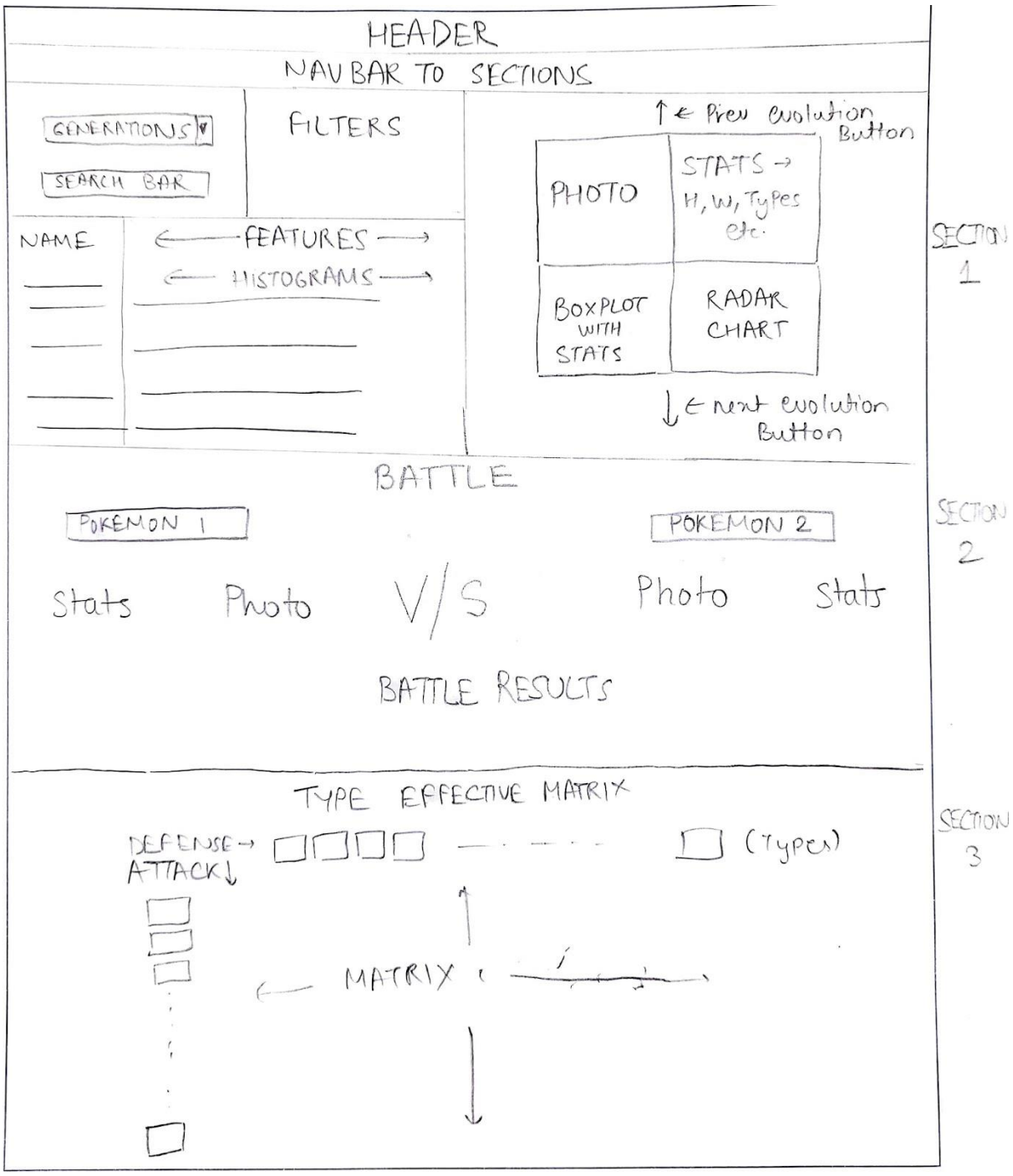
In our second prototype design, the webpage is split into two vertical halves. The left side displays a list of Pokémon, which users can filter by features like type, generation, or legendary status. The right side is divided into two parts: The upper section features a **type effectiveness heatmap**, allowing users to compare the relative strengths of Pokémon types in battle. The lower section includes a **battle simulator**, where users can select Pokémon from dropdown menus to simulate battles, with outcomes based on their stats. This design emphasizes user control over data filtering and comparisons.

Prototype 3: Checkbox Feature Selection with Arc Diagram



In the third prototype, users select features using checkboxes to filter a list of Pokémon and visualize selected attributes. The bottom section of the page is divided into: **Battle Simulator (left)**: Users can simulate battles between Pokémon based on their stats. **Type Effectiveness Arc Diagram (right)**: This diagram visually compares the damage output between Pokémon types, allowing users to assess which types are more effective in battle. This design emphasizes detailed comparisons and interactive features for exploring relationships between Pokémon types.

Final Design: Interactive Pokémon Dashboard



Our final design incorporates the strengths of all three prototypes, resulting in a comprehensive and interactive dashboard that balances usability with depth of information. Key elements of the final design include:

Section 1: Pokémon List and Filtering (Left): A list of Pokémon, which can be filtered by attributes such as type, generation, or legendary status. This section makes it easy for users to quickly find specific Pokémon or filter the list according to their interests.

Section 1: Radar Chart and Box Plot (Right) : Once a Pokémon is selected, its detailed stats (attack, defense, speed, etc.) will be visualized using a radar chart and box plot. These visualizations provide a clear and detailed comparison of the Pokémon's attributes.

Section 2: Battle Simulator: This section allows users to compare two Pokémon side-by-side by displaying their stats and simulating a battle. The battle comparison visualization provides a clear and engaging way to assess which Pokémon would likely win in a battle based on their statistics.

Section 3: Type Effectiveness Matrix: A type effectiveness matrix visually encodes how different Pokémon types interact with each other, showing which types are strong, weak, or neutral against others. This allows users to quickly understand the dynamics of Pokémon battles and the relative effectiveness of different types.

Justification for Visual Encodings:

- **Table Data with histogram stats**: Using a table layout to list Pokémon is a natural and organized way to display large datasets. It allows for sorting, filtering, and easy lookup of specific Pokémon and their features, making it accessible for users to view at a glance. Histograms provide a straightforward visualization of the distribution of key stats (e.g., HP, attack, defense) across multiple Pokémon. They allow users to quickly see which stats are common, rare, or skewed toward extremes, giving insight into the overall balance within the dataset.
- **Radar Chart**: Ideal for comparing multiple attributes of a Pokémon (attack, defense, speed) in a single view.
- **Box Plot**: Provides a clear statistical summary, highlighting medians, quartiles, and outliers for key stats.
- **Type Effectiveness Matrix**: A matrix visualization is intuitive for showing relationships between different types and understanding strengths and weaknesses.
- **Battle Comparison**: A side-by-side display allows for easy comparison of two Pokémon's stats and predicted battle outcomes.

➢ **Must-Have Features**

1. **Stat Distribution Histogram**: Display histograms to show the distribution of key Pokémon stats (e.g., HP, attack, defense) across the dataset.
2. **Radar Chart for Pokémon Stats**: Create radar charts to compare Pokémon across multiple attributes, representing each Pokémon with a unique polygon.
3. **Box Plot for Stat Distributions**: Use box plots to show the distribution of key stats (e.g., HP, attack, defense), highlighting medians, quartiles, and outliers.
4. **Type Effectiveness Matrix**: Visualize type interactions with a matrix displaying effectiveness levels, indicating which types are strong, weak, or neutral against others.
5. **Battle Comparison Visualization:** Display two Pokémon side-by-side with their images, stats, and the predicted outcome of their battle.

- **Optional Features**

1. **Evolution Journey**: Visualize Pokémon evolution, showing changes in stats and attributes across different stages.
2. **Circular dendrogram for Pokémon Matchups**: Display a central Pokémon surrounded by other Pokémon, color-coded to indicate which ones are likely to win or lose against it.
3. **Results Generated Using Generative AI**: Use AI simulations to predict Pokémon battle outcomes based on current stats and attributes.

- **Project Schedule:**

Sept 9/15 -> Finalize dataset selection and complete the project proposal

Sept 6/22 -> Clean and preprocess the dataset

Sept 23/29 -> Work on building project skeleton code

Sept 23/29 -> Create table to fetch backend dataset and convert the stats into histogram.

Oct 7/13 -> Work on Type Effectiveness Matrix

Oct 14/20 -> Polish the visualization design for Milestone Submission

Oct 21/27 -> Milestone Submission and start to work on Boxplot Visualization

Oct 28-Nov 03 -> Work on Radar Chat Visualization

Nov 4/10 -> Battle Comparison Visualization

Nov 11/17 -> Polish the visualization design

Nov 18/24 -> Submit the Project Screencast Submission and start on any additional

Nov 25-Dec 1 -> Work on Optional Feature if everything Must-have feature is completed.

Dec 2/8 -> Submit the final project