Welcome to Pokémon World

Process book

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1.   Introduction

The era of data refreshes the way people explore the unknown, from basic construction to aerospace engineering. Since the time that we were children watching Pokémon before televisions, Prof Oak from Pallet Town keeps searching and helping Pokémon Trainers to train their coveted Pokémon. He invented Pokédex to show the simple analysis of Pokémon, including Pokémon's height, weight, characteristics, etc. But we, as Pokémon trainers, always dreamed of being Pokémon Masters since we were children. So just analyzing the data of a single Pokémon is far from satisfying our needs.

In this context, we attempt to bring insightful visualizations about the raw data obtained from all these creatures that we love. What's more, we intend to dig deeper and compare their strength and weakness. Furthermore, we focus on an interactive, elegant and playful user experience so that our visualizations are not only informative but also aesthetically pleasing. To understand Pokemon better, our official website can be viewed on the following link:
https://com-480-data-visualization.github.io/data-visualization-project-2021-bit-shiba/.

2.   Problem Statement

Welcome to the Pokémon World! As the Pokémon data scientists in Pallet Town, we want to help our children and rookies explore the Pokémon world more easily. We would like to give them some advice on how to choose their coveted Pokémon and set up their own strong team. We strive for an elegant way to show Pokémon's characteristics and capabilities by using interactive graphs instead of numbers and tables.

With our data visualization, we would like to cover the following questions:

- What's the distribution of Pokémon varying different types? And what's the most known Pokémon in a specific type? And then we also give a detailed introduction of Pokémon in each type.
- Trainers may want to find a mix-type(combined type) Pokémon. Under our visualization, they can figure out an overview of these mix-type Pokémon. What are the connections among different types?
- What's the distribution of species strengths among types? What's the Pokémon with the highest/lowest species strength? What's the type with the highest/lowest average species strength? At the same time, minimum, maximum, and medium are given for each type.
- Last but not least, we help the trainer to team up his favorite team, showing the type, picture of each Pokémon! Furthermore, we can automatically indicate types that the team is weak/ immune to, and resists.

3.   Dataset

Pokémon shortened from Pocket Monster, is any of the documented species of the organisms that have evolved and inhabited the fictional "Pokémon World" with an innate connection to element-based supernatural powers. Officially, Pokémon is a Japanese media franchise managed by The Pokémon Company, a company founded by Nintendo, Game Freak, and Creatures. This year is in

commemoration of the twenty-fifth anniversary of the Pokémon franchise, which began with the original Japanese release of Pocket Monsters Red and Green for the Game Boy on February 27, 1996.

In the first part of the Pokémon Series, Ash Ketchum is allowed to start his journey in the world of Pokémon and dreams of becoming a Pokémon master. The same as Ash, many of us dream to become the Pokémon master! Based on the topic "How to become a Pokémon master", we gain our dataset and try to figure out a modern way to analyze our Pokémon.

We get our dataset from Kaggle, and its original resource is from https://serebii.net, which is the most famous online Pokémon website. The dataset consists of 50 columns and there are 890 Pokémon from generation 1 to 8. To assess the dataset, the dataset is quite accurate and relatively clear. There are not too many pre-processing works before our official visualization. After neglecting trivial variables, variables related to our project are shown below.

- *Pokedex_number*: The ID number of documented Pokémon in the National Pokedex
- *Name*: The English name of the Pokémon
- *Generation*: The numbered generation which the Pokémon was first introduced
- *Status*: The status of the Pokémon (A categorical feature contains: normal, sub-legendary, legendary, mythical)
- *Species*: The species of the Pokémon
- *Hp/ Attack/ Defense/ Sp_attack/ Sp_defense/ Speed*: The Base HP/ Attack/ Defense/ Special Attack/ Special Defense/ Speed value of the Pokémon
- *Height_m/ Weight_kg*: The Height/ Weight of the Pokémon
- *Against_?*: Eighteen features that denote the relationship of damages taken against an attack of a particular type
- *Abilities*: A stringified list of abilities that the Pokémon is capable of having
- *type_1/ tpye_2*: The Primary/ Secondary type of the Pokémon
- *Percentage_male*: The percentage of the species that are male. Nan if the Pokémon is genderless

4. Project Structure
4.1. List of the tools

There are five main interactive figures on our website: Bubble diagram, Chord diagram, Sankey diagram, Violin graph, and final selection page. As expected, we will use all lectures about HTML, CSS and, Javascript. The specific tools we used are as follows.

d3.js

Our graphs require the use of the d3.js library. Some visualizations are done with the help of the d3.js gallery, like the Bubble diagram.

Highcharts

Highcharts is a software library for charting written in pure JavaScript, first released in 2009. Other visualizations such as the Chord Diagram, Violin Chart and Sankey Diagram are done with Highcharts, which is a library with an API providing us lots of ways to modify the charts.

Bootstrap.js

Bootstrap is a free and open-source CSS framework directed at responsive, mobile-first front-end web development. It contains CSS- and JavaScript-based design templates for typography, forms, buttons, navigation, and other interface components. We use it to build our initial CSS file.

jQuery.js

jQuery is a JavaScript library designed to simplify HTML DOM tree traversal and manipulation, as well as event handling, CSS animation, and Ajax. It is free, open-source software using the permissive MIT License. As of May 2019, jQuery is used by 73% of the 10 million most popular websites.

Lecture and Tutorials

We are inspired by some examples introduced by lectures and exercises, such as interactive d3 (Lecture 5 and exercise 5), color marks, and channels (Lecture 6 and exercise 6). What's more, future lectures like graphs and tabular data will be of great help for our selection and comparison part (the radar chart). And there possibly are other lectures that will inspire us to do further perfection.

4.2. Architecture

To understand Pokemon better, our official website can be viewed on the following link: https://com-480-data-visualization.github.io/data-visualization-project-2021-bit-shiba/. And we describe here the file structure of the project in the docs/ directory:

• css: In this folder, we put in our css and the css library we use

  -"style.css" our main css file, including all the html css we use

  -"bootstrap.css", "bootstrap.min.css" are the css library.

• js: React components for each page and visualization. They are described in greater detail in the following sections.

  -select folder:include all the js we use in the select.html

  -bubble,chrod, violin…. Js, is each html js

•static: here include the static date of our pokemon

  -type_data.xml: including name,resists and weak to.

  -types.jason:the attribute restrain table of pokemon

  -pokemon.jason:the jason table of each pokemon, including detailed information.
.

• images: Images used for web pages and visualization.

5. Visualizations
5.1. Index Page

On this page, we give an overview of our project. Pikachu will lead you into our project. And on the right side, we show our project's purposed and ideas. Just click on the "Pokemon Go!" button, we will introduce you to the more interesting pages.

When it comes to Pokémon, you may have a broad outline of it from the games, the anime, the movies, and the trading cards, or are completely bewildered by the Pokémon mania that's gripping the Internet right now. Regardless of which camp you are in, sit back, grab your beverage of choice, and relax—we are going to get a detailed look at Pokémon and choose your favorite pocket monsters. Our website contains five different visualizations. The first part is a bubble diagram, presented in the form of "Poké balls". Then, in the second part, we wanna use the chord diagram to get an overview of the mix-type Pokémon. The third part is a violin graph to show the species strength distribution. Finally, we wanna users to choose their favorite Pokémon by comparing their basic skills, abilities, and other relational characteristics.

The main target of our website is to help either rookie, amateurs, or big fans of Pokémon to acquaint with Pokémon from different dimensions. First, we will use Poké Ball to display different types of Pokémon. Then the chord diagram will represent the relationship between different types, and the Sankey diagram will exhibit the relationship between species, growth rate, and catch rate. Finally, users can choose their favorite Pokémon by comparing the description information and 6 basic abilities exhibited by the radar chart.
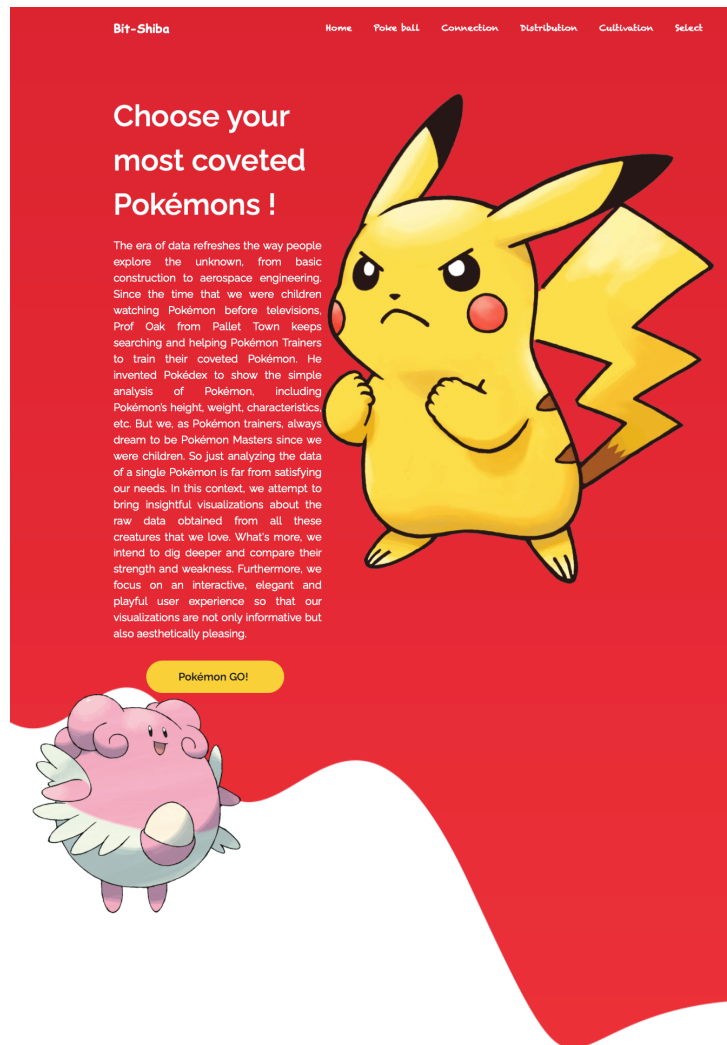
Figure. Index Page

5.2. Poké Ball Page

This visualization is designed to attract users to select their own Poké Balls and explore the basic characteristics of each type. Opening the Poké Ball, users can have the first understanding of their abilities, main skills, and macroscopic features. Selecting Pokémon through Poké Balls simulates the process of catching and storing Pokémon, which will let users feel the Pokémon world, and gain a better understanding of the legendary Pocket Monsters.

This bubble diagram displays as PokeBalls to exhibit different types of Pokémon. When selecting a Poke Ball, you can see detailed information of a type of Pokémon, such as the name, the number of each type of Pokémon, the typical abilities, appearance description, and skills assessment. Under this

text description, a typical image of each type follows. Combining the words and pictures, you can use a fast, easy, and vivid way to open your own Poke Balls, and choose the preferred type.
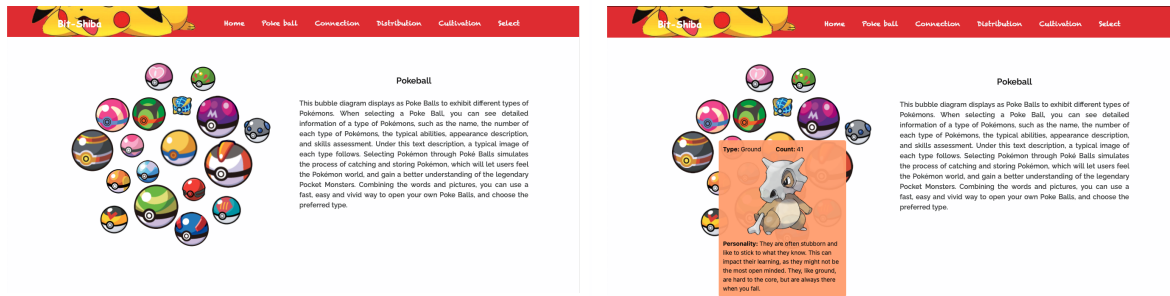

Figure. Poke Ball Page

5.3. Connection Page

After understanding the basic aspects of Pokémon, we want our users to go on exploring. There are plenty of mix-type Pokémon that make up the wonderful Pokémon world. We use the chord map to help them to get an overview of how a mix-type Pokémon looks like and its abilities. when they move their mouse they can see different kinds of representative Pokémon and their ability panel. Then they can decide whether they like this mix-type.

There are around 189 mix type Pokémon there, how to get an overview of the number of each type and mix-type can be hard, but thanks to chord diagram we can show it in an interactive way .using a chord diagram is intuitive, as we can easily represent the number of each mix-type with a node and trace a link between any two of the type. When the mouse hovers over the link, it will tell the number so that we can easily get which type of Pokémon has the most and which mix-type is unusual. We use **Highcharts** to finish our work and here is the documentation.

Other than just showing one type of Pokémon, users may want to find a mix-type (combined type) of Pokémon. We use the chord map to help them, when their mouse stops on a chord such as a fight and lighting, there will be a representative Pokémon name, pictures, their abilities panel on the right help the rookie to get an overview of this mix-type, whether they like how it looks, or be happy with their attribute.
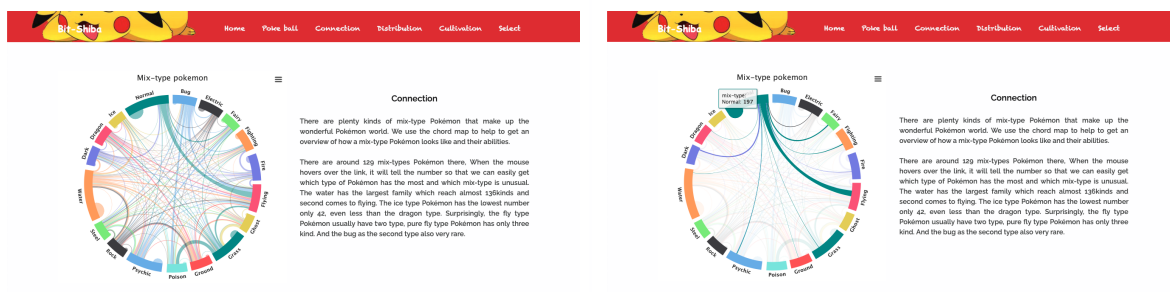

Figure. Connection Page

5.4. Distribution Page

Jingrong Chen; Siran Li; Chenkai Wang

Then we focus on the species strength, which is the sum of these six abilities. Species strength may be the most practical variable to measure the strength of Pokémon. There is a saying among players, we reckon that this is a quite powerful Pokémon when the species strength value is more than 550. Here a 'Powerful' Pokémon means it's better than the majority of Pokémon.

This visualization aims to help players to know Pokémon with high species strength. Each violin in our graph represents the data from the same type, such as Grass, Fire, Water, and so on. In this part, we use a violin graph to show the Pokémon's species strength. The y-label is the Pokémon's species strength, while the x-label is the primary type of Pokémon. We can see Dragon Pokémon tend to have the highest species strength among all the types. This is also the same as players' intuition.

As for the interactive part, when the viewer puts his mouse on each violin, for example on the Grass type's violin, it shows 1) the maximum of grass Pokémon's species strength; 2)the minimum of grass Pokémon's species strength; 3)the medium of grass Pokémon's species strength; 4) the Q1 and Q3 of grass Pokémon's species strength.

This can help players have a more type-based general view of Pokémon, which helps players to narrow down their target range and find their one and only coveted Pokémon team.
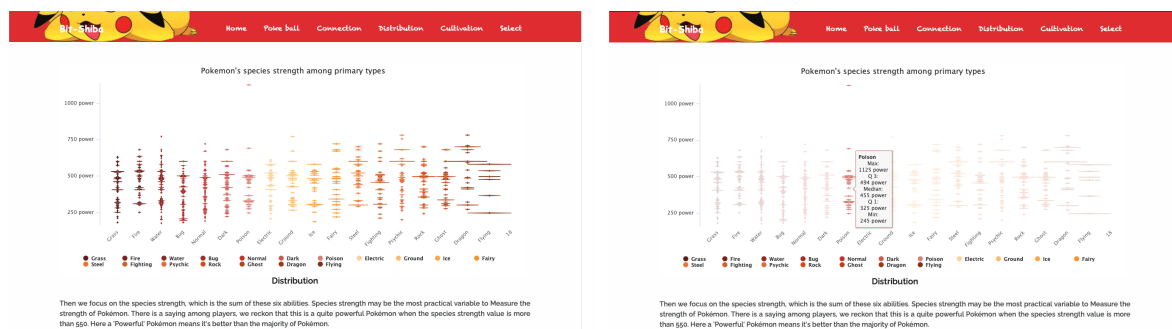

Figure. Distribution Page

5.5.   Cultivation Page

In the Sankey diagram, we focus on three attributes: types, catch rate, and growth rate (from the left column to the right column). Users can get information on the catch rate and growth rate of different primary types. The left column is the catch rate, we divide it into 5 degrees: when the catch rate ≤ 50, it belongs to the "Very Easy" section; when $50 <$ catch rate ≤ 100, it belongs to the "Easy" section; when $100 <$ catch rate ≤ 150, it belongs to "Middle" section; when $150 <$ catch rate ≤ 200, it belongs to "Hard" section; when catch rate ≥ 200, it belongs to "Super Hard" section. And the growth rate has 6 levels: 'Slow', 'Medium Slow','Medium Fast', 'Fast', 'Erratic' and 'Fluctuating'. When the mouse hovers over the link, it will tell the count number of Pokémon belonging to each level, so that we can easily find out which kind of species is easier to catch and faster in growing.
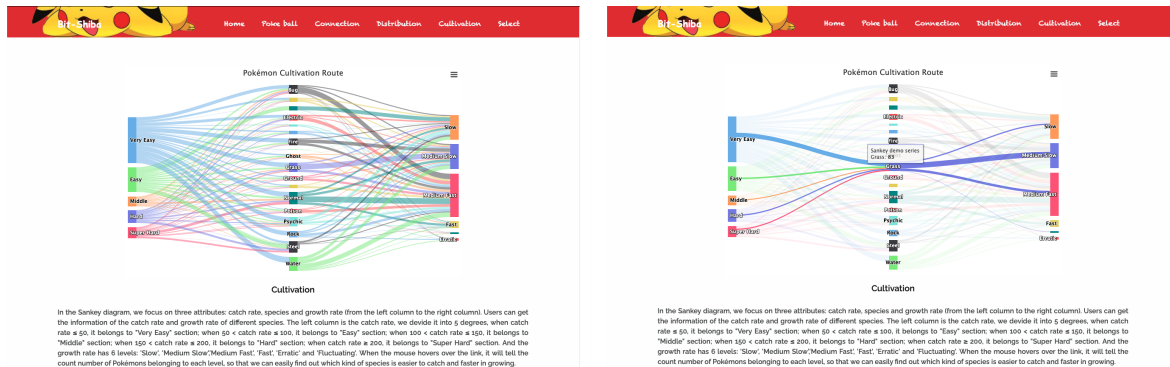
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Figure. Cultivation Page

5.6.   Selection Page

Here, we give visualization to compare different Pokémon and inspire you to choose your coveted Pokémon. This the final and the most important step to achieve our goal. Here, we provide an interactive figure to have a specific view and several chosen Pokémon. Also, you can check all the Pokemon with their Evolutions below. Players can choose 6 Pokémon, and our website will give pictures of these Pokemon, as well as their names and types.

Furthermore, we can automatically indicate types that the team is weak/ immune to, and resists. Some attached information such as the Pokémon's generation, type, and evolution can also be used to search for a specific Pokemon.

After the comparison and comprehensive consideration, you can draw a conclusion to team up your own coveted Pokémon team! Hopefully, after this part, the player can have a deep understanding of these Pokémon and find their coveted ones.
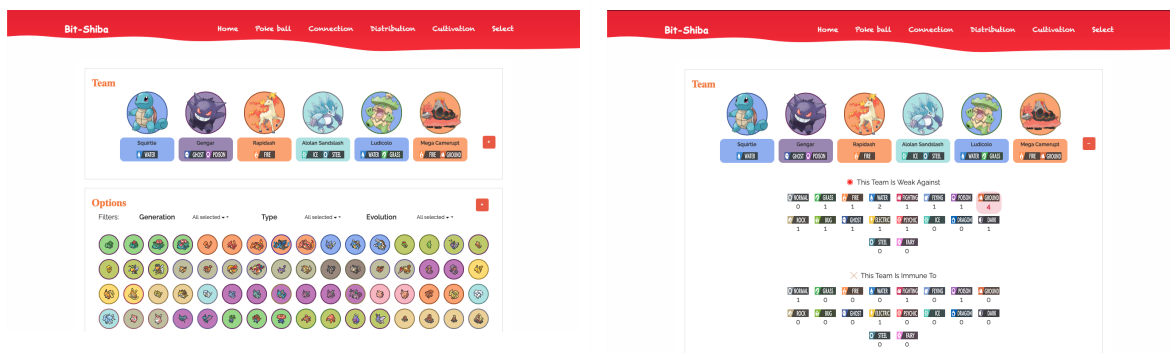

Figure. Selection Page

6.   challenges and design decisions

Each member is a rookie in web development, the first challenge to us is working with css. We have to try many times to get the desired layout we want, sometimes if we change one place, the other will change. We decided not to use any other structure such as vue or something like that. It's quite challenging but we got so much we can learn from it

Jingrong Chen; Siran Li; Chenkai Wang

The second challenge is the js, in this project we mainly use D3,highcharts to help us draw the diagrams. It took time to get a full understanding of these extended libraries. For the bubble diagram, we use D3 to finish it. When it comes to sankey chords and violin graphs, it's quite difficult to use D3 so we mainly use highcharts to help.

The most difficult part is the select.html part, there are hundreds of pokemon, and for each pokemon, we need a profile of them and their type. Our solution is to use a big png picture including all the png of pokemon and use css to locate each pokemon. However, the work of entering the information of each pokemon is quite time-consuming. We took almost two days to enter all the data of each pokemon including their type, name, and css position. We use python to help us generate the css and art.png. to recognize some of the pokemon is hard sometimes.

7.   Peer Assessment

Each member mainly worked on its visualization(s) and the necessary data processing. We all contributed to the general visualization ideas and decisions that lead to the final website result. And the toughest part, the selection page, is also contributed by all of us three.

Jingrong Chen:
• Website design
• Web app setup, global structure
• Chord diagram (data processing, visualization, and animations)
• The selection page
Siran Li:
• Website design
• Bubble diagram (data processing, visualization, and animations)
• Sankey diagram (data processing, visualization, and animations)
• The selection page
Chenkai Wang:
• Website design
• Violin chart (data processing, visualization, and animations)
• Helped with data processing (pandas)
• The selection page
• Finish the process book

8.   Conclusion

In this project we worked on different visualizations about Pokémon, to showcase their appearance and charisma. We opted for a web application that renders a page for each visualization rather than a single linear page. The implementation was realized with modern web technologies including ReactJS, Babel, Webpack and visualization libraries D3 and Highcharts, and custom barebone JS components.

We hope that users can explore and experiment with the different visualizations with an overall fun, elegant and engaging experience that provides them with visual insights into Pokémon World.