Process Book
Pokémon visualization

Data visualization

Sena Cetin

Kamil Seghrouchni

Ludovic Delisle

Team: analaktycs

Bubble plot: Conception

Motivation

From the moment we decided to use Pokemon data, we knew we wanted to visualize Pokémon stats in an interactive way so that it would serve as a guide for players and fans, where they could easily view the distribution of each Pokémon's stats and decide which one to choose in battles. The existing data visualizations on Pokemon did not have a generation-wise display of their stats. The generation-wise display is especially important for players as each game only includes a certain generation. Therefore, we wanted to fill in this gap and provide our audience with a stats plot, making it as informative as possible.

Changes since milestone 2

In our second milestone, we had included some extra ideas for figure 1, one of which was the generation-wise toggle switch that would either show all the Pokémon together in one graph or separate them into their respective generations. Due to the high number (721) of Pokémon, it became impossible to fit them all into one graph. Therefore, we have decided to only keep the generation-wise view. Another extra idea we had was the "Randomize my variables" button. We have decided that it would not add enough visual value to the graph and therefore have diverted our efforts into more meaningful functionalities. Another design change was to use a dropdown menu instead of a slider for selecting the generation in order to carry out the same design decisions for each visualization.
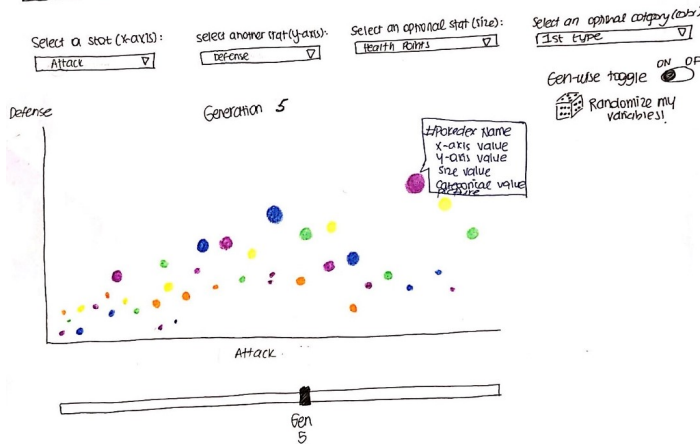
Dropped idea

We have decided to not include Fig1.1 stated in our second milestone that would show interesting plots as it was not an interactive enough chart for a data visualization course.

Challenges

Making an interactive data visualization requires many trials and errors and obviously has its challenges. One of these challenges was during the generation-wise split of the Pokémon. It was complicated to update the displayed Pokémon in the chart each time the generation was changed due to the differing numbers of Pokémon in each generation. Another challenge was having to make adjustments to the dataset by hand since there was no complete dataset on some of the features. The hardest challenge was making this chart work with other charts on the website due to the differing versions of d3 in each of our visualizations.
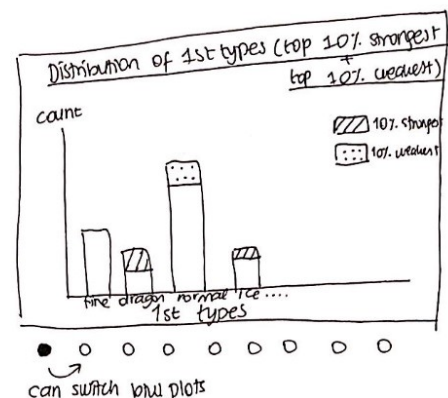
Bubble plot: Overview

Description:
This bubble chart provides many insights for players and fans. Firstly, players can make informed decisions before choosing their Pokémon. They can specify the variables that they care about the most in the generation that they want to play, e.g. Sp. Attack, Speed, HP, Psychic type, and Generation 1, and find the pokemon that is best-suited for their choices, which in this case would be Mewtwo. Secondly, players can even decide which generation of game to play using this chart. They can view the approximate distribution of each type in each generation, take a look at the pokemon in each generation, and choose the generation that they prefer. Thirdly, they can observe any correlations between the selected variables, i.e. any of the battle stats or the physical stats. They can also observe how types are distributed along the graph, i.e. if their stats are evenly distributed or they have an overall superiority in a certain aspect.

Drop down menus that allow the user to choose the features to display on x and y axis of the scatterplot

Drop down menu that allow the user to choose the generation of Pokémons that he wants to display

Tools and inspirations:
We have been inspired by the Mark Channel lecture of week 6, where it is explained that you can utilize position, hue, and size to show your continuous variables and color to show your categorical variable. That meant that we could display three continuous variables and one categorical variable all of which could be selected by the user. Two of the continuous variables would be displayed in the x- and y-axes and the third continuous variable would determine the radius of the bubbles. One of the most crucial traits of Pokémon are their types, which determine their superiority/inferiority over another type. We used the same colors for the bubbles that are used to indicate Pokémon types in the game. Moreover, we decided to use a tooltip to show the Pokémon each bubble belongs to along with the Pokémon's stats

| Attack ⌄ | Defense ⌄ | HP ⌄ | Generation 1 ⌄ |

Defense

Drop down menu that let the user choose the feature for the 3rd axis of the scatterplot, which correspond to the size of the dots

Legend that tells us what the colors of the scatterplot correspond to

- normal
- fighting
- flying
- poison
- ground
- rock
- bug
- ghost
- steel
- fire
- water
- grass
- electric
- psychic
- ice
- dragon
- dark
- fairy

Each dot of the scatter plot has a mouse-over event that will give the user even more informations !

Attack

#150 Mewtwo

HP: 106 Attack: 150 Defense: 70 Sp. Atk: 194 Sp. Def: 120 Speed: 140 Weight (kg): 122 Height (cm): 200

Dot mouse-over event: When the user hovers his mouse over this display will appear, showing a picture of the Pokémon and displaying all of its stats
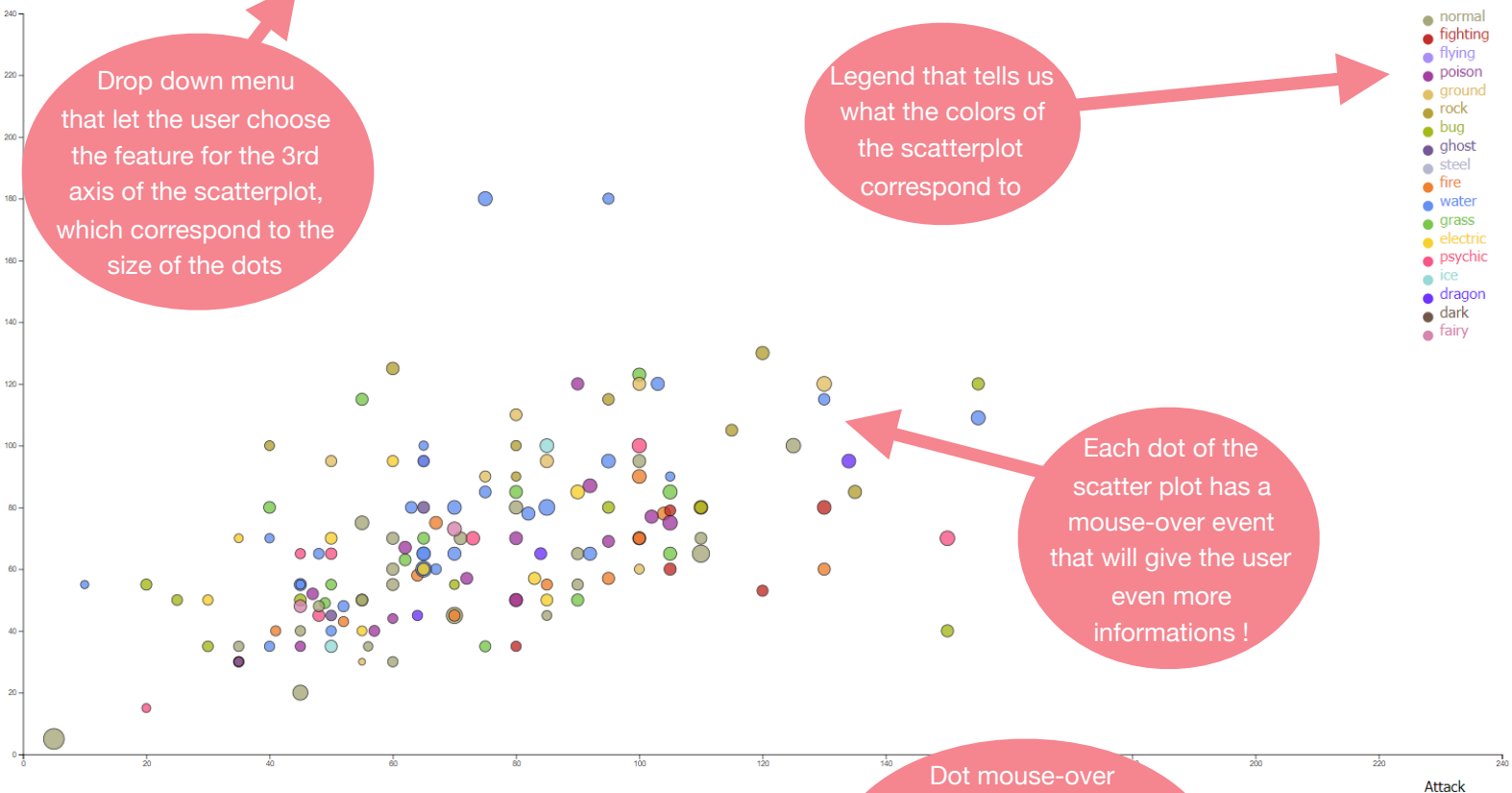
Bipartite visualization

Motivation:

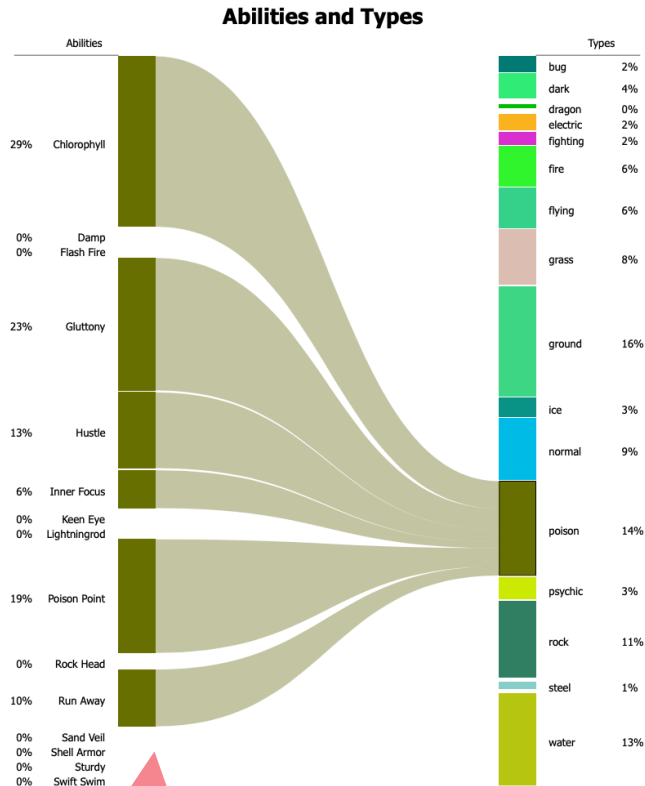Feature relationship investigation has always been for us a really important part of our visualization as it was our main difference compared to the existing related work done so far. The idea here was to provide the reader with some concrete information on Pokémon's characteristics so that it would help him at end both better understand Pokémon dynamics across generations and gaining insights on one or a subset of Pokémon of interest. That way, the reader would have at his disposal a Pokémon recommender system.

Abilities | Body style | Color

Abilities and Types

Abilities		Types	
29%	Chlorophyll	bug	2%
		dark	4%
		dragon	0%
		electric	2%
0%	Damp	fighting	2%
0%	Flash Fire	fire	6%
23%	Gluttony	flying	6%
		grass	8%
13%	Hustle	ground	16%
6%	Inner Focus	ice	3%
0%	Keen Eye	normal	9%
0%	Lightningrod		
19%	Poison Point	poison	14%
0%	Rock Head	psychic	3%
10%	Run Away	rock	11%
0%	Sand Veil	steel	1%
0%	Shell Armor		
0%	Sturdy	water	13%
0%	Swift Swim		

Buttons that the user can click to select the feature display

generation 1

Drop down menu that let the user choose the Pokémon generation that is to be explored

Column of the bipartite plot displaying the chosen feature. In this case, the chosen feature is "Abilities". Moreover, there's a mouse-over event that will put the focus on the targeted value

default column of the bipartite plot displaying the type feature. Moreover, there's a mouse-over event that will put the focus on the targeted type. In this case, the user is hovering over the poison type

Evolution of the visualization:

Initially, this part was only going to be displaying a bipartite graph showing the intricate relationships between Pokémon two features in terms of mutual appearances frequencies. But in order to make it more specific and for the displayed information to be more consistent, choice was made to put a focus on the type feature as we thought it was a key difference across the Pokémons hence implying specific and dedicated abilities, body styles and colors. Hence, the reader would hover over a given and immediately be displayed the related selected feature.
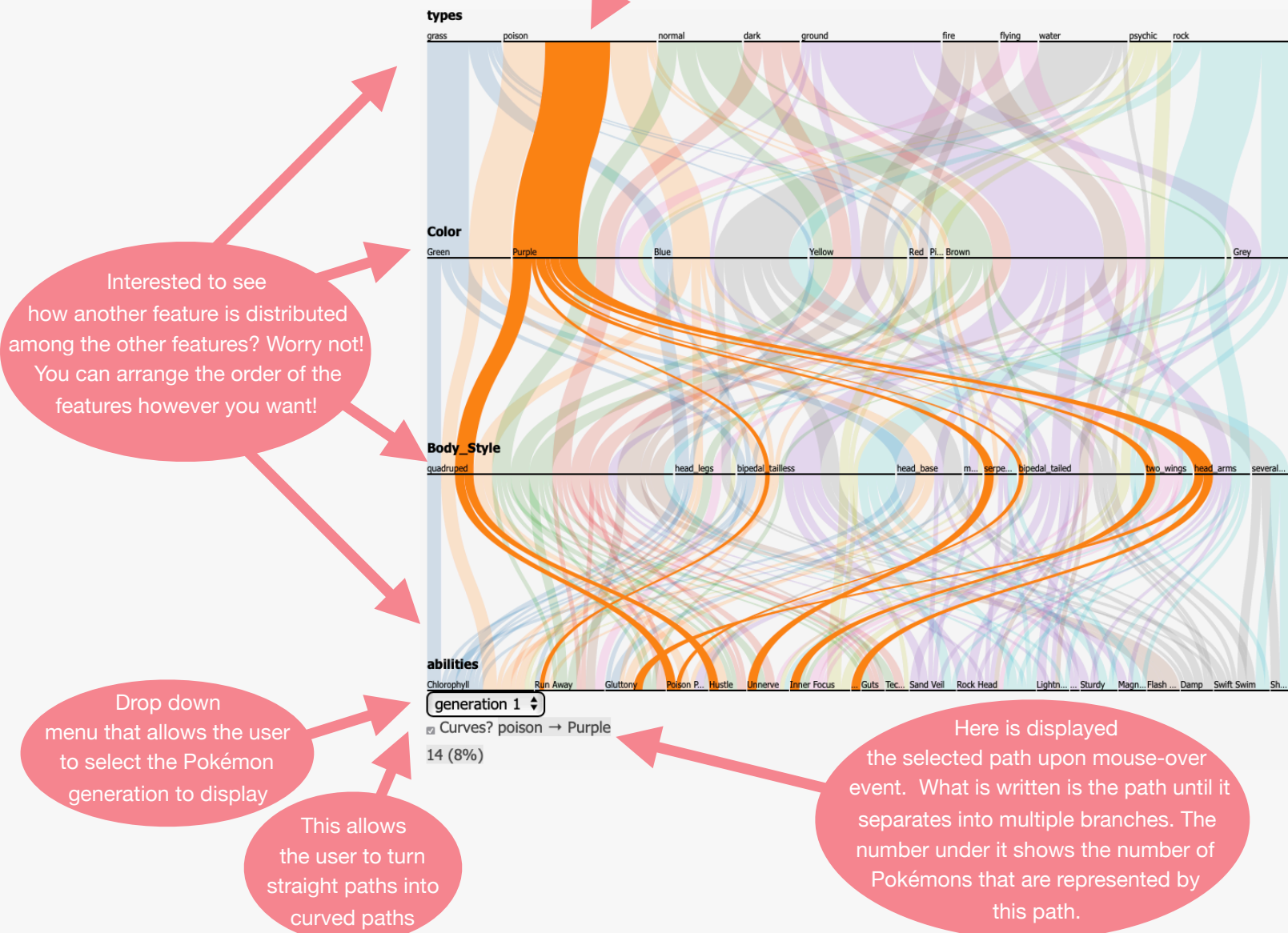
Parallel feature representation

Motivation:

The previous plot is a good start, however, we felt like such investigation was on its own insufficient regarding the true outcome for the reader. In fact, our work needed to approach feature investigation more in depth and put together the independently gained insights on the selected feature pairs. Moreover, one might also say that since one of our edge was to provide esthetic related informations for a final Pokémons choice, it felt like such investigation would not fulfill completely its purpose without allowing the reader to filter by body shapes or color and ending up with a subset of Pokémons names matching his criteria. That is why an initially single bipartite figure has been completed by two other visualizations.

First additional visualization

In order to complete our bipartite visualization, we made a parallel figure displaying the left combinations and choices of feature elements after selection of one. This provides the existing patterns across the generations and links together the individually gained insight as the readers hovers over a feature element and observes both the highlighted data as well as the Pokemon.
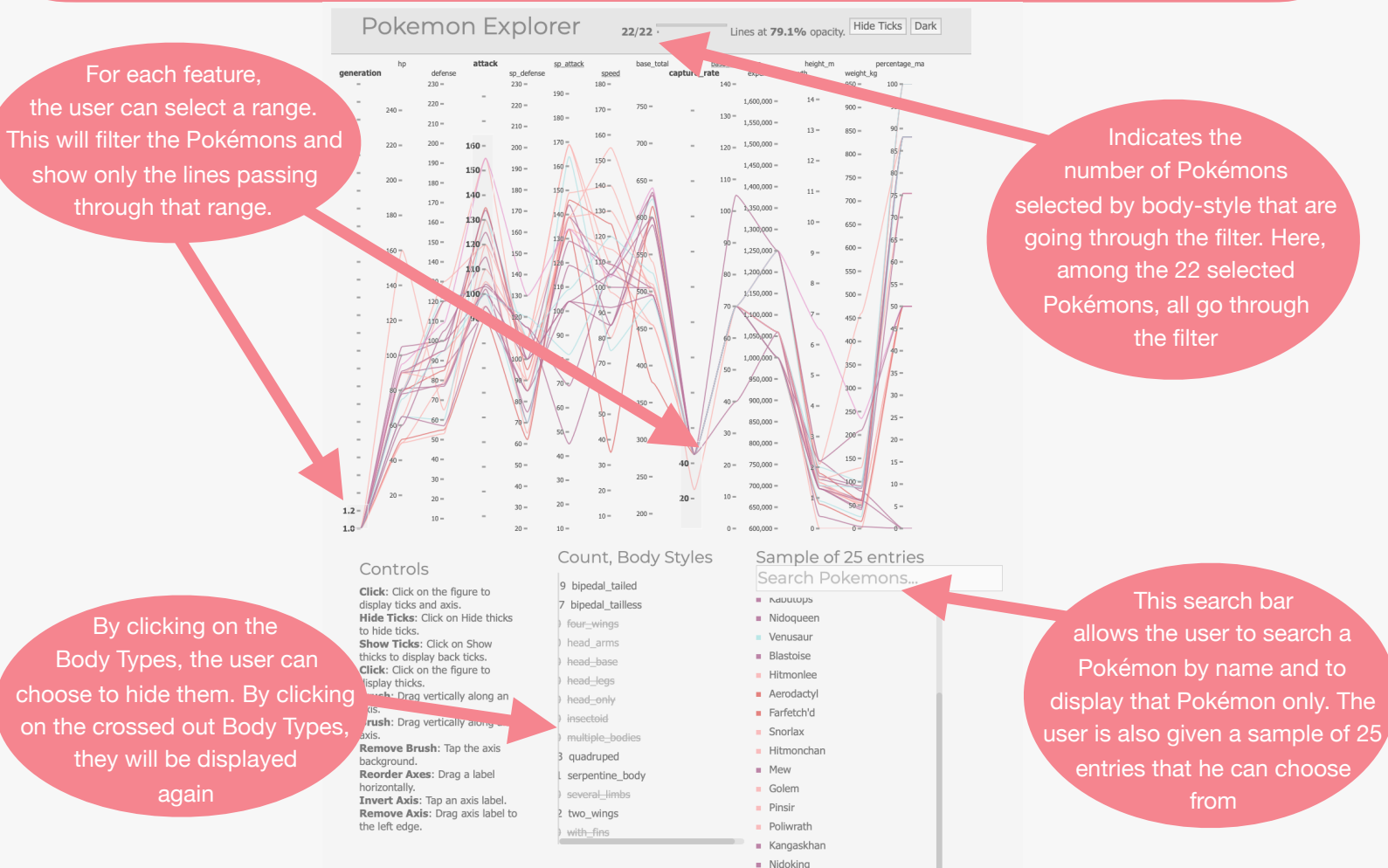
Mouse-over event:
When the user hover his cursor over a path, the later will be put into focus and it will be very easy to see the possible paths for the selected value

Interested to see how another feature is distributed among the other features? Worry not! You can arrange the order of the features however you want!

types

grass   poison   normal   dark   ground   fire   flying water   psychic rock

Color

Green   Purple   Blue   Yellow   Red Pi... Brown   Grey

Body_Style

quadruped   head_legs   bipedal_tailless   head_base   m... serpe... bipedal_tailed   two_wings head_arms several...

abilities

Chlorophyll   Run Away   Gluttony   Poison P... Hustle Unnerve Inner Focus ... Guts Tec... Sand Veil Rock Head   Lightn... ... Sturdy Magn... Flash ... Damp Swift Swim   Sh...

generation 1 ▼

☑ Curves? poison → Purple
14 (8%)

Drop down menu that allows the user to select the Pokémon generation to display

This allows the user to turn straight paths into curved paths

Here is displayed the selected path upon mouse-over event. What is written is the path until it separates into multiple branches. The number under it shows the number of Pokémons that are represented by this path.

Coordinate visualization

Second additional visualization:

In order to further complete our visualization, we also made a coordinate display aiming at providing the reader information on categorical features impact upon body style choice. The idea was to help the reader understand and compare the outcome of a given body style on its Pokémon behaviour and characteristics. By displaying only continuous numerical features, the reader would have at the end a broad and complete overview of the main Pokemon characteristics and could connect them in his final Pokemon choice. For that, a list of Pokemon matching the filter criteria was displayed and updated upon the reader's choices and selections and the number of shown Pokémons is updated in real time (shown on top). Filters are created by selecting a subset for a given feature upon clicking and dragging as well as selecting and deselecting body styles in the corresponding section. Generation related comparisons were also made possible that way by displaying them in the first axis even though it was a categorical feature.without allowing the reader to filter by body shapes or color and ending up with a subset of Pokémons names matching his criteria. That is why an initially single bipartite figure has been completed by two other visualizations.

For each feature, the user can select a range. This will filter the Pokémons and show only the lines passing through that range.

Indicates the number of Pokémons selected by body-style that are going through the filter. Here, among the 22 selected Pokémons, all go through the filter

By clicking on the Body Types, the user can choose to hide them. By clicking on the crossed out Body Types, they will be displayed again

This search bar allows the user to search a Pokémon by name and to display that Pokémon only. The user is also given a sample of 25 entries that he can choose from

Challenges:

Such visualizations were challenging in many ways, whether in terms of the existing feature diversity both at feature number and element per feature level or in terms of the technical tools used for the implementation as well. In fact, by looking at the Pokemon distribution per feature, the reader will discover a high sparsity and diversity making it difficult to unravel significant relationships for a majority of Pokemon. Moreover, their total number makes it even more difficult as it increases the number of possible combinations. Hence, choice was made to only display most represented elements per features at each generation and to investigate the relationships between them only. At the end, the Pokemon explorer allows to wrap up by displaying the total number of existing Pokemon for the selected features. Regarding the technical challenges experienced, merging all the figures and finding the architecture coord implementations that would make them coexist was a hard task. More precisely, it concerned mostly the different d3.js versions used in the various figures as well as the underlying implementations allowing the figures to be interactive. In fact, this part uses conflicting versions of d3.js from v2 to v4 and without a strong background in JavaScript libraries it took sometime to debug and find all the workarounds for our figure to be fully functional without one impacting another. Pokémons names matching his criteria. That is why an initially single bipartite figure has been completed by two other visualizations.

Circle chart: Overview

Drop down menus that allow the user to select the pokémon generation he wants to visualize and to choose the feature that interests him.

Display of all the values among the selected feature. Serves as a legend for the colored dots below

Dots arranged in circle around a Pokéball designed circle. Each dot has an on-click and on mouser-over event that will give more information about the corresponding Pokémon

Sound icon that can be clicked to turn on and off the sound

generation 1   Type   🔊

grass fire water bug normal poison electric ground fairy fighting psychic rock ghost ice dragon
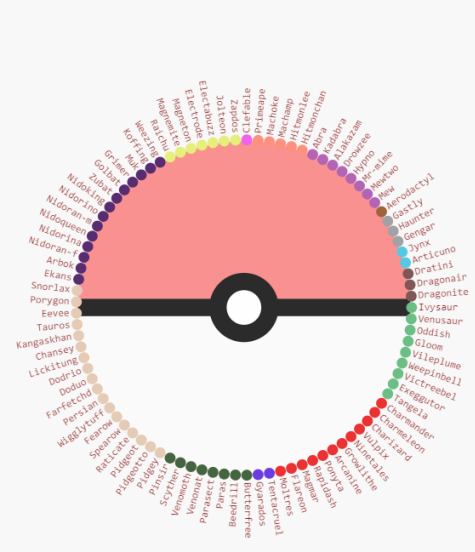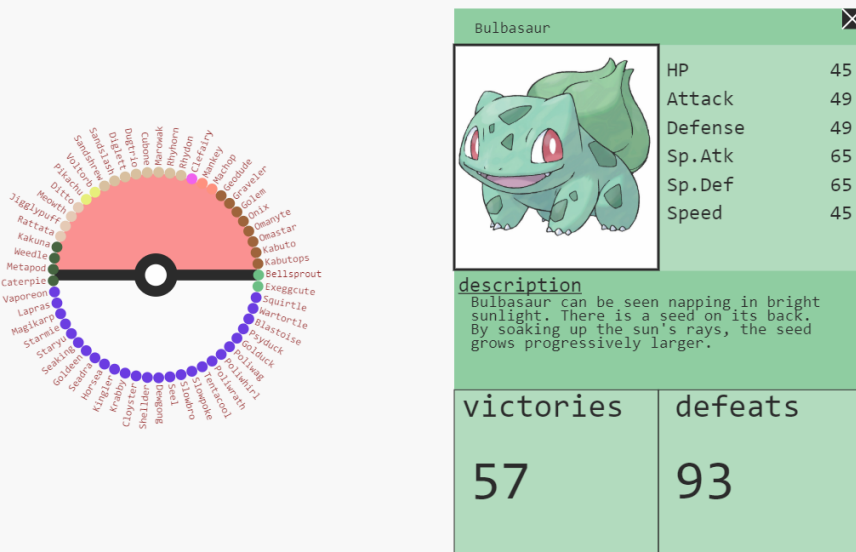
Dot Mouse over Event:

When the user passes its mouse over one of the dot, an ID card like this will appear in the middle of the Pokéball. The ID card displays a picture of the selected Pokémon and a spider chart showing its stats.

Gengar

hp
def
atk
sp_def
sp_atk
spd
30 60 80 95 170
200

Challenges encountered with those elements:

1) I had a very hard time to deal with the CORS policies and play the Pokémons cries.

2) As there are a lot of Pokémons, it would have been impossible to display all of them around the same circle so I splitted them generation-wise but it was still difficult to find the right proportions and make it easily readable on all screens.

3) Displaying the names in a circular fashion was very tricky.

Circle chart: Changes since last milestone

Bulbasaur

HP	45
Attack	49
Defense	49
Sp.Atk	65
Sp.Def	65
Speed	45

description
Bulbasaur can be seen napping in bright sunlight. There is a seed on its back. By soaking up the sun's rays, the seed grows progressively larger.

victories	defeats
57	93

When the user clicks on one of the dots, multiple actions will be taking place :
- The selected Pokémon cry will be played, although it is not very useful, it brings a bit of uniqueness to the visualization.
- The dots will form two new Pokéballs with the loosers and winners of a fight against the selected Pokémon (see more on that on next page).
- The info sheet will appear in the middle of the screen. This info sheet displays the stats in another way than the spider chart which might be easier to read if the user is just interested by the values and not by the ratios. There will also be the game description of the Pokémon. Finally, it will also display the number of victories and defeats among the selected Pokémon's generation

Why such a display ?

Challenges

The main challenge with displaying it that way was that we initially coded it on a big screen and it was already hard to make everything fit in. Coming up with a set up that allows the user to clearly see everything without zooming but also being careful that there is nothing off screen when displaying the results of a very weak/strong Pokémon because there's a huge difference in size between the two circles, was a very complicated task. The second challenge was caused by retrieving the Pokémon's descriptions and battle results from online websites. We came across a lot of CORS policies or websites where it was impossible to retrieve that text. Data scrapping with python finally did the trick.

Displaying the victories and defeats with two circles is very visual and easy to understand. Indeed a smaller circle on the victories side than on the loss side indicates that the selected Pokémon is weaker than most other Pokémons from that generation. Moreover, it is very easy to see the strengths and weaknesses of the Pokémon. In that example, we can clearly see that bulbasaur is very weak to fire but very strong against water type Pokémons.

The new spider chart !

This is a small change that is nonetheless quite important. The idea with the spider chart was to display the stats in a way to be able to see the strength/weaknesses of a Pokémon. For example, we can see here that two of the stats seem higher than the others. However, the problem was that it was confusing to not know the exact value of each stat and that outer ring system made it even more confusing. Adding the values made the chart much more clear.
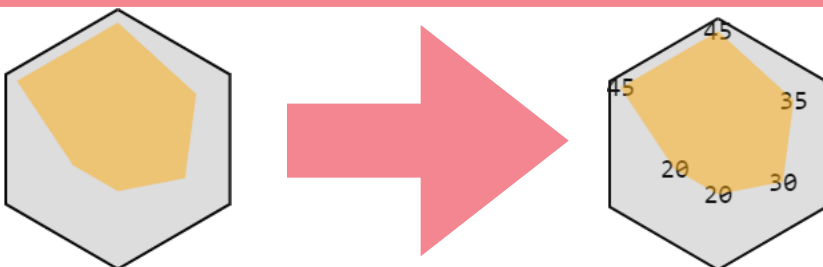
The legends

It was not possible to understand this visualization without a legend, we had colored dots but there was no way of knowing what their color corresponded to

Peer assessment

Each member worked on the figures that peaked their interest the most. The main contributions of each member may be summarized as:

Sena:

Hosting the page on github.io; finding an appropriate bootstrap; abstract and visual appearance of the page; bubble plot visualizing of Pokémon stats and all the related textual information and presentation. Sena also took care of the screen cast.

Kamil:

Implementing feature relationship investigation related figures. That means the bipartite graph as well as parallel and coordinate graph but also all the related textual information and presentation. Kamil also took charge of merging each and everyone's figure in a single html file, dealing with the issues that came along.

Ludovic:

Implementing combat arena visualization from the overall display to the single Pokémon combat focus and writing all related textual information and presentation. Ludovic also took charge of the visual appearance of the process book as well as integrating the different contributions to it.