

Homework 3: Pokemon

Introduction

The goal of this homework was to find the strongest Pokemon and the strongest team of Pokemons. To do so, I have decided to set battles between different Pokemons to give them a score. This score was used to compare Pokemons.

1. Formalization

Problem: 1- Find out which is the strongest Pokemon
2- Find out which is the strongest Pokemon team

Definition of Pokemons: First-generation Pokemons (151 Pokemons)

Definition of strong: the ability to defeat other Pokemon in a battle

Definition of battle: a duel between two Pokemons defined by a battle function written in Python. This function can be found in the PokemonFunctions.py

2. Strongest Pokemon

2.1. Experiment 1

To find the strongest Pokemon I have decided to set battle between all Pokemons in a Python program because their total is only 151. Every Pokemon fights every other Pokemon. The winning Pokemon gets 2 points. They both get 1 point in the case of a draw. These battles make it possible to have a strength score for each Pokemon.

Results

Cloyster, Mewtwo, Mew

Comments on the results

The results of this experiment were not stable but Colyster was usually the strongest.

2.2. Experiment 2

In order to have scores that are more stable, I have decided to make Pokemons fight each other 5 times and not only 1 time. The rest of the experiment is identical to Experiment 1.

Results

- 1 - Cloyster
- 2 - Mewtwo
- 3 - Mew

Comments on the results

The result is statistical. This means that Mewtwo can come sometimes as the strongest Pokemon but very rarely.

2.3. Experiment 3

I have decided to change the score of a draw battle to 0 points. The rest of the experiment is identical to Experiment 1.

Results

- 1 - Mewtwo
- 2 - Mew
- 3 - Cloyster

Comments on the results

We can understand that Cloyster is capable of having more draws but necessarily winning. The goal behind the battles is deciding if one Pokemon is stronger than the other. A draw, however, is not useful in determining if one is stronger than the other.

2.4. Experiment 4

I have decided to set a battle between the top 3 Pokemons Mewtwo, Mew, and Cloyster. However, we should not forget that the strongest Pokemon is the one that defeats the most other Pokemomons.

Results

Cloyster defeats both Mewtwo and Mew.

Comment on results

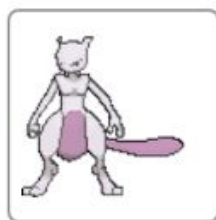
If Cloyter can beat Mewtwo and Mew this does not prove that he can beat more Pokemons than them. This is why this experiment is not very useful.

2. 5. Theoretical comparison

By reading documentation, we can find out that Mewtwo and Mew are one of the most powerful Pokemon in terms of the abilities numbers and diversity: attack, speed, etc. However, other than its very good defense Cloyster has lower numbers.

Mewtwo

Base



Type: **Psychic**
Abilities: **Pressure**
Unnerve
Tier: **Uber**

HP:	106	<div></div>
Attack:	110	<div></div>
Defense:	90	<div></div>
Sp. Atk:	154	<div></div>
Sp. Def:	90	<div></div>
Speed:	130	<div></div>

Source: <https://www.smoгон.com/dex/sm/pokemon/mewtwo/>

Mew



Type: **Psychic**
Abilities: **Synchronize**
Tier: **UU**

HP:	100	<div></div>
Attack:	100	<div></div>
Defense:	100	<div></div>
Sp. Atk:	100	<div></div>
Sp. Def:	100	<div></div>
Speed:	100	<div></div>

Source: <https://www.smoгон.com/dex/sm/pokemon/mew/>

Cloyster



Type: **Water** **Ice**
Abilities: **Overcoat**
Shell Armor
Skill Link
Tier: **RU**

HP:	50	<div></div>
Attack:	95	<div></div>
Defense:	180	<div></div>
Sp. Atk:	85	<div></div>
Sp. Def:	45	<div></div>
Speed:	70	<div></div>

Source: <https://www.smoгон.com/dex/sm/pokemon/cloyster/>

On the other hand, I have noticed that numbers special attack and special defense are missing in the data used in my experiments.

2.5. Final verdict

Mewtwo is the strongest Pokemon. It can beat the largest number of Pokemons.



Among the 5 five experiments, experiment 3 is the most accurate. Cloyster is able to draw in battles but this does not match with our definition of strongest Pokemon.

However, in our experiments, the data used is not complete. Abilities like **special speed** and **special defense** are missing. The battles did not include **special attacks**. The absence of this extra data might have given Cloyster an advantage in the experiments. Cloyster did not receive special attacks and thanks to Cloyster's very good defense to regular attacks, he was able to win.

<https://bulbapedia.bulbagarden.net/wiki/Statistic>

3. Strongest Pokemon team

Definition of a team: 6 Pokemons

Definition of the strongest team: the team that kind beat the most pokemons possible (widest range of different pokemons)

We can not set up battles between all combinations of teams possible because of complexity. I have decided to start with a theoretical comparison.

3.1. Experiment

Store the wins of each Pokemon

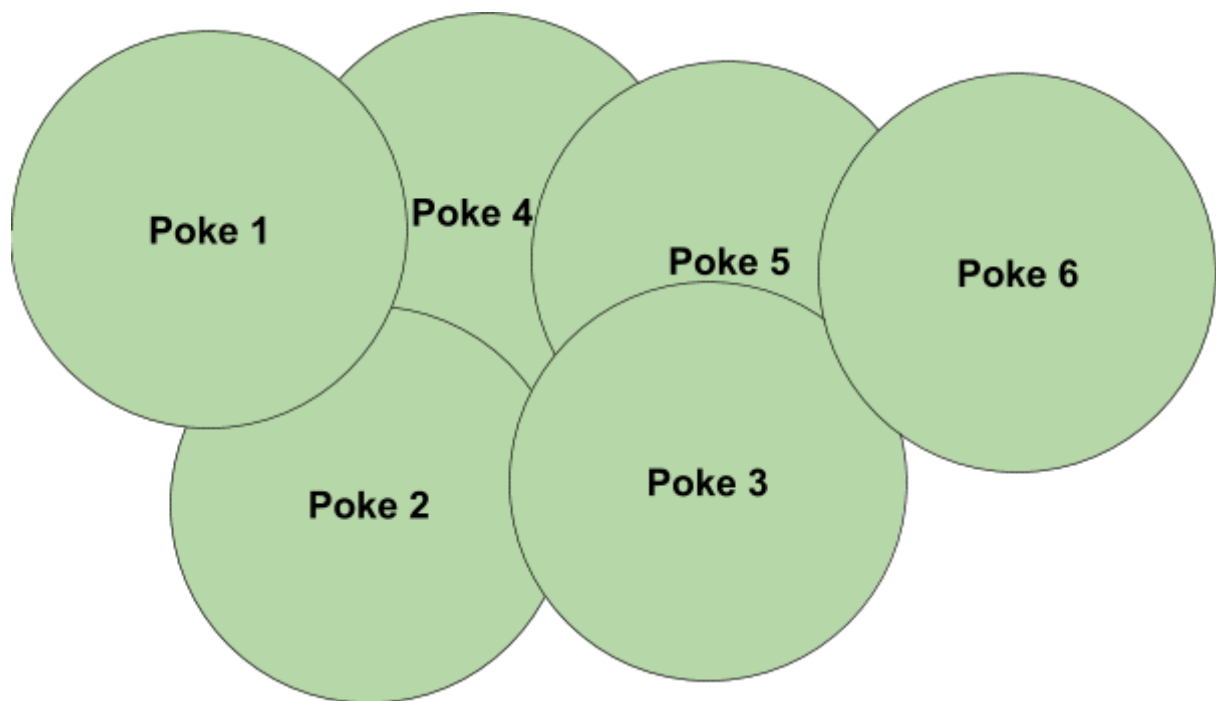
For every Pokemon, I ran the same experiment used before but this time I do not count a score. I store the number of each Pokemon beaten in a list of 151 booleans.

Create teams

I create teams of 6 Pokemon from a pool of the top-scoring Pokemon found earlier. We can not run all the possible We can not go through all combinations of teams possible from 151 pokemons because of complexity. I have used the 35 top scoring Pokemon. The computer takes a few seconds to calculate.

Calculate union score of each team

I compare the wins of each pokemon in the team. Wins is the set of other Pokemon a certain Pokemon can defeat. I calculate the number of unique Pokemon that the Pokemon in this team can beat collectively.



Find the team with the maximum union score

The union score is the key metric I have used to find the strongest team. The larger the number the stronger the team. You want to have a team with a broad range of abilities and able to beat the widest range Pokemon.

Display the team

I finally print out the names of the Pokemons in the team with the maximum union score.

3.2. Results

Max union score: 148

Team with the max union score:

- Mew
- Mewtwo
- Golem
- Sandslash
- Graveler
- Machamp

3.3. Comments on the results

The strongest team is not just the team with the strongest Pokemon. You need to have a good variety of pokemon types. Therefore, I find that the results match what can be expected theoretically. The strongest 6 Pokemons in the same team have a union score of only 74.

Conclusion

The strongest Pokemon is **Mewtwo**.

The strongest Pokemon team is:

- **Mew**
- **Mewtwo**
- **Golem**
- **Sandslash**
- **Graveler**
- **Machamp**

However, these results can be improved by including special attacks.