

Pokémon STATS ANALYSIS

BY: GISELLE HALIM



• OVERVIEW •

Hey there, Trainers! We dove headfirst into the world of Pokémon to uncover the ultimate battle beasts. Who's the fastest? Who packs the biggest punch? We crunched numbers, compared stats, and battled with data to find out! From tiny Caterpie to legendary Mewtwo, no Pokémon was safe from our analysis.

We didn't stop at just finding the strongest, though! We built a super-smart machine to predict which Pokémon are worthy of the legendary title. Think of it as a Pokédex on steroids! By studying their stats and abilities, our machine learned to spot the legendary spark. So, grab a Poké Ball and get ready for some mind-blowing insights!

Gotta Analyze 'Em All!





DATA UNDERSTANDING

#	Name	Type 1	Type 2	Total	HP	Attack	Defense	Sp. Atk	Sp. Def	Speed	Generation	Legendary
1	Bulbasaur	Grass	Poison	318	45	49	49	65	65	45	1	False
2	Ivysaur	Grass	Poison	405	60	62	63	80	80	60	1	False
3	Venusaur	Grass	Poison	525	80	82	83	100	100	80	1	False
3	VenusaurMega Venusaur	Grass	Poison	625	80	100	123	122	120	80	1	False
4	Charmander	Fire	Nan	309	39	52	43	60	50	65	1	False
5	Charmeleon	Fire	Nan	405	58	64	58	80	65	80	1	False
6	Charizard	Fire	Flying	534	78	84	78	109	85	100	1	False
6	CharizardMega Charizard X	Fire	Dragon	634	78	130	111	130	85	100	1	False
6	CharizardMega Charizard Y	Fire	Flying	634	78	104	78	159	115	100	1	False

Alright, Trainers, let's dive into the nitty-gritty! Our Pokédex of data includes a whopping list of Pokémon with key stats. **We've got their names, types, which generation they hail from, and whether they're legendary or not.** Plus, **we've broken down their total power into HP, Attack, Defense, Special Attack, Special Defense, and Speed.** It's like capturing a wild Pokémon, but for data!

DATA CLEANING

Type 1	0
Type 2	386
Total	0
HP	0
Attack	0
Defense	0
Sp. Atk	0
Sp. Def	0
Speed	0
Generation	0

```
df['Type 2'] = df['Type 2'].replace(np.nan, "None")  
  
#Checking if the data is still missing  
df.isnull().sum()  
  
#          0  
Name        0  
Type 1      0  
Type 2      0  
Total       0  
HP          0  
Attack      0  
Defense     0  
Sp. Atk     0  
Sp. Def     0  
Speed       0  
Generation  0  
Legendary   0
```

Our Pokédex wasn't perfect, Trainers! **Some Pokémon were missing a second type.** We couldn't let those missing types hide in the tall grass, so **we gave them a "None" type.** Now, our data is clean and ready for battle!



DATA CLEANING

```
#Bool to str  
df['Legendary'] = df['Legendary'].replace({True: 'True', False: 'False'})
```

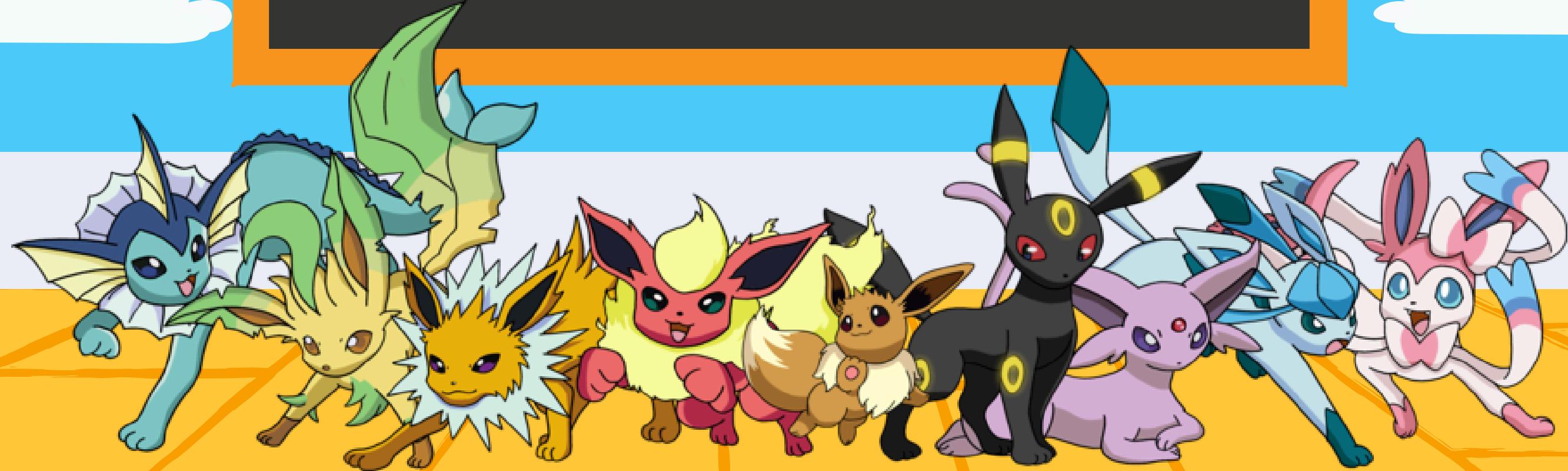
```
df.head()
```

#	Name	Type 1	Type 2	Total	HP	Attack	Defense	Sp. Atk	Sp. Def	Speed	Generation	Legendary
0 1	Bulbasaur	Grass	Poison	318	45	49	49	65	65	45	1	False
1 2	Ivysaur	Grass	Poison	405	60	62	63	80	80	60	1	False
2 3	Venusaur	Grass	Poison	525	80	82	83	100	100	80	1	False
3 3	VenusaurMega Venusaur	Grass	Poison	625	80	100	123	122	120	80	1	False

Our Pokédex was full of surprises, Trainers! The **Legendary** column was causing a bit of confusion, as it was a boolean type (True or False). To make things easier for our analysis, we **changed it to a string format, keeping the same True and False values**. Now, our data is ready for battle!

Topic #1

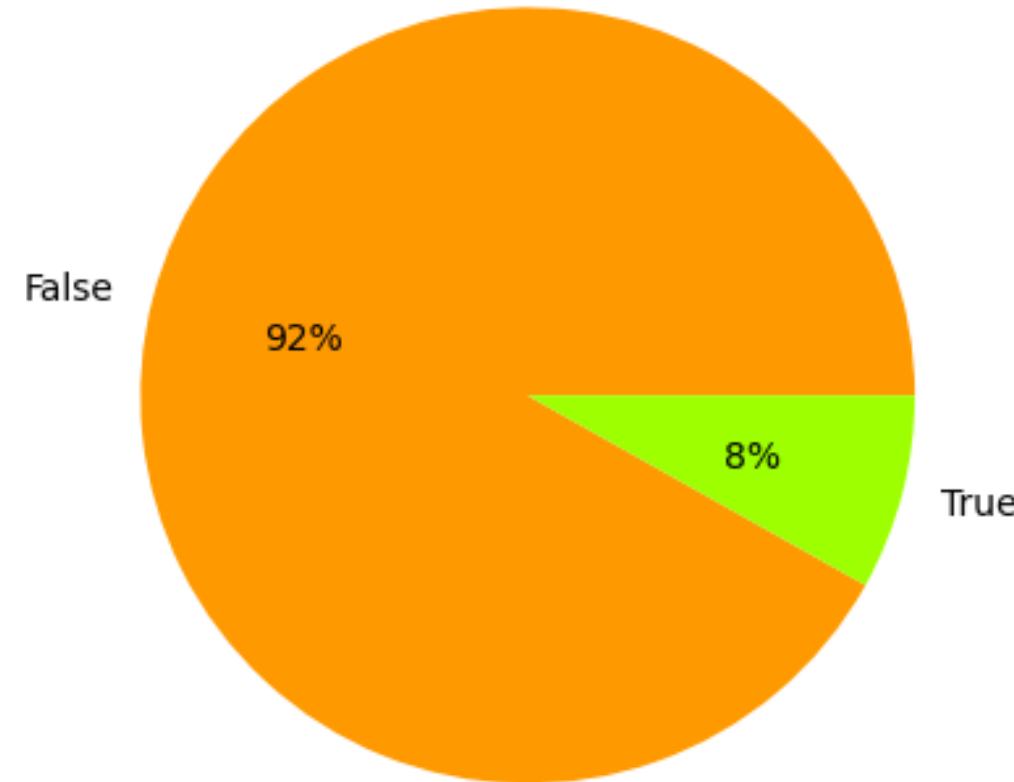
How Many Legendary Pokemons are there?



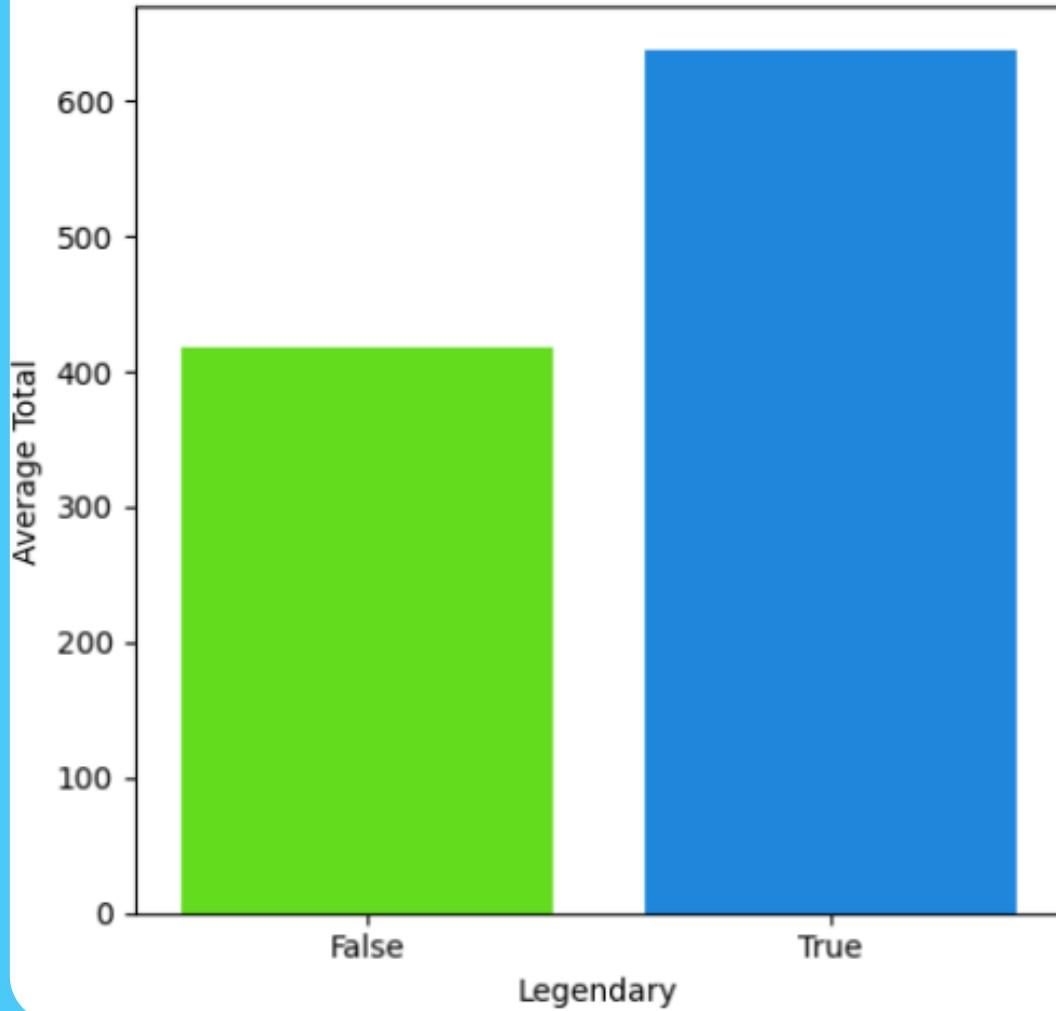


POKEMON DISTRIBUTION

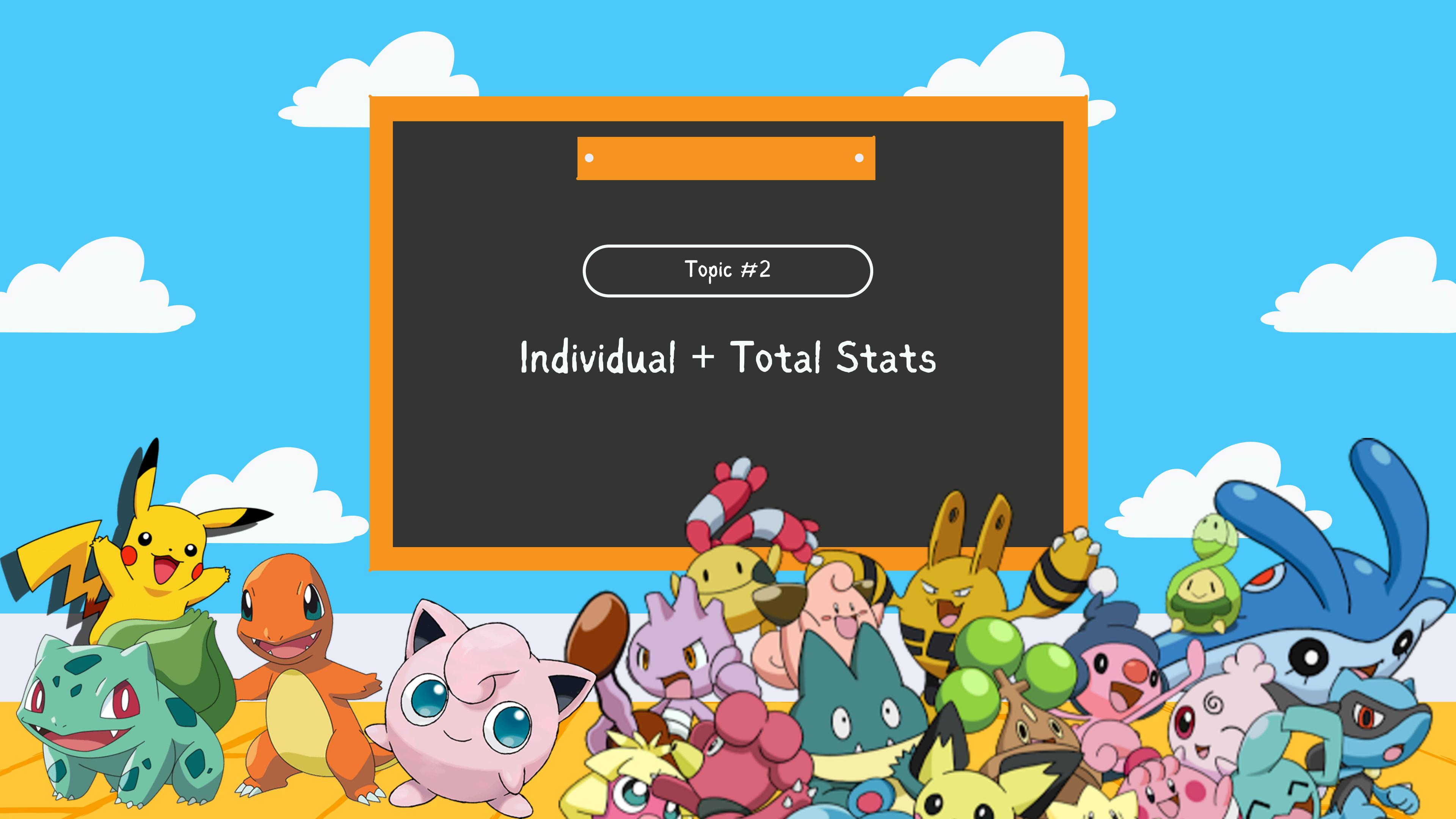
Legendary Pokemon



Average Total - Legendary vs Non-Legendary



Out of 800 Pokémon, only 65 are legendary, making them as rare as a Shiny Pokémon! But what makes them so special? Turns out, they pack a serious punch. **Legendary Pokémon have higher average stats compared to their normal counterparts.** So, while they're tough to find, they're definitely worth the hunt if you're aiming to be a champion. However, don't let this discourage you, Trainers! There are plenty of non-legendary Pokémon that can hold their own in battle.

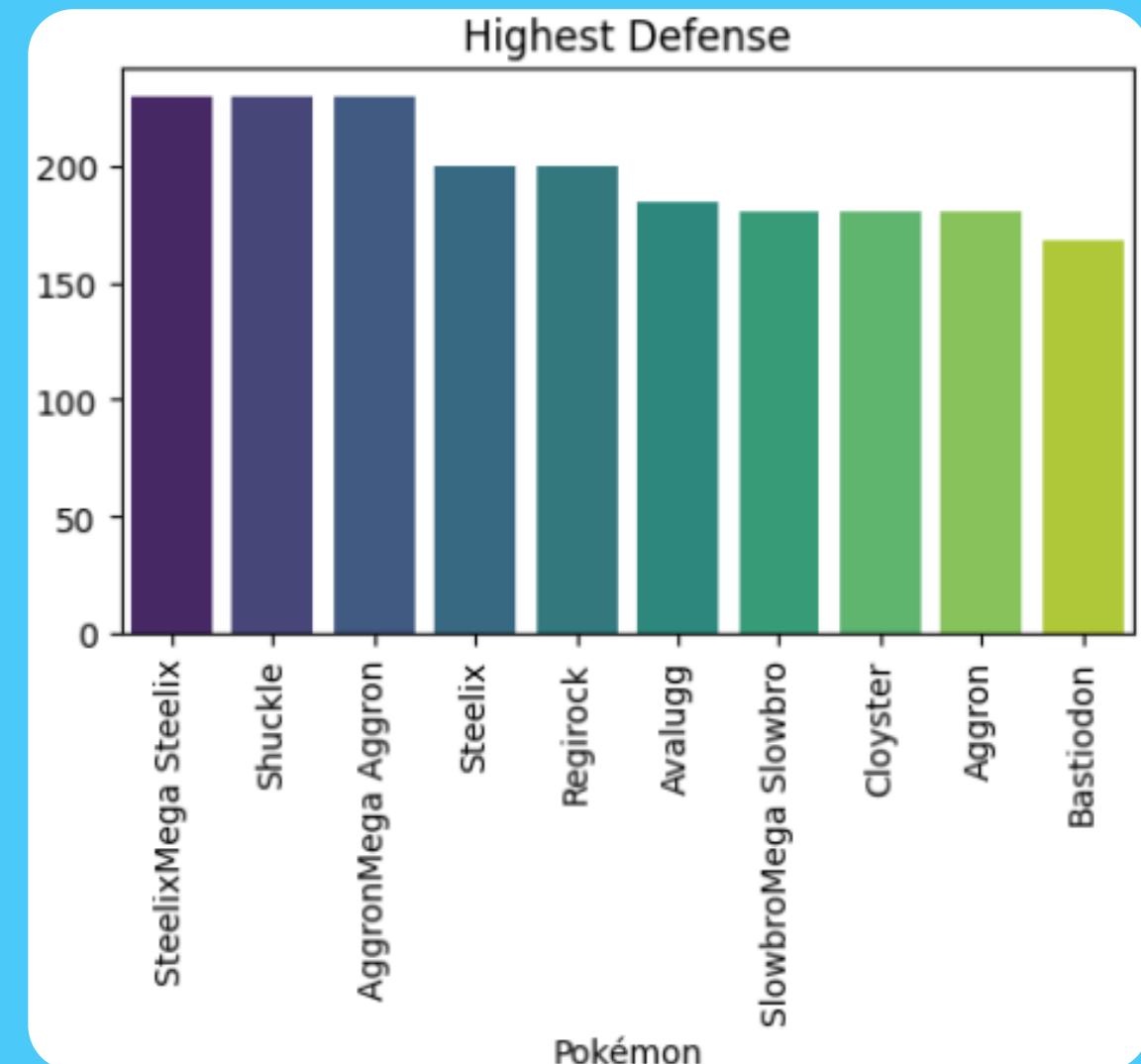
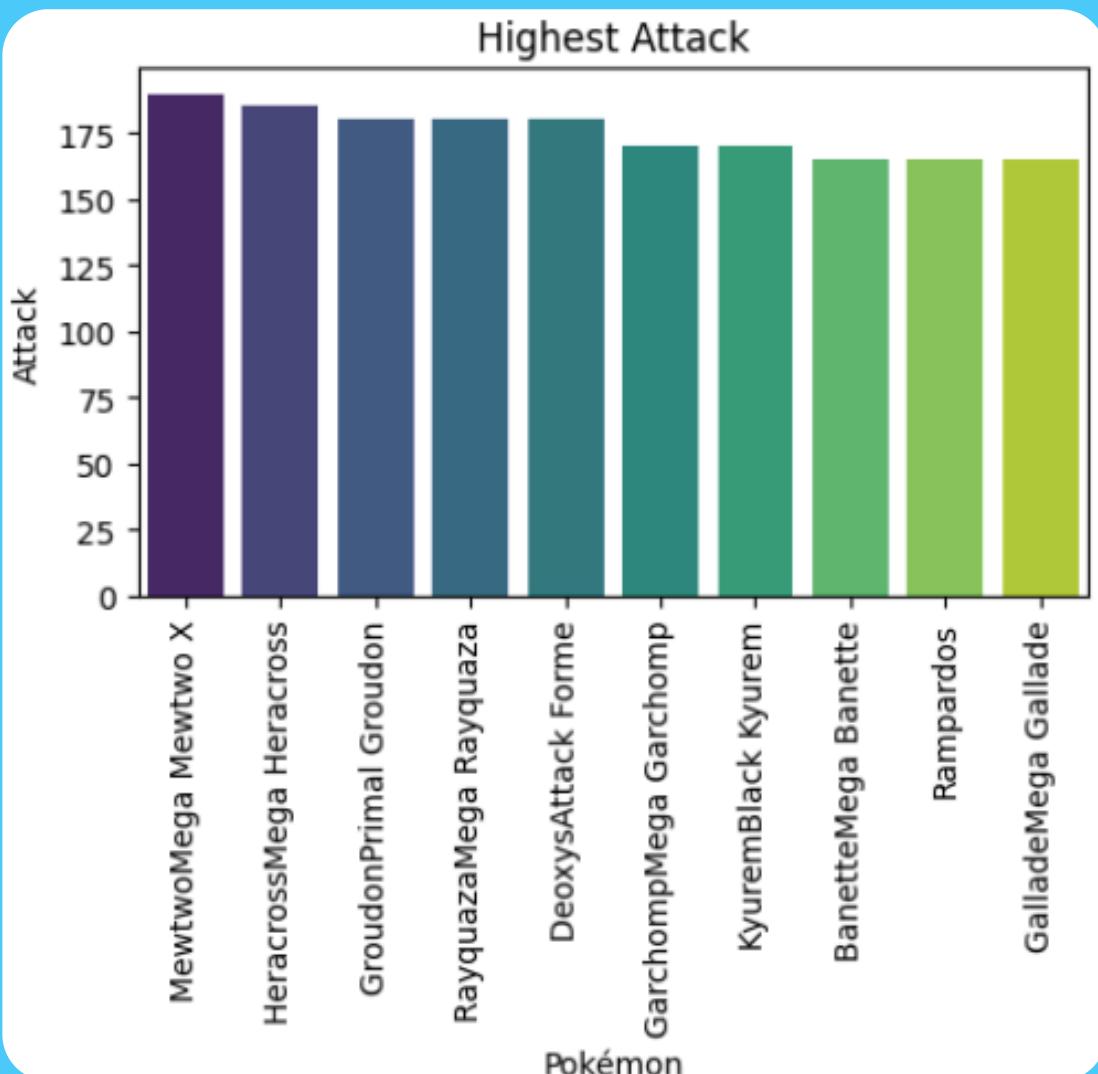
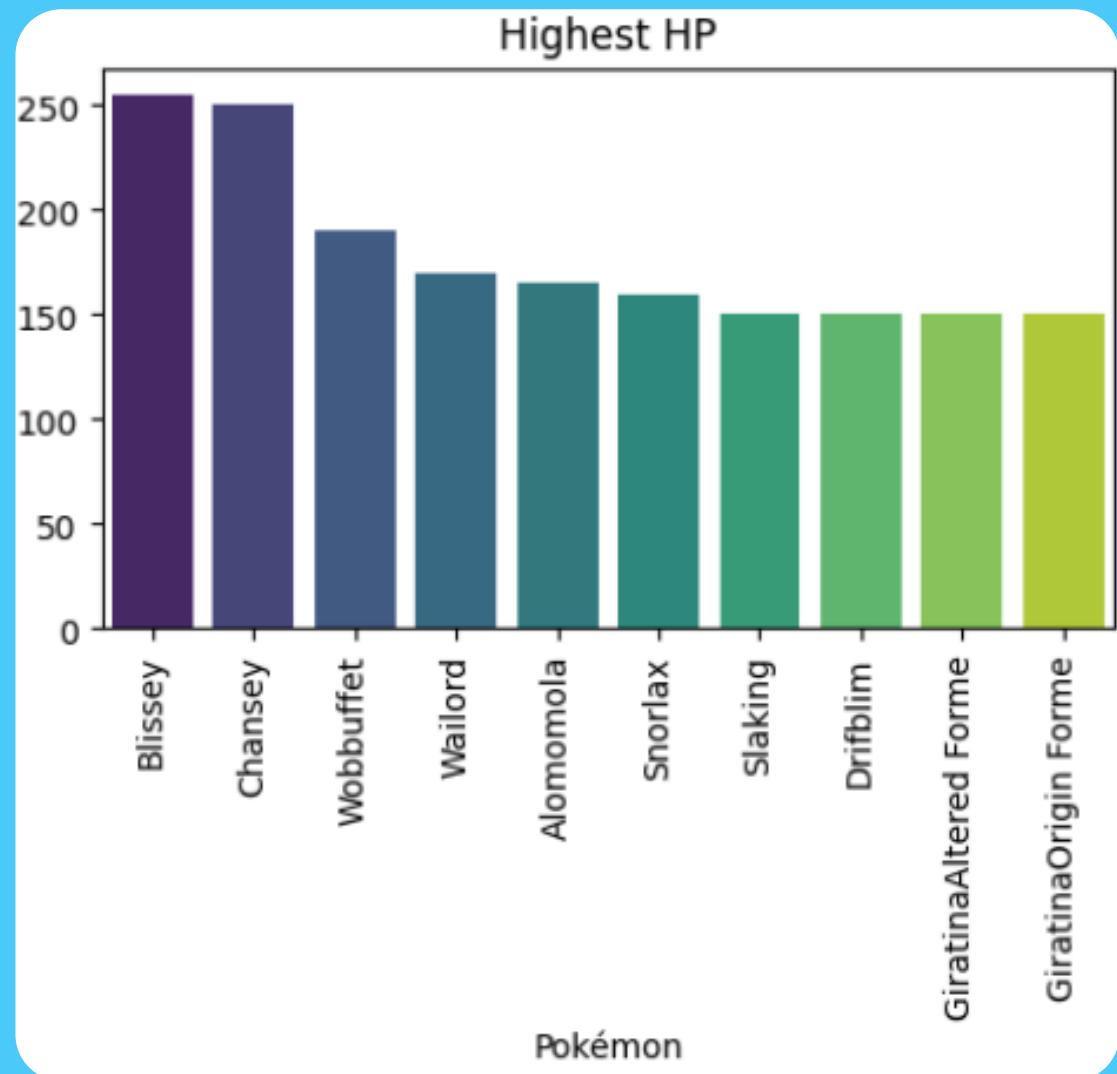


Topic #2

Individual + Total Stats



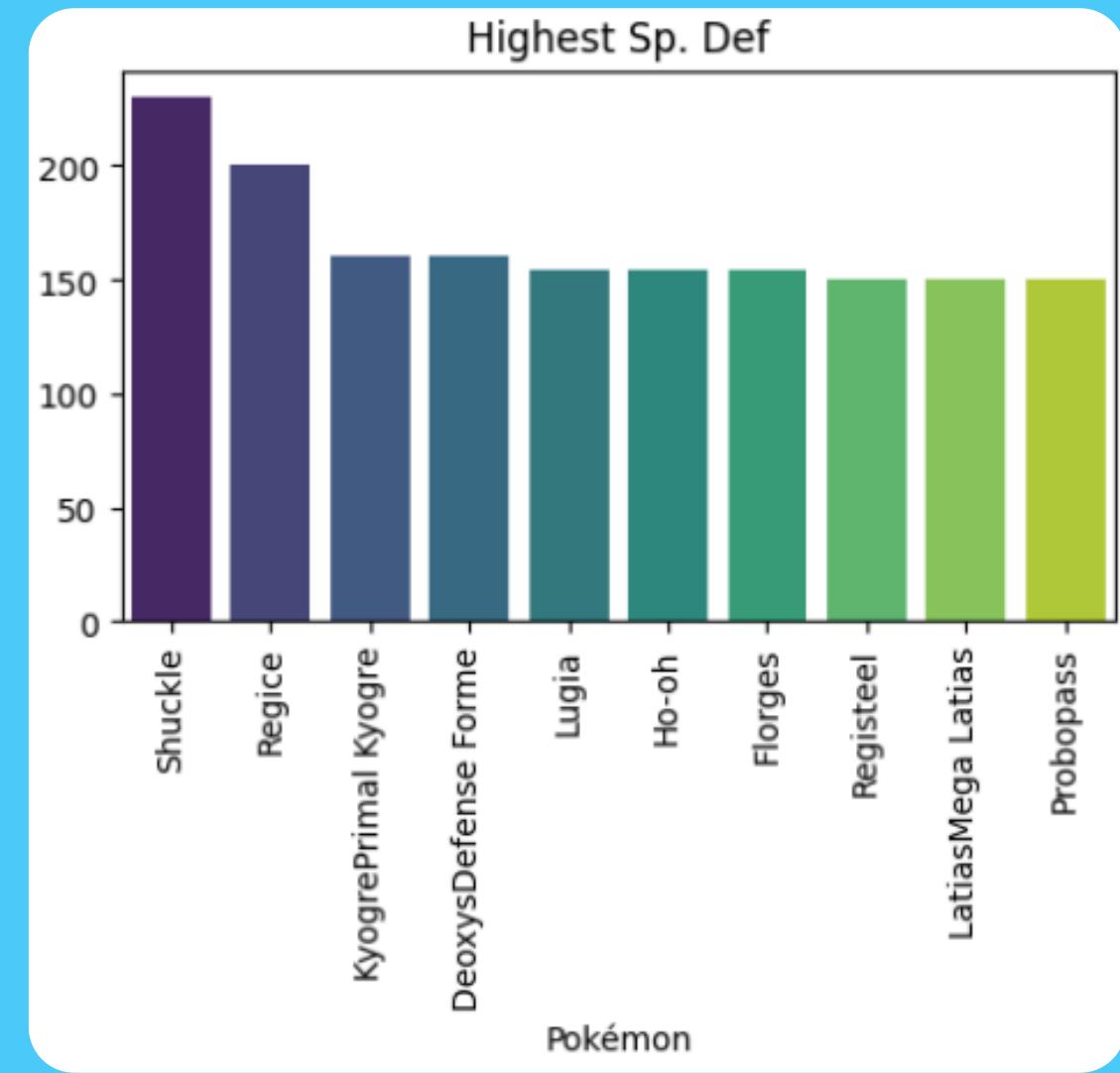
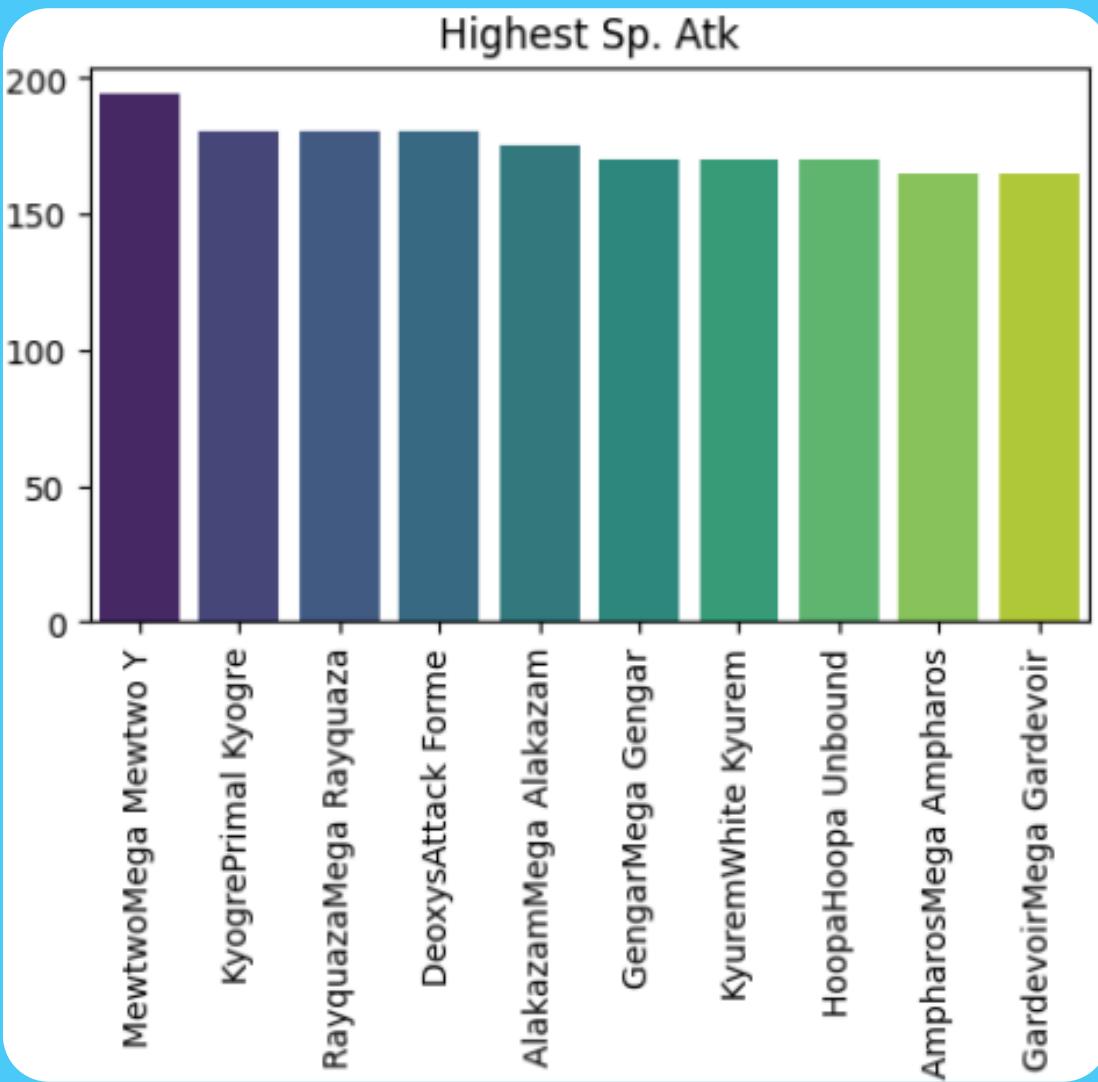
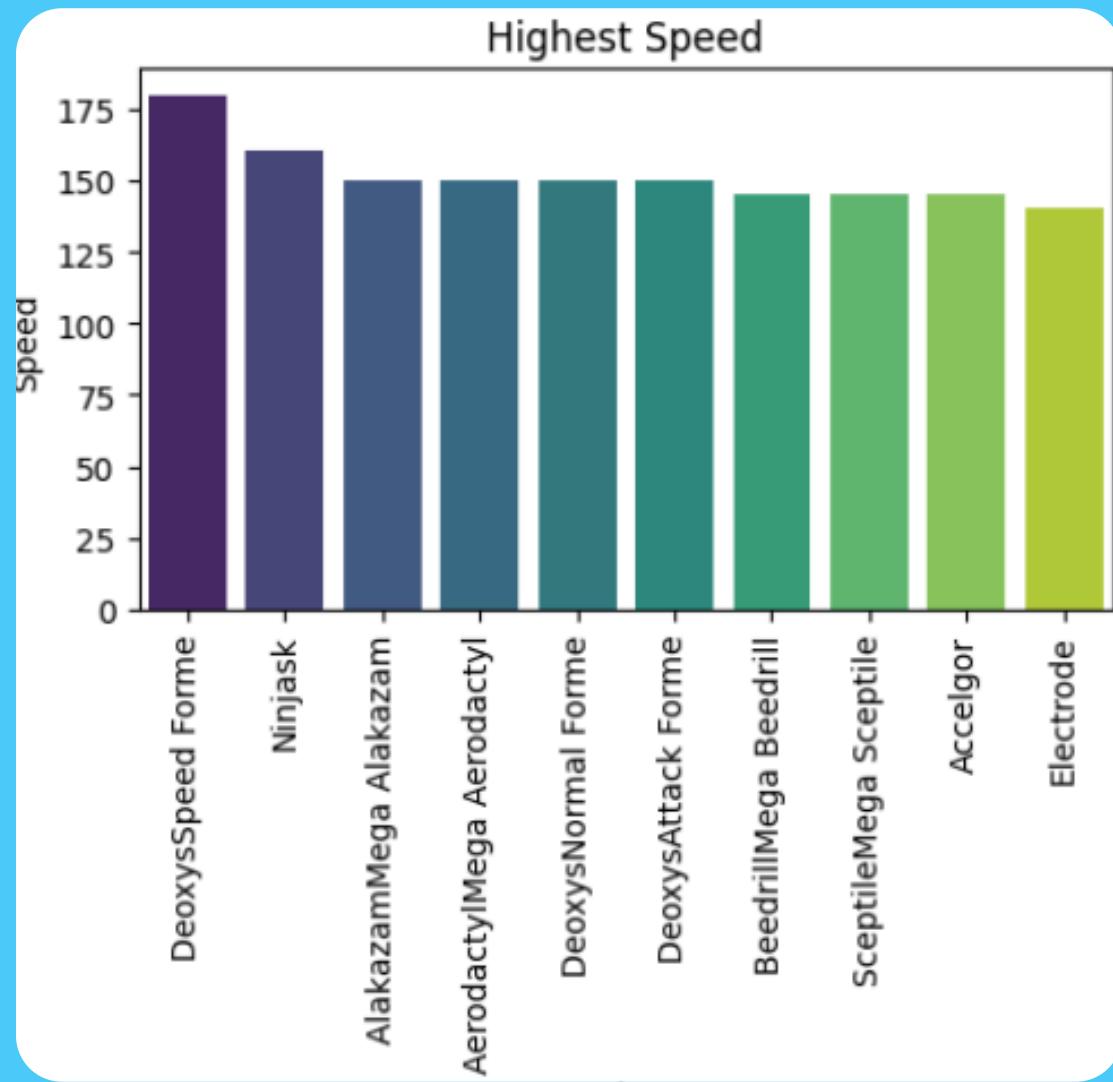
INDIVIDUAL STATS #1



HP, Attack, and Defense are the backbone of any Pokémon battle. HP keeps your buddy standing tall, Attack packs the punch, and Defense protects from incoming hits. We'll reveal the **top 10 Pokémon in each category**, so get ready to discover the ultimate battle machines!



INDIVIDUAL STATS #2



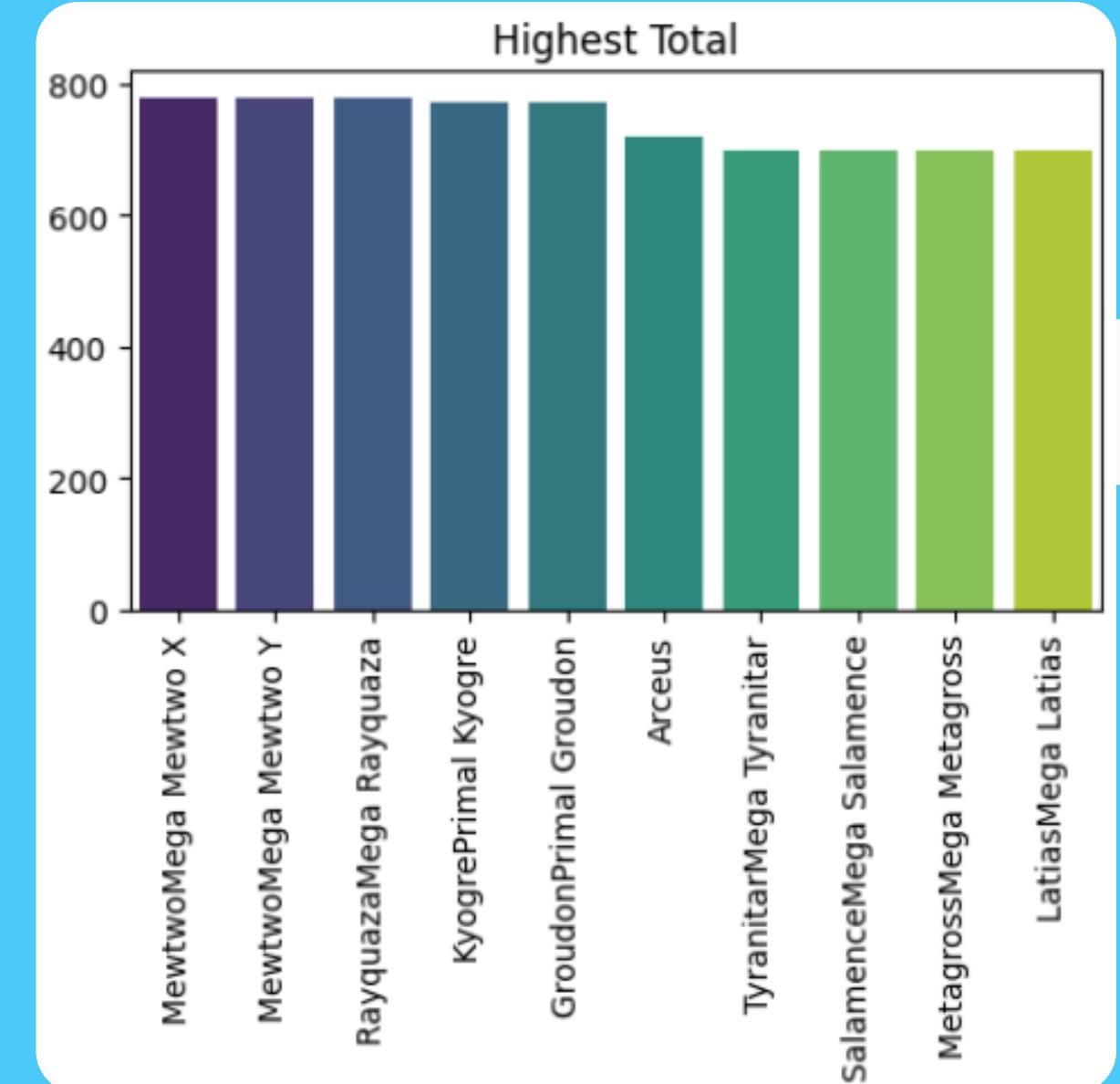
Trainers, victory isn't just about brute force! Speed determines who strikes first, Special Attack unleashes powerful elemental attacks, and Special Defense protects against them. Get ready to **discover the speedsters, special attackers, and defensive geniuses** as we unveil the top 10 in each category!



TOTAL STATS

Trainers, get ready for a battle of brawn! Total stats are a Pokémon's overall power level. **Higher stats often mean a stronger Pokémon.** We'll reveal the top 10 Pokémon with the highest total stats.

While **legendary Pokémon dominate the list** (7 out of 10), proving their mythical might, don't underestimate the non-legendary powerhouses! Pokémon like Tyranitar, Salamence, and Metagross show that with the right combination of stats, even ordinary Pokémon can rise to the top!





THE CHAMPIONS #1



BLISSEY

HEALTH MASTER



MEGA MEWTWO X

ATTACK ACE



MEGA STEELIX

IRON WALL



DEOXYS SPEED

THE FLASH



THE CHAMPIONS #2



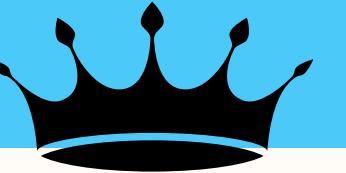
MEGA MEWTWO Y

SPECIAL MAESTRO



SHUCKLE

MAGIC SHIELD

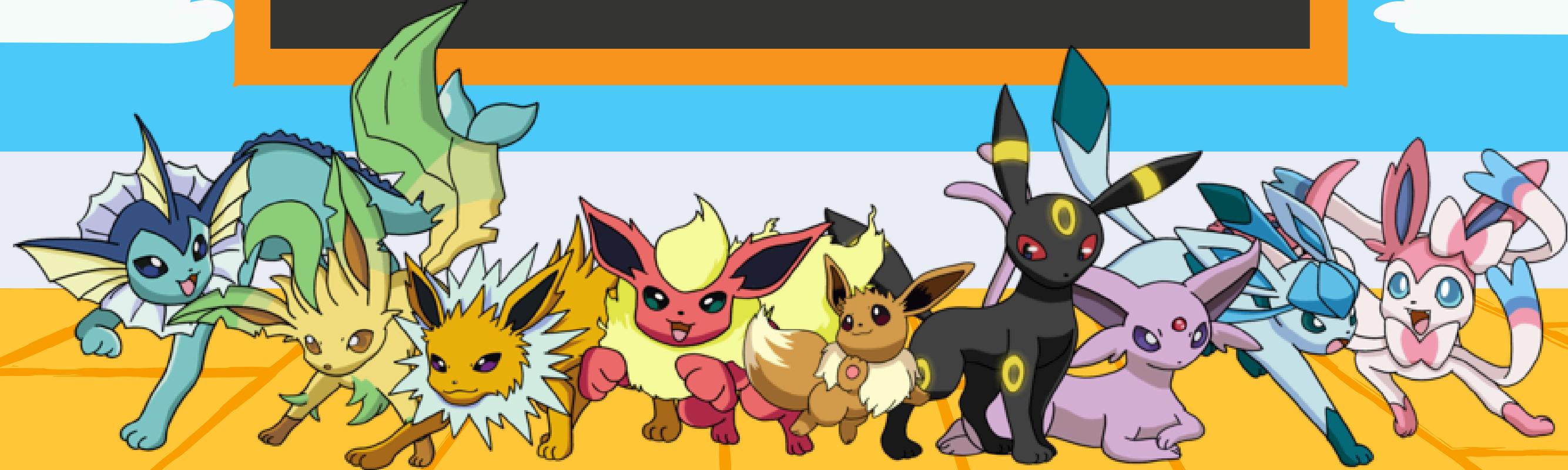


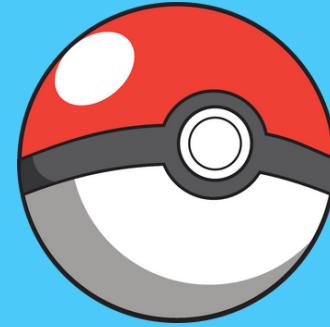
MEGA MEWTWO X & Y
MEGA RAYQUAZA

OVERALL POWERHOUSE

Topic #3

About the Types

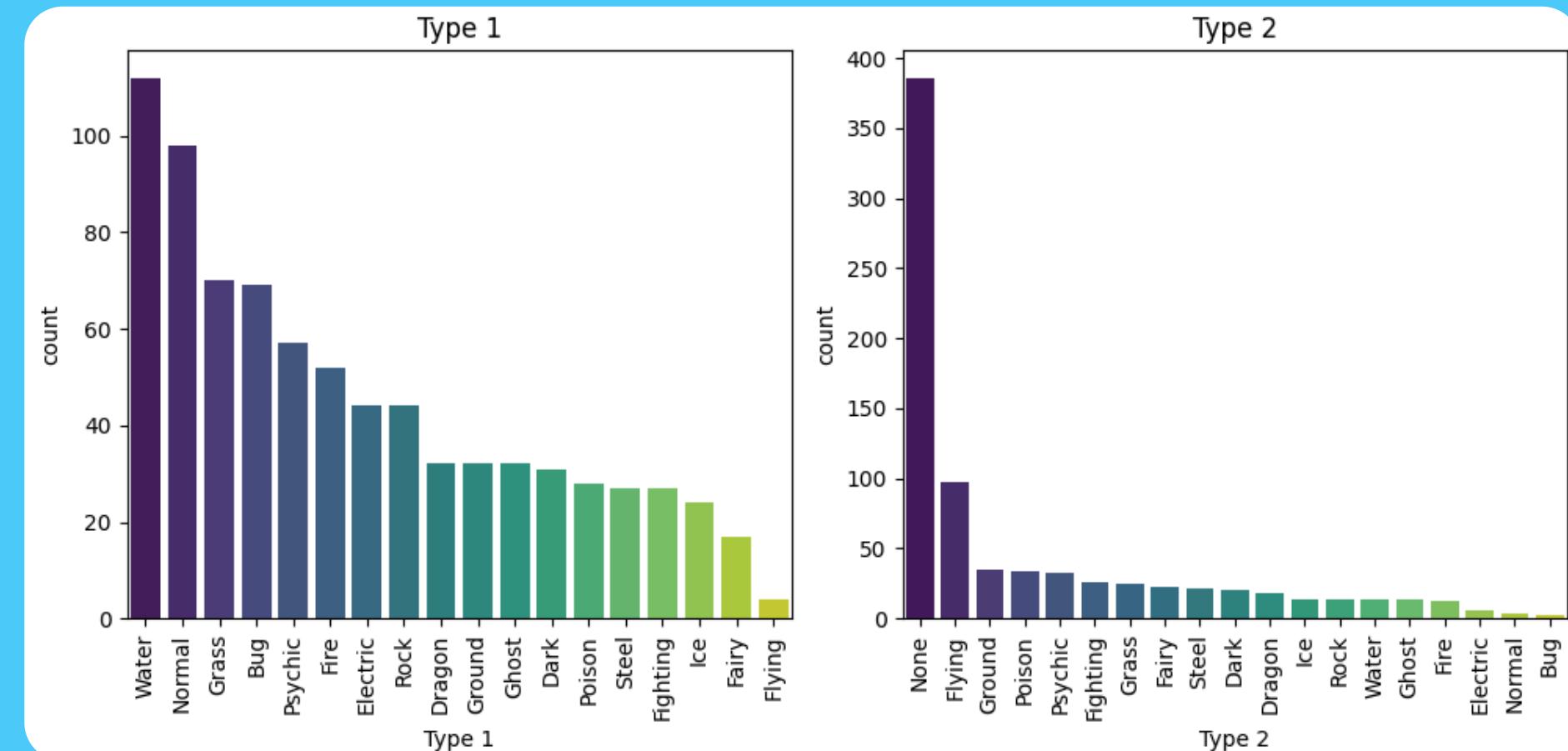




ABOUT THEIR TYPES

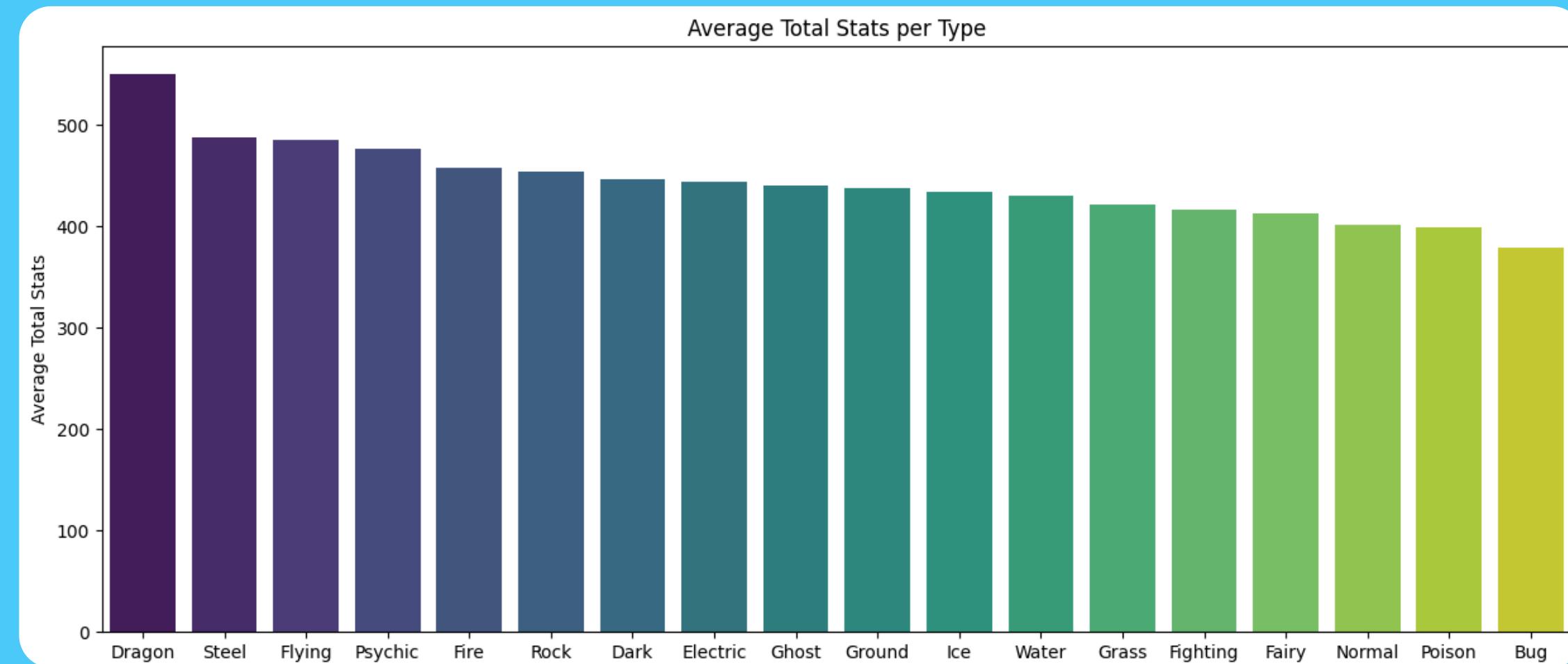
Looks like **Water, Normal, and Grass-type** Pokémon are splashing, dashing, and flourishing in the Pokémon world! They're **the most common primary types**, proving their versatility.

Most Pokémon stick to one type, but for those who dare to be different, **Flying takes the cake as the most popular secondary type**. So, if you're looking for a Pokémon with an edge, keep an eye out for those with wings!





AVG STATS BY TYPE



Trainers, prepare to be amazed! **Dragon-type Pokémon are the undisputed kings of power**, with an average total stat that's a whopping 70 points higher than the second-place Steel type. It's like comparing a legendary dragon to a regular lizard!

On the other end of the spectrum, **Poison and Bug types struggle to keep up**. With average total stats below 400, they face an uphill battle in the world of Pokémon battles. But remember, even the smallest Pokémon can surprise us with the right training!



TYPE CHAMPIONS

	Type 1	Name	Total_max
426	Dragon	RayquazaMega Rayquaza	780
163	Psychic	MewtwoMega Mewtwo X	780
422	Water	KyogrePrimal Kyogre	770
424	Ground	GroudonPrimal Groudon	770
552	Normal	Arceus	720
413	Steel	MetagrossMega Metagross	700
268	Rock	TyranitarMega Tyranitar	700
792	Fairy	Xerneas	680
270	Fire	Ho-oh	680
544	Ghost	GiratinaAltered Forme	680
793	Dark	Yveltal	680
275	Grass	SceptileMega Sceptile	630
498	Fighting	LucarioMega Lucario	625
196	Electric	AmpharosMega Ampharos	610
137	Bug	PinsirMega Pinsir	600
156	Ice	Articuno	580
702	Flying	TornadusIncarnate Forme	580
183	Poison	Crobat	535

First off, the mightiest Pokémon of 'em all! **Mega Rayquaza**, a sky-high Dragon type, and **Mega Mewtwo X**, a psychic powerhouse, reign supreme with the **highest stats in the whole Pokédex!** This proves that Dragon types are truly top-tier, while Psychic types aren't far behind!

But hey, don't count out the Normal types just yet! **Arceus is a Normal type with stats that'll blow your mind!** It's proof that even the most humble type can pack a punch.

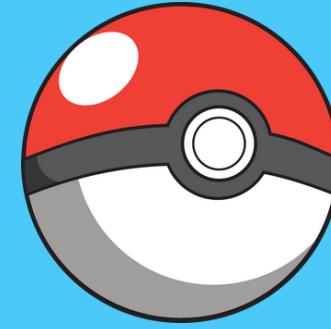
On the flip side, **Crobat and Mega Pinsir** (Poison and Bug type respectively), though strong in their own right, **find themselves in the lower ranks.** This just goes to show that not every type is built for battle in the same way.



Topic #4

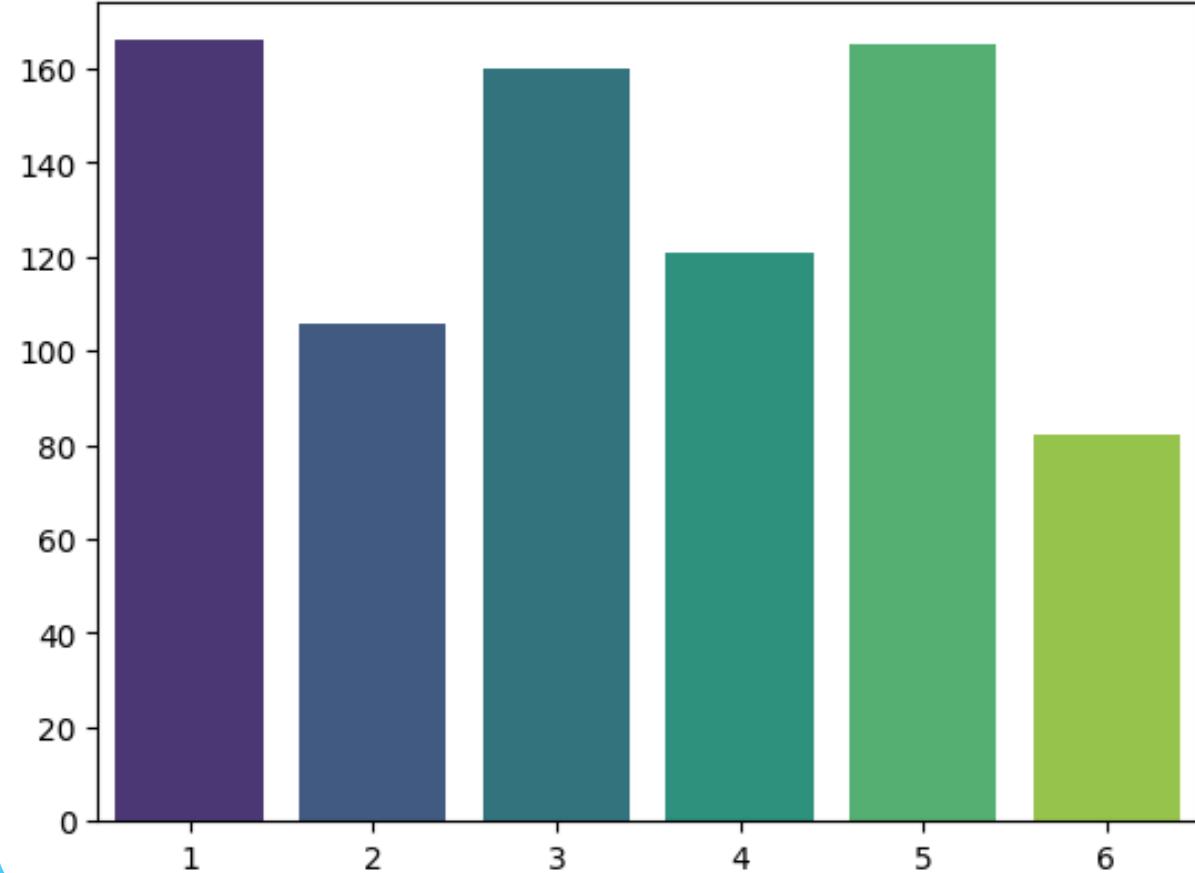
The Generations



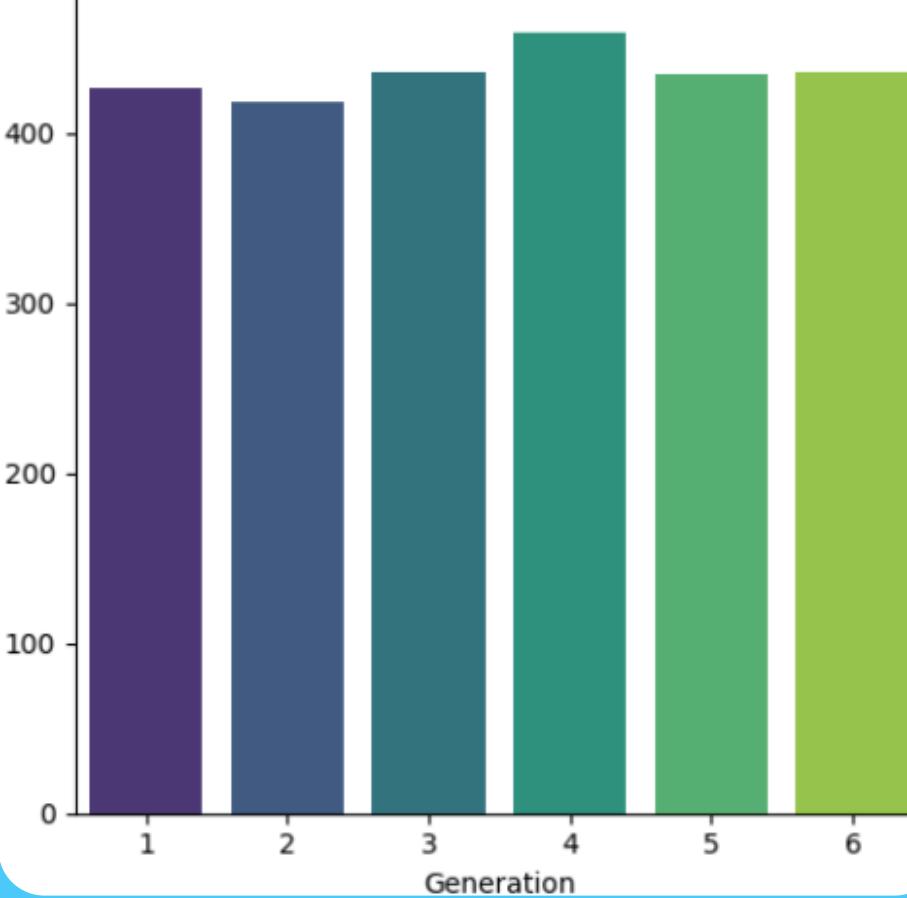


GENERATIONS

Pokemon in Each Generation



Average Total by Generation

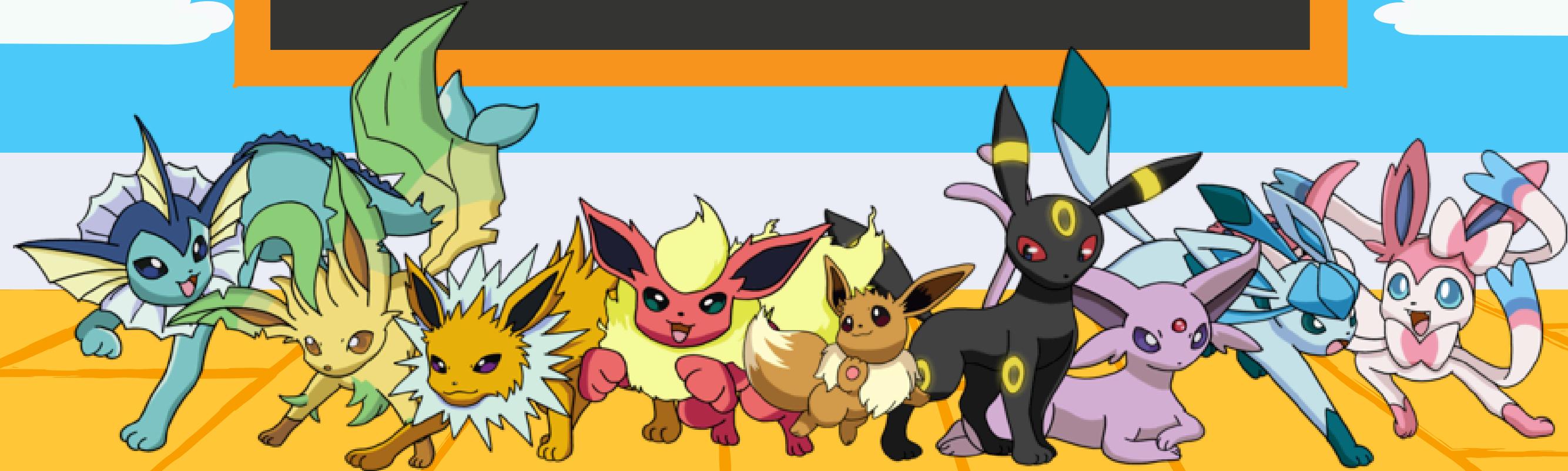


Trainers, we've got a mystery on our hands! The sixth generation might have the smallest roster, but its Pokémons pack a mean punch! While **the average total stats across all generations are pretty close**, it's intriguing that **the sixth generation can hold its own despite having fewer members**. This could mean they've carefully crafted each Pokémon to be a powerhouse.

However, more research is needed to confirm if this is a lucky statistical anomaly or a sign of an era of powerful Pokémons!

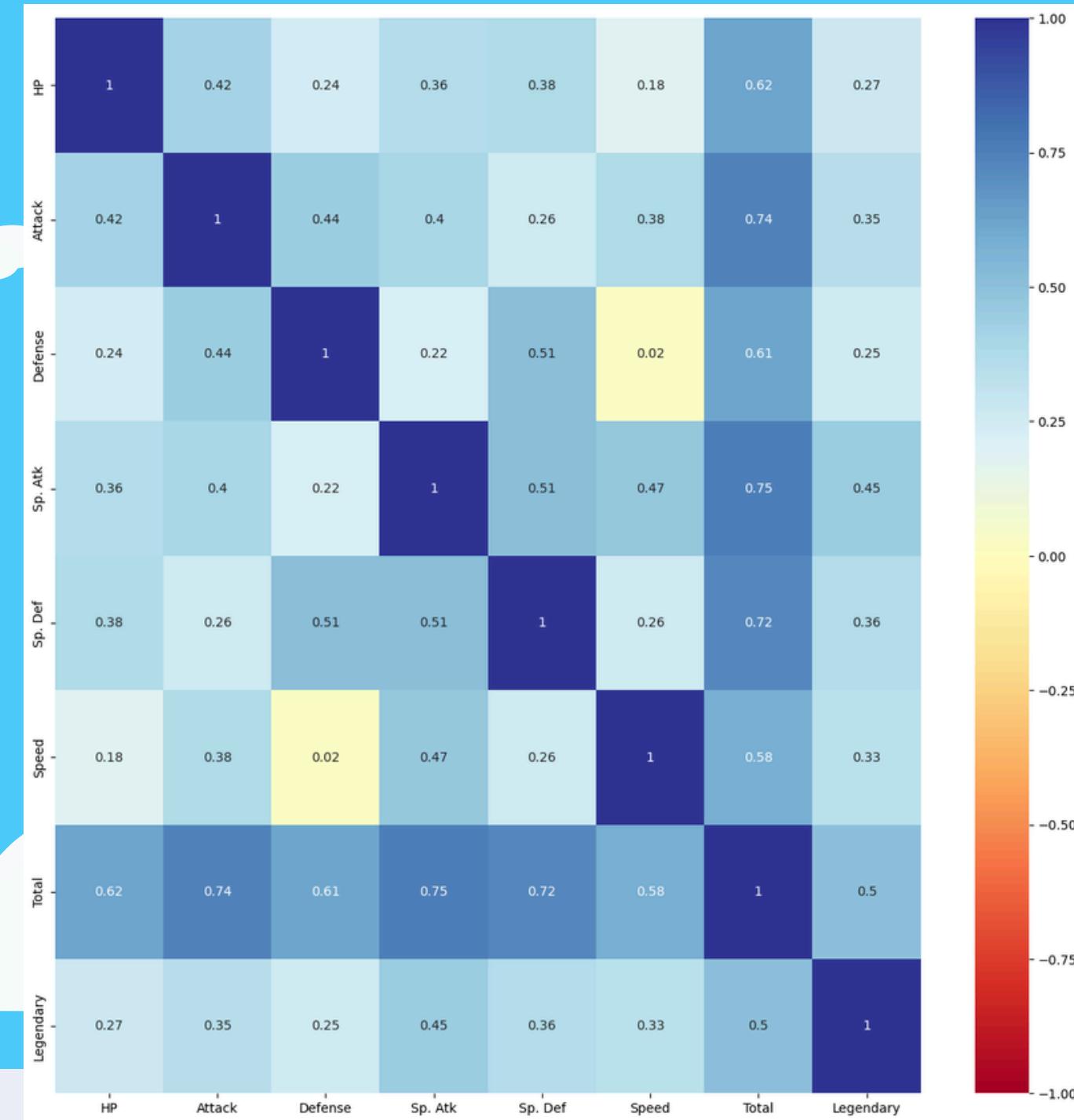
Topic #5

Correlations in the Data (or Pokédex)





CORRELATIONS



Checking out the stats, we found some interesting patterns. **Total stats and Special Attack seem to be the best clues for spotting legendary Pokémon**, with correlation values of 0.5 and 0.45 respectively. That means **Pokémon with high numbers in these areas are more likely to be legendary**. Other stats like Special Defense (0.36), Attack (0.35), and Speed (0.33) also play a role, but not as strongly.

Topic #6

Legendary Pokémon Predictor

EXTRA PREPROCESSING

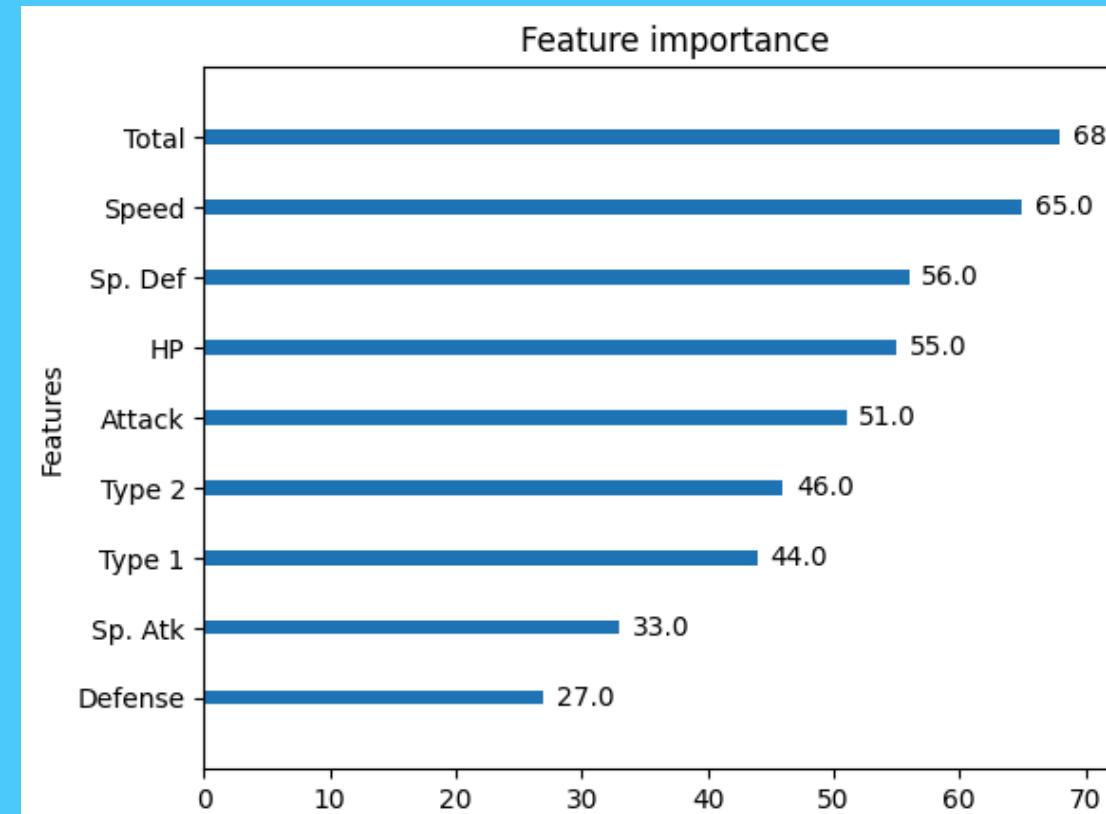
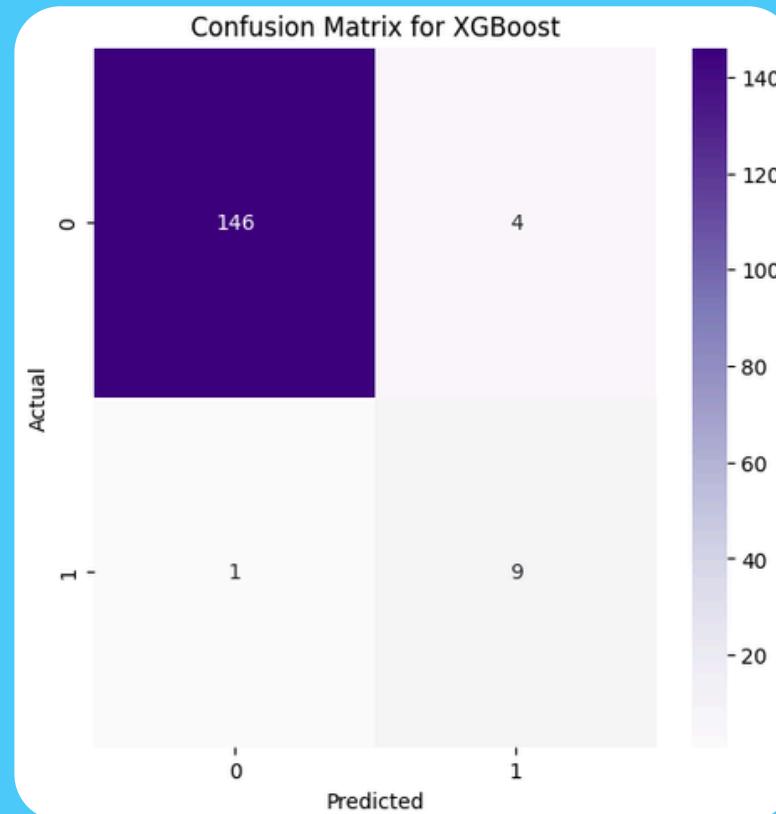
```
df = df.drop(['#', 'Name', 'Generation'], axis=1)  
df['Legendary'] = df['Legendary'].map(legend)  
df['Type 1'] = df['Type 1'].map(element)  
df['Type 2'] = df['Type 2'].map(element)
```

```
#Defining x and y  
x = df.drop(columns=['Legendary'])  
y = df['Legendary']  
  
from sklearn.model_selection import train_test_split  
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size = 0.2, random_state = 42)
```

Alright, Trainers! To build our super-smart Pokémon prediction machine, we had to prep our data like a true battle strategy. First, **we cut out the fluff – Pokémon numbers, names, and generations** – because they didn't help us predict legendary status. Then, we **translated some of the data from Pokémon language (like type names) into numbers** that our machine can understand. Finally, **we split our data into two teams: the training squad (80% of our Pokémon) and the test squad (20%)**. Our goal? To teach our machine to recognize legendary Pokémon based on the training data and then test its skills on the unknown test team!



LEGENDARY PREDICTOR

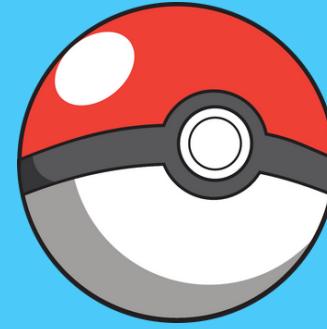


	precision	recall	f1-score	support
0	0.99	0.97	0.98	150
1	0.69	0.90	0.78	10
accuracy				
macro avg	0.84	0.94	0.97	160
weighted avg	0.97	0.97	0.97	160

```
roc_auc_score(y_test, y_pred_xgb)  
0.9366666666666666
```

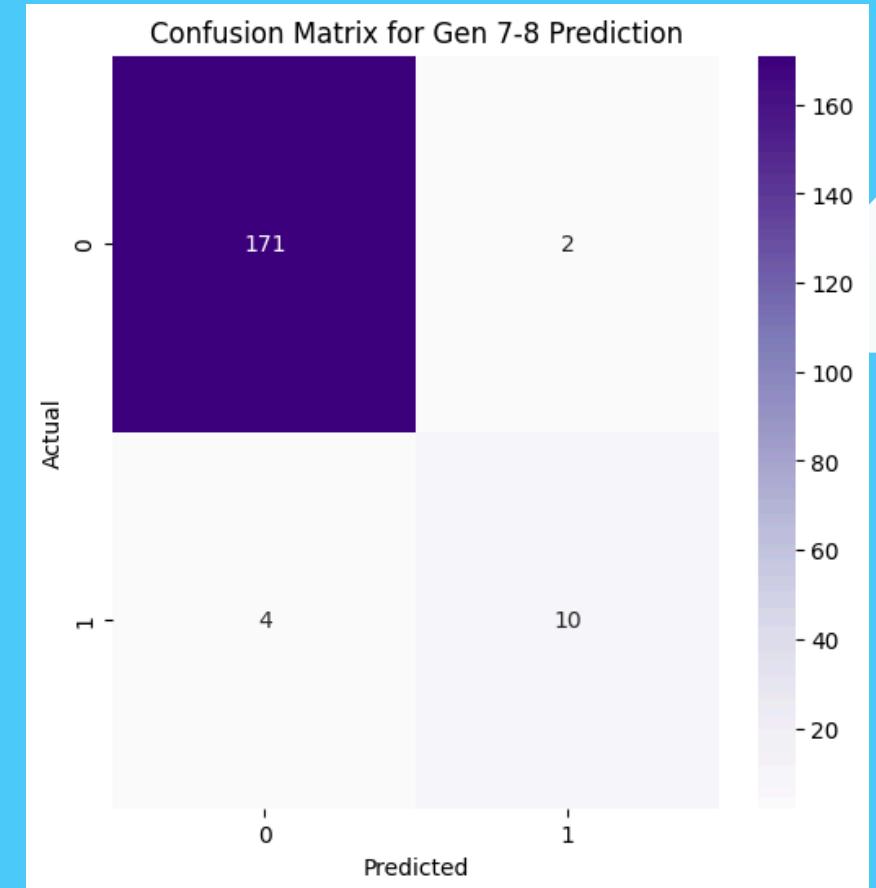
Trainers, we've built a Pokémon prediction machine using the power of **XGBoost**! It's pretty good at telling legendary Pokémon apart from normal ones, with **an accuracy of 0.97**. Our model also has **a precision of 0.84, recall of 0.94, F1-score of 0.88**, and an impressive **AUC of 0.94**. It's like having a Professor Oak with super powers!

But wait, there's more! Our machine revealed a big secret: **Total stats are the most important factor in determining if a Pokémon is legendary**, according to our model. This machine is a true champion at sniffing out legendary Pokémon!



PREDICTION TEST

#	Name	Type 1	Type 2	Total	HP	Attack	Defense	Sp. Atk	Sp. Def	Speed	Generation	Legendary	
0	841	Rowlet	Grass	Flying	320	68	55	55	50	50	42	7	0
1	842	Dartrix	Grass	Flying	420	78	75	75	70	70	52	7	0
2	843	Decidueye	Grass	Ghost	530	78	107	75	100	100	70	7	0
3	844	Litten	Fire	Nan	320	45	65	40	60	40	70	7	0
4	845	Torracat	Fire	Nan	420	65	85	50	80	50	90	7	0
5	846	Incineroar	Fire	Dark	530	95	115	90	80	90	60	7	0
6	847	Popplio	Water	Nan	320	50	54	54	66	56	40	7	0
7	848	Brionne	Water	Nan	420	60	69	69	91	81	50	7	0
8	849	Primarina	Water	Fairy	530	80	74	74	126	116	60	7	0
9	850	Pikipek	Normal	Flying	265	35	75	30	30	30	65	7	0



Trainers, our XGBoost-powered legendary predictor has evolved to a whole new level! We captured its power in a Poké Ball, or rather, a model file, and sent it on an expedition to the uncharted territories of the 7th and 8th generations.

Facing 187 mysterious new Pokémon, our legendary detector proved its worth by correctly identifying a whopping 181 of them! It's like having a Master Ball that never misses! This incredible accuracy showcases the might of our machine, proving that it's truly the ultimate tool for spotting legendary Pokémon.

• SUMMARY •

Trainers, we've caught 'em all - or at least, analyzed 'em all!

From catching the data to training our ultimate Pokémon predictor, this journey has been filled with surprises. We've discovered the secrets behind legendary Pokémon, uncovered hidden strengths of different types, and many others. Our machine learning model have proven to be incredibly accurate in predicting legendary Pokémon, thanks to XGBoost. But this is just the beginning of our Pokémon adventure!

Want to dive deeper into the data? Check out the full analysis on my GitHub:

CLICK HERE!



THANK YOU!



LinkedIn: [Giselle Halim](#)

GitHub: [gisellehalim](#)

