

Advance_Data_Visualization

July 26, 2023

1 Advanced data visualization with Seaborn

```
[4]: import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

1.1 Read CSV Dataset

```
[8]: df = pd.read_csv("pokemon.csv")
pd.set_option("display.max_column", df.shape[1])
df.head()
```

```
[8]:
```

	abilities	against_bug	against_dark	against_dragon	\
0	['Overgrow', 'Chlorophyll']	1.0	1.0	1.0	
1	['Overgrow', 'Chlorophyll']	1.0	1.0	1.0	
2	['Overgrow', 'Chlorophyll']	1.0	1.0	1.0	
3	['Blaze', 'Solar Power']	0.5	1.0	1.0	
4	['Blaze', 'Solar Power']	0.5	1.0	1.0	

	against_electric	against_fairy	against_fight	against_fire	\
0	0.5	0.5	0.5	2.0	
1	0.5	0.5	0.5	2.0	
2	0.5	0.5	0.5	2.0	
3	1.0	0.5	1.0	0.5	
4	1.0	0.5	1.0	0.5	

	against_flying	against_ghost	against_grass	against_ground	against_ice	\
0	2.0	1.0	0.25	1.0	2.0	
1	2.0	1.0	0.25	1.0	2.0	
2	2.0	1.0	0.25	1.0	2.0	
3	1.0	1.0	0.50	2.0	0.5	
4	1.0	1.0	0.50	2.0	0.5	

	against_normal	against_poison	against_psychic	against_rock	\
0	1.0	1.0	2.0	1.0	
1	1.0	1.0	2.0	1.0	
2	1.0	1.0	2.0	1.0	
3	1.0	1.0	1.0	2.0	

4	1.0	1.0	1.0	2.0
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	against_steel	against_water	attack	base_egg_steps	base_happiness	\
0	1.0	0.5	49	5120	70	
1	1.0	0.5	62	5120	70	
2	1.0	0.5	100	5120	70	
3	0.5	2.0	52	5120	70	
4	0.5	2.0	64	5120	70	

	base_total	capture_rate	classification	defense	experience_growth	\
0	318	45	Seed Pokémon	49	1059860	
1	405	45	Seed Pokémon	63	1059860	
2	625	45	Seed Pokémon	123	1059860	
3	309	45	Lizard Pokémon	43	1059860	
4	405	45	Flame Pokémon	58	1059860	

	height_m	hp	japanese_name	name	percentage_male	\
0	0.7	45	Fushigidane	Bulbasaur	88.1	
1	1.0	60	Fushigisou	Ivysaur	88.1	
2	2.0	80	Fushigibana	Venusaur	88.1	
3	0.6	39	Hitokage	Charmander	88.1	
4	1.1	58	Lizardo	Charmeleon	88.1	

	pokedex_number	sp_attack	sp_defense	speed	type1	type2	weight_kg	\
0	1	65	65	45	grass	poison	6.9	
1	2	80	80	60	grass	poison	13.0	
2	3	122	120	80	grass	poison	100.0	
3	4	60	50	65	fire	NaN	8.5	
4	5	80	65	80	fire	NaN	19.0	

	generation	is_legendary
0	1	0
1	1	0
2	1	0
3	1	0
4	1	0

1.2 Descriptive Statistics

```
[9]: df.shape
```

```
[9]: (801, 41)
```

```
[10]: df.tail()
```

```
[10]:
```

	abilities	against_bug	against_dark	against_dragon	\
796	['Beast Boost']	0.25	1.0	0.5	

797	['Beast Boost']	1.00	1.0	0.5
798	['Beast Boost']	2.00	0.5	2.0
799	['Prism Armor']	2.00	2.0	1.0
800	['Soul-Heart']	0.25	0.5	0.0

	against_electric	against_fairy	against_fight	against_fire	\
796	2.0	0.5	1.0	2.0	
797	0.5	0.5	2.0	4.0	
798	0.5	4.0	2.0	0.5	
799	1.0	1.0	0.5	1.0	
800	1.0	0.5	1.0	2.0	

	against_flying	against_ghost	against_grass	against_ground	\
796	0.5	1.0	0.25	0.0	
797	1.0	1.0	0.25	1.0	
798	1.0	0.5	0.50	1.0	
799	1.0	2.0	1.00	1.0	
800	0.5	1.0	0.50	2.0	

	against_ice	against_normal	against_poison	against_psychic	\
796	1.0	0.5	0.0	0.5	
797	1.0	0.5	0.0	0.5	
798	2.0	1.0	1.0	0.0	
799	1.0	1.0	1.0	0.5	
800	0.5	0.5	0.0	0.5	

	against_rock	against_steel	against_water	attack	base_egg_steps	\
796	1.0	0.5	1.0	101	30720	
797	0.5	0.5	0.5	181	30720	
798	1.0	1.0	0.5	101	30720	
799	1.0	1.0	1.0	107	30720	
800	0.5	1.0	1.0	95	30720	

	base_happiness	base_total	capture_rate	classification	defense	\
796	0	570	25	Launch Pokémon	103	
797	0	570	255	Drawn Sword Pokémon	131	
798	0	570	15	Junkivore Pokémon	53	
799	0	600	3	Prism Pokémon	101	
800	0	600	3	Artificial Pokémon	115	

	experience_growth	height_m	hp	japanese_name	name	\
796	1250000	9.2	97	Tekkaguya	Celesteela	
797	1250000	0.3	59	Kamiturugi	Kartana	
798	1250000	5.5	223	Akuziking	Guzzlord	
799	1250000	2.4	97	Necrozma	Necrozma	
800	1250000	1.0	80	Magearna	Magearna	

	percentage_male	pokedex_number	sp_attack	sp_defense	speed	type1	\
796	NaN	797	107	101	61	steel	
797	NaN	798	59	31	109	grass	
798	NaN	799	97	53	43	dark	
799	NaN	800	127	89	79	psychic	
800	NaN	801	130	115	65	steel	

	type2	weight_kg	generation	is_legendary
796	flying	999.9	7	1
797	steel	0.1	7	1
798	dragon	888.0	7	1
799	NaN	230.0	7	1
800	fairy	80.5	7	1

```
[12]: df.sample(5).T
```

```
[12]:
abilities          ['Shed Skin', 'Friend Guard']
against_bug        1.0
against_dark        1.0
against_dragon      1.0
against_electric    1.0
against_fairy        1.0
against_fight        0.5
against_fire         2.0
against_flying       2.0
against_ghost        1.0
against_grass        0.5
against_ground       0.5
against_ice          1.0
against_normal       1.0
against_poison       1.0
against_psychic      1.0
against_rock         2.0
against_steel        1.0
against_water        1.0
attack              22
base_egg_steps       3840
base_happiness        70
base_total           213
capture_rate         120
classification       Scatterdust Pokémon
defense              60
experience_growth    1000000
height_m             0.3
hp                   45
japanese_name        Kofuurai
```

name	Spewpa
percentage_male	50.0
pokedex_number	665
sp_attack	27
sp_defense	30
speed	29
type1	bug
type2	NaN
weight_kg	8.4
generation	6
is_legendary	0
519 \	
abilities	['Big Pecks', 'Super Luck', 'Rivalry']
against_bug	0.5
against_dark	1.0
against_dragon	1.0
against_electric	2.0
against_fairy	1.0
against_fight	1.0
against_fire	1.0
against_flying	1.0
against_ghost	0.0
against_grass	0.5
against_ground	0.0
against_ice	2.0
against_normal	1.0
against_poison	1.0
against_psychic	1.0
against_rock	2.0
against_steel	1.0
against_water	1.0
attack	77
base_egg_steps	3840
base_happiness	70
base_total	358
capture_rate	120
classification	Wild Pigeon Pokémon
defense	62
experience_growth	1059860
height_m	0.6
hp	62
japanese_name	Hatoboh
name	Tranquill
percentage_male	50.0
pokedex_number	520
sp_attack	50

sp_defense	42
speed	65
type1	normal
type2	flying
weight_kg	15.0
generation	5
is_legendary	0
208 \	
abilities	['Intimidate', 'Run Away', 'Rattled']
against_bug	0.5
against_dark	0.5
against_dragon	0.0
against_electric	1.0
against_fairy	1.0
against_fight	0.5
against_fire	1.0
against_flying	1.0
against_ghost	1.0
against_grass	1.0
against_ground	1.0
against_ice	1.0
against_normal	1.0
against_poison	2.0
against_psychic	1.0
against_rock	1.0
against_steel	2.0
against_water	1.0
attack	80
base_egg_steps	5120
base_happiness	70
base_total	300
capture_rate	190
classification	Fairy Pokémon
defense	50
experience_growth	800000
height_m	0.6
hp	60
japanese_name	Bulu
name	Snubbull
percentage_male	24.6
pokedex_number	209
sp_attack	40
sp_defense	40
speed	30
type1	fairy
type2	NaN

weight_kg	7.8
generation	2
is_legendary	0

	465	\
abilities	['Motor Drive', 'Vital Spirit']	
against_bug	1.0	
against_dark	1.0	
against_dragon	1.0	
against_electric	0.5	
against_fairy	1.0	
against_fight	1.0	
against_fire	1.0	
against_flying	0.5	
against_ghost	1.0	
against_grass	1.0	
against_ground	2.0	
against_ice	1.0	
against_normal	1.0	
against_poison	1.0	
against_psychic	1.0	
against_rock	1.0	
against_steel	0.5	
against_water	1.0	
attack	123	
base_egg_steps	6400	
base_happiness	70	
base_total	540	
capture_rate	30	
classification	Thunderbolt Pokémon	
defense	67	
experience_growth	1000000	
height_m	1.8	
hp	75	
japanese_name	Elekible	
name	Electivire	
percentage_male	75.4	
pokedex_number	466	
sp_attack	95	
sp_defense	85	
speed	95	
type1	electric	
type2	NaN	
weight_kg	138.6	
generation	4	
is_legendary	0	

abilities	['Run Away', 'Keen Eye', 'Frisk']	161
against_bug		1.0
against_dark		1.0
against_dragon		1.0
against_electric		1.0
against_fairy		1.0
against_fight		2.0
against_fire		1.0
against_flying		1.0
against_ghost		0.0
against_grass		1.0
against_ground		1.0
against_ice		1.0
against_normal		1.0
against_poison		1.0
against_psychic		1.0
against_rock		1.0
against_steel		1.0
against_water		1.0
attack		76
base_egg_steps		3840
base_happiness		70
base_total		415
capture_rate		90
classification	Long Body Pokémon	
defense		64
experience_growth		1000000
height_m		1.8
hp		85
japanese_name	Ootachi	
name	Furret	
percentage_male		50.0
pokedex_number		162
sp_attack		45
sp_defense		55
speed		90
type1	normal	
type2	NaN	
weight_kg		32.5
generation		2
is_legendary		0

```
[13]: df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 801 entries, 0 to 800
Data columns (total 41 columns):
```


#	Column	Non-Null Count	Dtype
0	abilities	801 non-null	object
1	against_bug	801 non-null	float64
2	against_dark	801 non-null	float64
3	against_dragon	801 non-null	float64
4	against_electric	801 non-null	float64
5	against_fairy	801 non-null	float64
6	against_fight	801 non-null	float64
7	against_fire	801 non-null	float64
8	against_flying	801 non-null	float64
9	against_ghost	801 non-null	float64
10	against_grass	801 non-null	float64
11	against_ground	801 non-null	float64
12	against_ice	801 non-null	float64
13	against_normal	801 non-null	float64
14	against_poison	801 non-null	float64
15	against_psychic	801 non-null	float64
16	against_rock	801 non-null	float64
17	against_steel	801 non-null	float64
18	against_water	801 non-null	float64
19	attack	801 non-null	int64
20	base_egg_steps	801 non-null	int64
21	base_happiness	801 non-null	int64
22	base_total	801 non-null	int64
23	capture_rate	801 non-null	object
24	classification	801 non-null	object
25	defense	801 non-null	int64
26	experience_growth	801 non-null	int64
27	height_m	781 non-null	float64
28	hp	801 non-null	int64
29	japanese_name	801 non-null	object
30	name	801 non-null	object
31	percentage_male	703 non-null	float64
32	pokedex_number	801 non-null	int64
33	sp_attack	801 non-null	int64
34	sp_defense	801 non-null	int64
35	speed	801 non-null	int64
36	type1	801 non-null	object
37	type2	417 non-null	object
38	weight_kg	781 non-null	float64
39	generation	801 non-null	int64
40	is_legendary	801 non-null	int64

dtypes: float64(21), int64(13), object(7)

memory usage: 256.7+ KB

```
[15]: df.describe().T
```

```
[15]:
```

	count	mean	std	min	25%	\
against_bug	801.0	9.962547e-01	0.597248	0.25	0.5	
against_dark	801.0	1.057116e+00	0.438142	0.25	1.0	
against_dragon	801.0	9.687890e-01	0.353058	0.00	1.0	
against_electric	801.0	1.073970e+00	0.654962	0.00	0.5	
against_fairy	801.0	1.068976e+00	0.522167	0.25	1.0	
against_fight	801.0	1.065543e+00	0.717251	0.00	0.5	
against_fire	801.0	1.135456e+00	0.691853	0.25	0.5	
against_flying	801.0	1.192884e+00	0.604488	0.25	1.0	
against_ghost	801.0	9.850187e-01	0.558256	0.00	1.0	
against_grass	801.0	1.034020e+00	0.788896	0.25	0.5	
against_ground	801.0	1.098002e+00	0.738818	0.00	1.0	
against_ice	801.0	1.208177e+00	0.735356	0.25	0.5	
against_normal	801.0	8.870162e-01	0.266106	0.00	1.0	
against_poison	801.0	9.753433e-01	0.549375	0.00	0.5	
against_psychic	801.0	1.005306e+00	0.495183	0.00	1.0	
against_rock	801.0	1.250312e+00	0.697148	0.25	1.0	
against_steel	801.0	9.834582e-01	0.500117	0.25	0.5	
against_water	801.0	1.058365e+00	0.606562	0.25	0.5	
attack	801.0	7.785768e+01	32.158820	5.00	55.0	
base_egg_steps	801.0	7.191011e+03	6558.220422	1280.00	5120.0	
base_happiness	801.0	6.536205e+01	19.598948	0.00	70.0	
base_total	801.0	4.283770e+02	119.203577	180.00	320.0	
defense	801.0	7.300874e+01	30.769159	5.00	50.0	
experience_growth	801.0	1.054996e+06	160255.835096	600000.00	1000000.0	
height_m	781.0	1.163892e+00	1.080326	0.10	0.6	
hp	801.0	6.895880e+01	26.576015	1.00	50.0	
percentage_male	703.0	5.515576e+01	20.261623	0.00	50.0	
pokedex_number	801.0	4.010000e+02	231.373075	1.00	201.0	
sp_attack	801.0	7.130587e+01	32.353826	10.00	45.0	
sp_defense	801.0	7.091136e+01	27.942501	20.00	50.0	
speed	801.0	6.633458e+01	28.907662	5.00	45.0	
weight_kg	781.0	6.137810e+01	109.354766	0.10	9.0	
generation	801.0	3.690387e+00	1.930420	1.00	2.0	
is_legendary	801.0	8.739076e-02	0.282583	0.00	0.0	

	50%	75%	max
against_bug	1.0	1.0	4.0
against_dark	1.0	1.0	4.0
against_dragon	1.0	1.0	2.0
against_electric	1.0	1.0	4.0
against_fairy	1.0	1.0	4.0
against_fight	1.0	1.0	4.0
against_fire	1.0	2.0	4.0
against_flying	1.0	1.0	4.0
against_ghost	1.0	1.0	4.0
against_grass	1.0	1.0	4.0

against_ground	1.0	1.0	4.0
against_ice	1.0	2.0	4.0
against_normal	1.0	1.0	1.0
against_poison	1.0	1.0	4.0
against_psychic	1.0	1.0	4.0
against_rock	1.0	2.0	4.0
against_steel	1.0	1.0	4.0
against_water	1.0	1.0	4.0
attack	75.0	100.0	185.0
base_egg_steps	5120.0	6400.0	30720.0
base_happiness	70.0	70.0	140.0
base_total	435.0	505.0	780.0
defense	70.0	90.0	230.0
experience_growth	1000000.0	1059860.0	1640000.0
height_m	1.0	1.5	14.5
hp	65.0	80.0	255.0
percentage_male	50.0	50.0	100.0
pokedex_number	401.0	601.0	801.0
sp_attack	65.0	91.0	194.0
sp_defense	66.0	90.0	230.0
speed	65.0	85.0	180.0
weight_kg	27.3	64.8	999.9
generation	4.0	5.0	7.0
is_legendary	0.0	0.0	1.0

1.3 Data Preprocessing

```
[18]: df.isna().sum()
```

```
[18]: abilities          0
      against_bug       0
      against_dark      0
      against_dragon    0
      against_electric  0
      against_fairy     0
      against_fight     0
      against_fire      0
      against_flying    0
      against_ghost     0
      against_grass     0
      against_ground    0
      against_ice       0
      against_normal    0
      against_poison    0
      against_psychic   0
      against_rock      0
      against_steel     0
```

```

against_water      0
attack             0
base_egg_steps     0
base_happiness     0
base_total         0
capture_rate       0
classification     0
defense            0
experience_growth  0
height_m           20
hp                0
japanese_name      0
name              0
percentage_male    98
pokedex_number     0
sp_attack          0
sp_defense         0
speed             0
type1              0
type2             384
weight_kg          20
generation         0
is_legendary       0
dtype: int64

```

```

[20]: # Replacing the values in type2 with None
df['type2'].fillna('None', inplace=True)

# Replacing the values in percentage_male with None
df['percentage_male'].fillna('None', inplace=True)

# Replacing the values in height_m with Mode value of the whole column
df['height_m'].fillna(df.height_m.mean(), inplace=True)

# Replacing the values in weight_kg with Mode value of the whole column
df['weight_kg'].fillna(df.weight_kg.mean(), inplace=True)

```

```

[21]: df.isna().sum()

```

```

[21]: abilities      0
      against_bug    0
      against_dark   0
      against_dragon  0
      against_electric 0
      against_fairy   0
      against_fight   0
      against_fire    0

```

```

against_flying      0
against_ghost       0
against_grass       0
against_ground      0
against_ice         0
against_normal      0
against_poison      0
against_psychic     0
against_rock        0
against_steel       0
against_water       0
attack             0
base_egg_steps      0
base_happiness      0
base_total         0
capture_rate       0
classification      0
defense            0
experience_growth   0
height_m           0
hp                0
japanese_name      0
name               0
percentage_male     0
pokedex_number     0
sp_attack          0
sp_defense         0
speed             0
type1              0
type2              0
weight_kg          0
generation         0
is_legendary       0
dtype: int64

```

```

[27]: # the column capture_rate has an object type although it has numbers
df[df.capture_rate == "30 (Meteorite)255 (Core)"][['name', 'abilities',
↪ 'capture_rate']] # this column is an issue

```

```

[27]:      name      abilities      capture_rate
773  Minior  ['Shields Down']  30 (Meteorite)255 (Core)

```

```

[33]: df['capture_rate'].replace('30 (Meteorite)255 (Core)', '30', inplace=True)

# convert capture_rate data type to int
df['capture_rate'] = df.capture_rate.astype(int)
df.capture_rate.dtype

```

```
[33]: dtype('int32')
```

```
[34]: # remove columns we dont need
df.drop(columns=['japanese_name', 'pokedex_number', 'percentage_male'], axis=1,
        inplace=True)
```

```
[35]: # adding column for pokemon total abilities
df['total_abilities'] = df.apply(lambda a: len(a['abilities']), axis=1)
```

```
[44]: # adding new column "type" by combining type1 and type2 columns
df['type'] = df.apply(lambda x: x['type1'] if pd.isna(x['type2']) else
        f"{x['type1']}_{x['type2']}", axis=1)

# rename type1 and type2 columns to primary and secondary
df.rename(columns={'type1': 'primary type', 'type2': 'secondary type'},
        inplace=True)
```

```
[45]: df.shape
```

```
[45]: (801, 40)
```

1.4 Visualization

```
[224]: df.corr()
```

```
[224]:
```

	against_bug	against_dark	against_dragon	\
against_bug	1.000000	0.230107	0.165430	
against_dark	0.230107	1.000000	0.140830	
against_dragon	0.165430	0.140830	1.000000	
against_electric	-0.246943	-0.015830	-0.108928	
against_fairy	0.239566	-0.301354	0.439705	
against_fight	0.137902	-0.357981	0.035237	
against_fire	0.202778	0.010527	-0.261570	
against_flying	0.183343	-0.179697	0.064850	
against_ghost	0.129174	0.672337	-0.049941	
against_grass	0.079197	-0.006533	-0.037135	
against_ground	-0.186841	-0.007660	-0.120042	
against_ice	0.148176	-0.010763	0.350048	
against_normal	0.215589	-0.413632	0.142035	
against_poison	0.354255	-0.236919	-0.210199	
against_psychic	-0.463272	-0.230415	0.100153	
against_rock	-0.210522	0.011963	0.090184	
against_steel	0.055504	-0.119758	-0.227697	
against_water	-0.254732	-0.001976	-0.096549	
attack	-0.054175	-0.098849	0.138217	
base_egg_steps	0.062133	0.187220	0.164773	
base_happiness	0.009994	0.024155	-0.151915	

base_total	-0.012398	0.065446	0.069766
capture_rate	0.005230	-0.047674	-0.091317
defense	-0.036474	0.048039	-0.023794
experience_growth	0.035717	-0.008391	0.172547
height_m	-0.059781	0.018608	0.164448
hp	0.034897	0.010589	0.089721
sp_attack	0.055352	0.170849	0.039739
sp_defense	-0.002342	0.132507	-0.047416
speed	-0.043802	-0.000326	0.078123
weight_kg	-0.031344	0.037634	0.125991
generation	-0.001549	-0.016013	-0.025201
is_legendary	0.027864	0.136315	0.014844
total_abilities	-0.009296	-0.133164	-0.065178

	against_electric	against_fairy	against_fight \
against_bug	-0.246943	0.239566	0.137902
against_dark	-0.015830	-0.301354	-0.357981
against_dragon	-0.108928	0.439705	0.035237
against_electric	1.000000	-0.089864	-0.102798
against_fairy	-0.089864	1.000000	0.157712
against_fight	-0.102798	0.157712	1.000000
against_fire	-0.279029	-0.169489	-0.076480
against_flying	-0.111461	0.199862	-0.318941
against_ghost	-0.073031	-0.120806	-0.546982
against_grass	0.056209	0.052899	0.269157
against_ground	-0.269444	-0.256504	0.358793
against_ice	-0.328531	0.273650	-0.220239
against_normal	0.076699	0.149488	-0.006997
against_poison	-0.015769	0.146464	-0.189798
against_psychic	-0.017592	-0.145238	-0.264938
against_rock	0.417261	-0.205444	-0.240964
against_steel	-0.187543	0.130323	0.165066
against_water	-0.297600	-0.218937	0.205249
attack	-0.104276	0.207526	0.149123
base_egg_steps	-0.061970	0.120594	-0.006359
base_happiness	0.030411	-0.209323	-0.088722
base_total	-0.017137	0.098948	0.048629
capture_rate	-0.006815	-0.091230	-0.040466
defense	-0.072433	0.001655	0.150424
experience_growth	-0.041584	0.146370	0.010407
height_m	0.003022	0.114993	0.058524
hp	-0.035354	0.129284	0.109425
sp_attack	0.022305	-0.010296	-0.118481
sp_defense	0.019193	0.002754	-0.044460
speed	0.111422	0.065401	-0.050495
weight_kg	-0.101403	0.098210	0.159761
generation	-0.063180	0.150801	0.000681

is_legendary	-0.023151	0.050165	-0.059132
total_abilities	-0.009941	-0.026883	0.112843

	against_fire	against_flying	against_ghost	against_grass \
against_bug	0.202778	0.183343	0.129174	0.079197
against_dark	0.010527	-0.179697	0.672337	-0.006533
against_dragon	-0.261570	0.064850	-0.049941	-0.037135
against_electric	-0.279029	-0.111461	-0.073031	0.056209
against_fairy	-0.169489	0.199862	-0.120806	0.052899
against_fight	-0.076480	-0.318941	-0.546982	0.269157
against_fire	1.000000	0.528127	0.050570	-0.463634
against_flying	0.528127	1.000000	0.013204	-0.358467
against_ghost	0.050570	0.013204	1.000000	0.029542
against_grass	-0.463634	-0.358467	0.029542	1.000000
against_ground	-0.260766	-0.465010	0.093727	0.195064
against_ice	0.186361	0.277935	-0.052531	-0.239682
against_normal	-0.055106	0.266780	-0.404780	-0.127550
against_poison	0.184334	0.484843	-0.105137	-0.221946
against_psychic	-0.018519	0.375023	-0.084496	-0.093657
against_rock	0.120747	0.161885	-0.061013	-0.375177
against_steel	0.115992	0.001264	-0.002008	0.082812
against_water	-0.242635	-0.311997	0.009046	0.229968
attack	-0.005762	-0.002991	-0.034549	0.036787
base_egg_steps	-0.044802	-0.091304	0.174115	-0.064971
base_happiness	0.007441	0.056480	-0.037205	0.063475
base_total	-0.061698	-0.106586	0.114179	-0.017340
capture_rate	0.078668	0.076299	-0.112219	0.000511
defense	0.037921	-0.127950	0.136490	0.139542
experience_growth	-0.027136	0.019100	0.059262	-0.039623
height_m	-0.085422	-0.072533	0.031626	0.029533
hp	-0.099242	-0.060624	-0.062052	0.056886
sp_attack	-0.088578	-0.111243	0.233309	-0.093899
sp_defense	-0.019520	-0.079022	0.195439	-0.056427
speed	-0.079129	-0.043381	-0.029007	-0.153618
weight_kg	-0.043925	-0.125959	0.046506	0.048407
generation	0.061157	0.058204	0.038027	-0.107987
is_legendary	-0.011073	-0.062214	0.170746	-0.070826
total_abilities	-0.037781	-0.014460	-0.153541	0.163818

	against_ground	against_ice	against_normal \
against_bug	-0.186841	0.148176	0.215589
against_dark	-0.007660	-0.010763	-0.413632
against_dragon	-0.120042	0.350048	0.142035
against_electric	-0.269444	-0.328531	0.076699
against_fairy	-0.256504	0.273650	0.149488
against_fight	0.358793	-0.220239	-0.006997
against_fire	-0.260766	0.186361	-0.055106

against_flying	-0.465010	0.277935	0.266780
against_ghost	0.093727	-0.052531	-0.404780
against_grass	0.195064	-0.239682	-0.127550
against_ground	1.000000	-0.490852	-0.302834
against_ice	-0.490852	1.000000	0.094797
against_normal	-0.302834	0.094797	1.000000
against_poison	-0.438281	0.233954	0.466155
against_psychic	0.044702	0.042876	0.136175
against_rock	-0.371675	0.065555	0.172851
against_steel	-0.104709	0.190155	-0.138512
against_water	0.411545	-0.045840	-0.243696
attack	0.028879	0.074172	-0.118407
base_egg_steps	0.017828	0.046349	-0.068140
base_happiness	-0.010439	-0.045024	0.113610
base_total	0.064252	0.021909	-0.105328
capture_rate	-0.062906	-0.017765	0.103860
defense	0.186532	-0.015977	-0.302423
experience_growth	0.015118	0.069633	0.065707
height_m	-0.004001	0.068134	-0.074020
hp	-0.025928	0.055031	0.042292
sp_attack	0.075511	-0.035767	-0.037069
sp_defense	0.058397	-0.043342	-0.111376
speed	-0.082846	0.056169	0.129555
weight_kg	0.108226	0.017194	-0.133903
generation	-0.019672	0.026089	-0.115024
is_legendary	0.012812	0.005580	-0.034761
total_abilities	0.004170	0.034051	0.106571

	against_poison	against_psychic	against_rock	\
against_bug	0.354255	-0.463272	-0.210522	
against_dark	-0.236919	-0.230415	0.011963	
against_dragon	-0.210199	0.100153	0.090184	
against_electric	-0.015769	-0.017592	0.417261	
against_fairy	0.146464	-0.145238	-0.205444	
against_fight	-0.189798	-0.264938	-0.240964	
against_fire	0.184334	-0.018519	0.120747	
against_flying	0.484843	0.375023	0.161885	
against_ghost	-0.105137	-0.084496	-0.061013	
against_grass	-0.221946	-0.093657	-0.375177	
against_ground	-0.438281	0.044702	-0.371675	
against_ice	0.233954	0.042876	0.065555	
against_normal	0.466155	0.136175	0.172851	
against_poison	1.000000	-0.005262	0.127510	
against_psychic	-0.005262	1.000000	-0.017883	
against_rock	0.127510	-0.017883	1.000000	
against_steel	0.210068	0.016128	0.037435	
against_water	-0.397988	-0.031205	0.057045	

attack	-0.178035	-0.007429	-0.131733
base_egg_steps	-0.106156	-0.129515	-0.048610
base_happiness	0.112715	0.149530	0.020233
base_total	-0.097396	-0.106435	-0.038083
capture_rate	0.055566	0.089375	-0.029422
defense	-0.234938	-0.116788	-0.161825
experience_growth	-0.025497	-0.009114	-0.041418
height_m	-0.124470	-0.021671	-0.035362
hp	-0.020831	-0.039355	-0.069542
sp_attack	0.050514	-0.127005	0.074479
sp_defense	-0.006453	-0.093377	-0.014870
speed	0.015357	-0.037739	0.156703
weight_kg	-0.201891	-0.087596	-0.111823
generation	0.085318	-0.095373	-0.026864
is_legendary	-0.024349	-0.106047	-0.017588
total_abilities	0.031017	0.083693	-0.071796

	against_steel	against_water	attack	base_egg_steps	\
against_bug	0.055504	-0.254732	-0.054175	0.062133	
against_dark	-0.119758	-0.001976	-0.098849	0.187220	
against_dragon	-0.227697	-0.096549	0.138217	0.164773	
against_electric	-0.187543	-0.297600	-0.104276	-0.061970	
against_fairy	0.130323	-0.218937	0.207526	0.120594	
against_fight	0.165066	0.205249	0.149123	-0.006359	
against_fire	0.115992	-0.242635	-0.005762	-0.044802	
against_flying	0.001264	-0.311997	-0.002991	-0.091304	
against_ghost	-0.002008	0.009046	-0.034549	0.174115	
against_grass	0.082812	0.229968	0.036787	-0.064971	
against_ground	-0.104709	0.411545	0.028879	0.017828	
against_ice	0.190155	-0.045840	0.074172	0.046349	
against_normal	-0.138512	-0.243696	-0.118407	-0.068140	
against_poison	0.210068	-0.397988	-0.178035	-0.106156	
against_psychic	0.016128	-0.031205	-0.007429	-0.129515	
against_rock	0.037435	0.057045	-0.131733	-0.048610	
against_steel	1.000000	0.239093	0.015767	-0.021007	
against_water	0.239093	1.000000	0.102973	-0.019664	
attack	0.015767	0.102973	1.000000	0.331088	
base_egg_steps	-0.021007	-0.019664	0.331088	1.000000	
base_happiness	0.006510	0.022273	-0.251811	-0.524551	
base_total	-0.006741	0.024011	0.730134	0.496466	
capture_rate	-0.012737	-0.037705	-0.497098	-0.355455	
defense	0.053419	0.136302	0.468915	0.265230	
experience_growth	-0.075842	-0.018585	0.241087	0.373837	
height_m	-0.028863	0.034565	0.418681	0.377584	
hp	0.028492	0.004569	0.410616	0.359218	
sp_attack	-0.076379	-0.060562	0.368154	0.404477	
sp_defense	0.055443	-0.054123	0.265836	0.335404	

speed	-0.096497	-0.044726	0.352703	0.289447
weight_kg	0.015950	0.113920	0.378137	0.438788
generation	0.069460	-0.061144	0.101375	0.128941
is_legendary	0.001397	-0.020679	0.303295	0.873488
total_abilities	0.081780	0.079804	-0.139730	-0.347812

	base_happiness	base_total	capture_rate	defense \
against_bug	0.009994	-0.012398	0.005230	-0.036474
against_dark	0.024155	0.065446	-0.047674	0.048039
against_dragon	-0.151915	0.069766	-0.091317	-0.023794
against_electric	0.030411	-0.017137	-0.006815	-0.072433
against_fairy	-0.209323	0.098948	-0.091230	0.001655
against_fight	-0.088722	0.048629	-0.040466	0.150424
against_fire	0.007441	-0.061698	0.078668	0.037921
against_flying	0.056480	-0.106586	0.076299	-0.127950
against_ghost	-0.037205	0.114179	-0.112219	0.136490
against_grass	0.063475	-0.017340	0.000511	0.139542
against_ground	-0.010439	0.064252	-0.062906	0.186532
against_ice	-0.045024	0.021909	-0.017765	-0.015977
against_normal	0.113610	-0.105328	0.103860	-0.302423
against_poison	0.112715	-0.097396	0.055566	-0.234938
against_psychic	0.149530	-0.106435	0.089375	-0.116788
against_rock	0.020233	-0.038083	-0.029422	-0.161825
against_steel	0.006510	-0.006741	-0.012737	0.053419
against_water	0.022273	0.024011	-0.037705	0.136302
attack	-0.251811	0.730134	-0.497098	0.468915
base_egg_steps	-0.524551	0.496466	-0.355455	0.265230
base_happiness	1.000000	-0.274795	0.167834	-0.191503
base_total	-0.274795	1.000000	-0.712275	0.629620
capture_rate	0.167834	-0.712275	1.000000	-0.445871
defense	-0.191503	0.629620	-0.445871	1.000000
experience_growth	-0.295348	0.256930	-0.173575	0.129698
height_m	-0.342484	0.529500	-0.375136	0.357813
hp	-0.108217	0.620624	-0.475327	0.242378
sp_attack	-0.228924	0.741120	-0.520682	0.241882
sp_defense	-0.149719	0.717434	-0.522616	0.526348
speed	-0.148753	0.547666	-0.384640	0.007934
weight_kg	-0.404763	0.453347	-0.321297	0.419234
generation	-0.115974	0.084358	-0.055102	0.057603
is_legendary	-0.413108	0.485440	-0.327677	0.265587
total_abilities	0.228206	-0.205599	0.240855	-0.112147

	experience_growth	height_m	hp	sp_attack \
against_bug	0.035717	-0.059781	0.034897	0.055352
against_dark	-0.008391	0.018608	0.010589	0.170849
against_dragon	0.172547	0.164448	0.089721	0.039739
against_electric	-0.041584	0.003022	-0.035354	0.022305

against_fairy	0.146370	0.114993	0.129284	-0.010296
against_fight	0.010407	0.058524	0.109425	-0.118481
against_fire	-0.027136	-0.085422	-0.099242	-0.088578
against_flying	0.019100	-0.072533	-0.060624	-0.111243
against_ghost	0.059262	0.031626	-0.062052	0.233309
against_grass	-0.039623	0.029533	0.056886	-0.093899
against_ground	0.015118	-0.004001	-0.025928	0.075511
against_ice	0.069633	0.068134	0.055031	-0.035767
against_normal	0.065707	-0.074020	0.042292	-0.037069
against_poison	-0.025497	-0.124470	-0.020831	0.050514
against_psychic	-0.009114	-0.021671	-0.039355	-0.127005
against_rock	-0.041418	-0.035362	-0.069542	0.074479
against_steel	-0.075842	-0.028863	0.028492	-0.076379
against_water	-0.018585	0.034565	0.004569	-0.060562
attack	0.241087	0.418681	0.410616	0.368154
base_egg_steps	0.373837	0.377584	0.359218	0.404477
base_happiness	-0.295348	-0.342484	-0.108217	-0.228924
base_total	0.256930	0.529500	0.620624	0.741120
capture_rate	-0.173575	-0.375136	-0.475327	-0.520682
defense	0.129698	0.357813	0.242378	0.241882
experience_growth	1.000000	0.245255	0.214068	0.201603
height_m	0.245255	1.000000	0.473163	0.346736
hp	0.214068	0.473163	1.000000	0.365973
sp_attack	0.201603	0.346736	0.365973	1.000000
sp_defense	0.088806	0.324967	0.366971	0.511496
speed	0.144946	0.199634	0.160760	0.438981
weight_kg	0.245378	0.626551	0.423089	0.240862
generation	0.052530	-0.024879	0.074065	0.070146
is_legendary	0.361038	0.319678	0.308405	0.406281
total_abilities	-0.119901	-0.078057	-0.055467	-0.242937

	sp_defense	speed	weight_kg	generation	is_legendary \
against_bug	-0.002342	-0.043802	-0.031344	-0.001549	0.027864
against_dark	0.132507	-0.000326	0.037634	-0.016013	0.136315
against_dragon	-0.047416	0.078123	0.125991	-0.025201	0.014844
against_electric	0.019193	0.111422	-0.101403	-0.063180	-0.023151
against_fairy	0.002754	0.065401	0.098210	0.150801	0.050165
against_fight	-0.044460	-0.050495	0.159761	0.000681	-0.059132
against_fire	-0.019520	-0.079129	-0.043925	0.061157	-0.011073
against_flying	-0.079022	-0.043381	-0.125959	0.058204	-0.062214
against_ghost	0.195439	-0.029007	0.046506	0.038027	0.170746
against_grass	-0.056427	-0.153618	0.048407	-0.107987	-0.070826
against_ground	0.058397	-0.082846	0.108226	-0.019672	0.012812
against_ice	-0.043342	0.056169	0.017194	0.026089	0.005580
against_normal	-0.111376	0.129555	-0.133903	-0.115024	-0.034761
against_poison	-0.006453	0.015357	-0.201891	0.085318	-0.024349
against_psychic	-0.093377	-0.037739	-0.087596	-0.095373	-0.106047

against_rock	-0.014870	0.156703	-0.111823	-0.026864	-0.017588
against_steel	0.055443	-0.096497	0.015950	0.069460	0.001397
against_water	-0.054123	-0.044726	0.113920	-0.061144	-0.020679
attack	0.265836	0.352703	0.378137	0.101375	0.303295
base_egg_steps	0.335404	0.289447	0.438788	0.128941	0.873488
base_happiness	-0.149719	-0.148753	-0.404763	-0.115974	-0.413108
base_total	0.717434	0.547666	0.453347	0.084358	0.485440
capture_rate	-0.522616	-0.384640	-0.321297	-0.055102	-0.327677
defense	0.526348	0.007934	0.419234	0.057603	0.265587
experience_growth	0.088806	0.144946	0.245378	0.052530	0.361038
height_m	0.324967	0.199634	0.626551	-0.024879	0.319678
hp	0.366971	0.160760	0.423089	0.074065	0.308405
sp_attack	0.511496	0.438981	0.240862	0.070146	0.406281
sp_defense	1.000000	0.225977	0.303386	0.048711	0.343241
speed	0.225977	1.000000	0.050731	-0.019914	0.311639
weight_kg	0.303386	0.050731	1.000000	0.083597	0.390001
generation	0.048711	-0.019914	0.083597	1.000000	0.139029
is_legendary	0.343241	0.311639	0.390001	0.139029	1.000000
total_abilities	-0.148840	-0.106234	-0.108321	-0.208220	-0.337101

	total_abilities
against_bug	-0.009296
against_dark	-0.133164
against_dragon	-0.065178
against_electric	-0.009941
against_fairy	-0.026883
against_fight	0.112843
against_fire	-0.037781
against_flying	-0.014460
against_ghost	-0.153541
against_grass	0.163818
against_ground	0.004170
against_ice	0.034051
against_normal	0.106571
against_poison	0.031017
against_psychic	0.083693
against_rock	-0.071796
against_steel	0.081780
against_water	0.079804
attack	-0.139730
base_egg_steps	-0.347812
base_happiness	0.228206
base_total	-0.205599
capture_rate	0.240855
defense	-0.112147
experience_growth	-0.119901
height_m	-0.078057

```

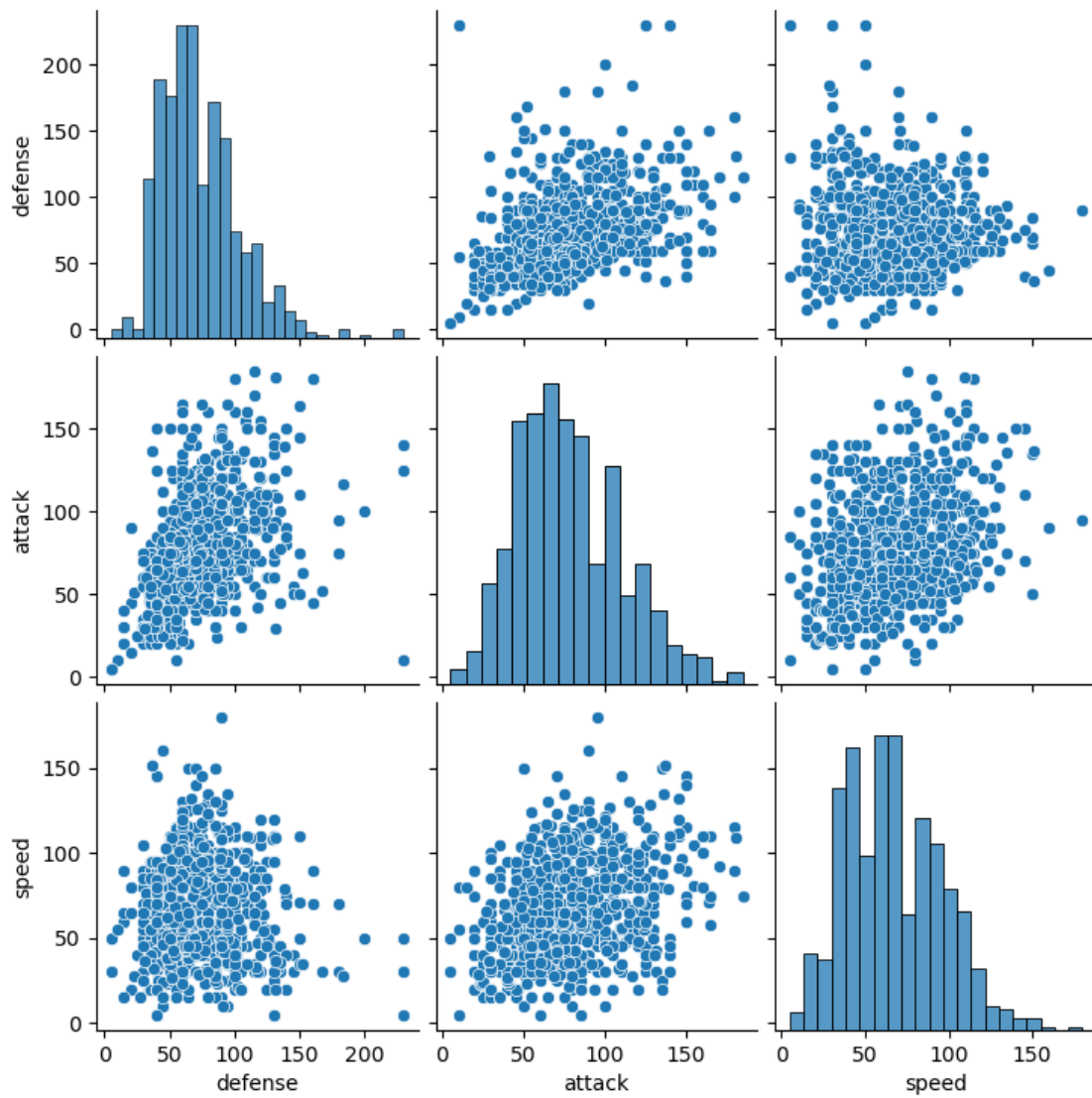
hp                -0.055467
sp_attack         -0.242937
sp_defense        -0.148840
speed            -0.106234
weight_kg         -0.108321
generation        -0.208220
is_legendary      -0.337101
total_abilities   1.000000

```

1.5 Pairplot for relations between attributes

```
[228]: sns.pairplot(data=df, vars=['defense', 'attack', 'speed'])
```

```
[228]: <seaborn.axisgrid.PairGrid at 0x1f59f61e400>
```

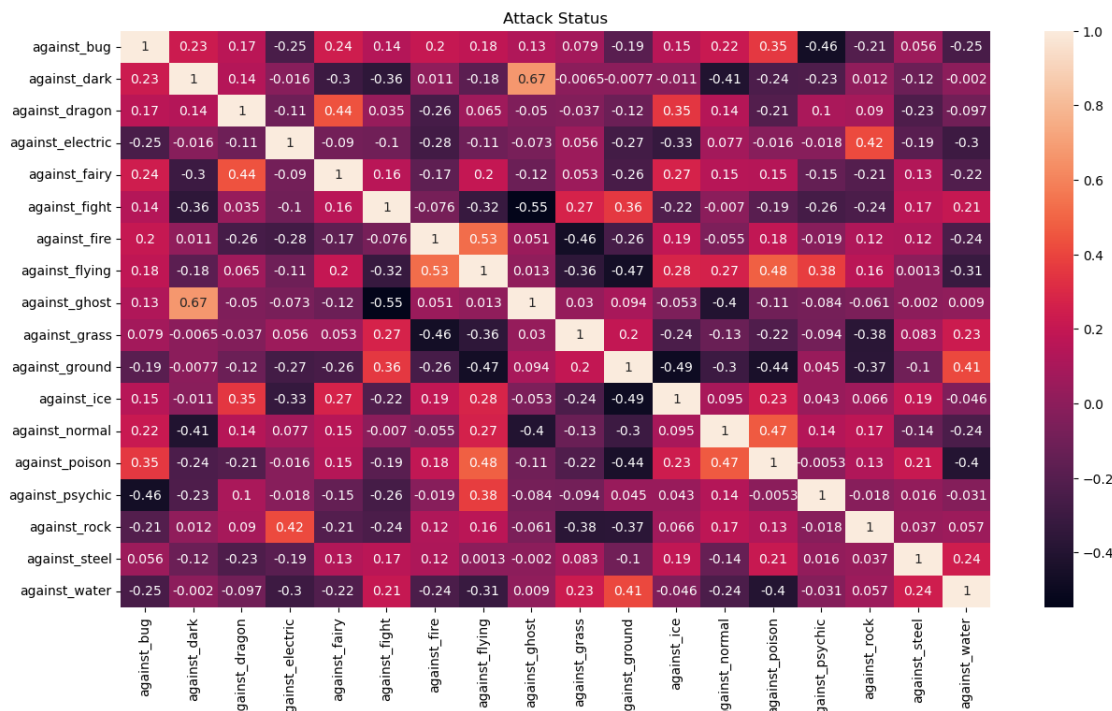


```
[53]: # separate the correlations into two main parts
```

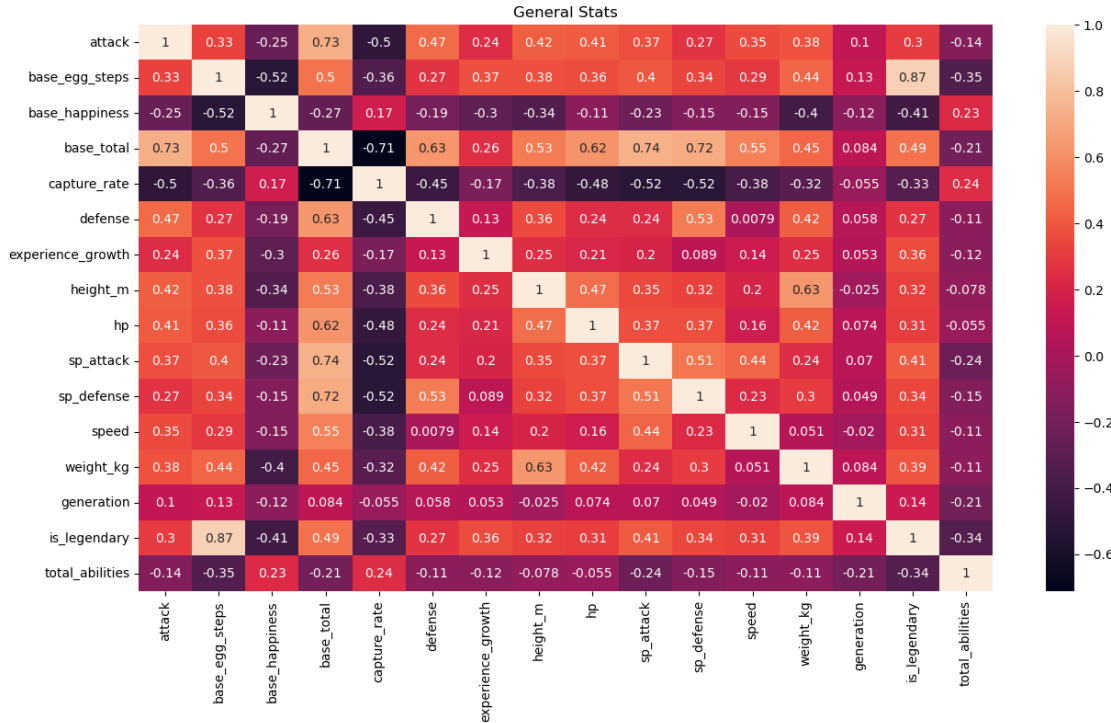
```
against = []
rest = []

for column_name in df.columns:
    if 'against' in column_name:
        against.append(column_name)
    else:
        rest.append(column_name)
```

```
[63]: plt.figure(figsize=(15,8))
sns.heatmap(df[against].corr(), annot=True).set_title("Attack Status")
plt.show()
```



```
[64]: plt.figure(figsize=(15, 8))
sns.heatmap(df[rest].corr(), annot=True).set_title("General Stats")
plt.show()
```



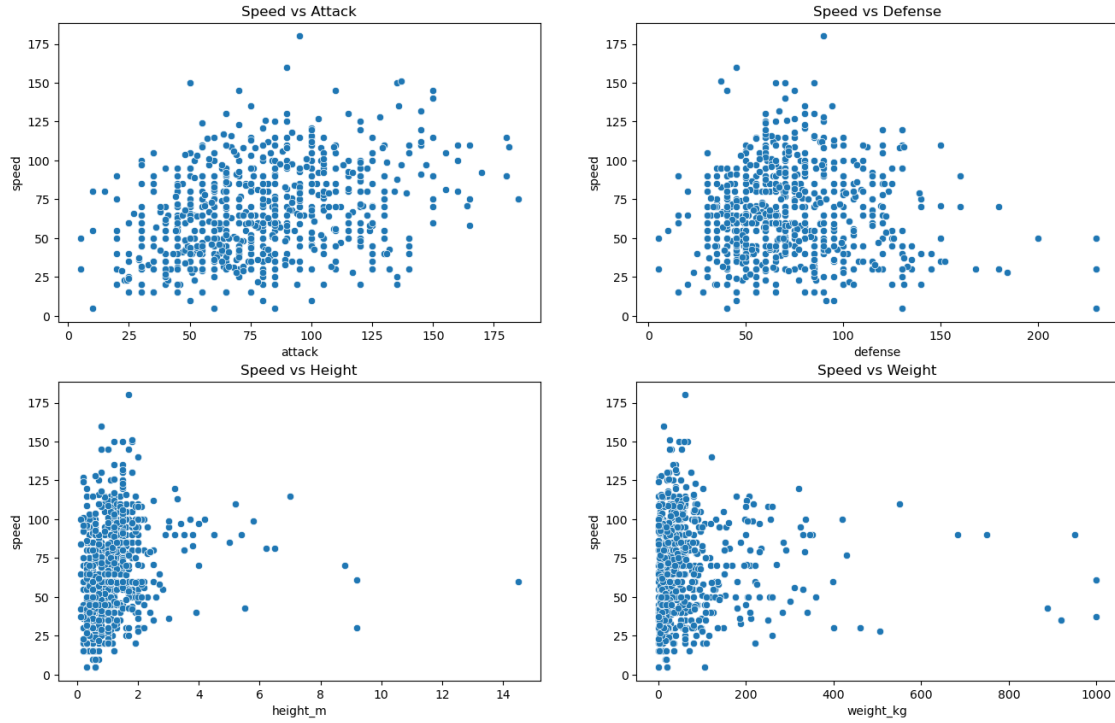
Points concluded from above - base_total has a good coorelation with defense and attack - lengendary pokemon have a huge coorelation with eggs_steps - weight of pokemon is dependent on its height

1.6 Speed of Pokemon with other attributes

```
[85]: # speed vs other factors/attributes
fig, axis = plt.subplots(2, 2, figsize=(16, 10))
sns.scatterplot(data=df, x='attack', y='speed', ax=axis[0,0]).set_title("Speed_
↪vs Attack")
sns.scatterplot(data=df, x='defense', y='speed', ax=axis[0,1]).set_title("Speed_
↪vs Defense")
sns.scatterplot(data=df, x='height_m', y='speed', ax=axis[1,0]).
↪set_title("Speed vs Height")
sns.scatterplot(data=df, x='weight_kg', y='speed', ax=axis[1,1]).
↪set_title("Speed vs Weight")

plt.suptitle("Speed Factors", size=20)
plt.show()
```

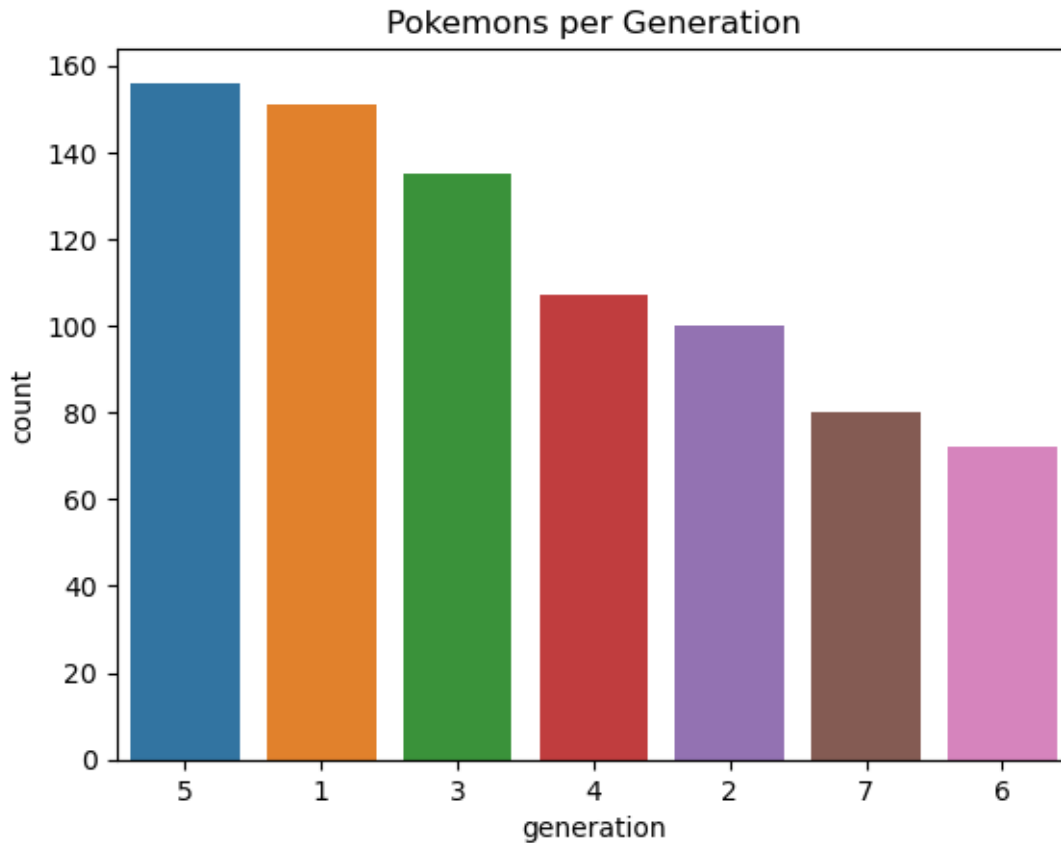

Speed Factors



1.7 Pokemon per Generation

```
[102]: sns.countplot(data=df, x='generation', order=df.generation.value_counts().  
         ↪index).set_title("Pokemons per Generation")
```

```
[102]: Text(0.5, 1.0, 'Pokemons per Generation')
```



```
[125]: type_generation_grouped = df.groupby(['generation', 'primary type'])['name'].
        ↪count().to_frame().reset_index()
        type_generation_grouped.rename(columns={'name': 'name_count'}, inplace=True)
        type_generation_grouped.head(20).T
```

```
[125]:
```

	0	1	2	3	4	5	6	7	\
generation	1	1	1	1	1	1	1	1	
primary type	bug	dragon	electric	fairy	fighting	fire	ghost	grass	
name_count	12	3	9	2	7	12	3	12	

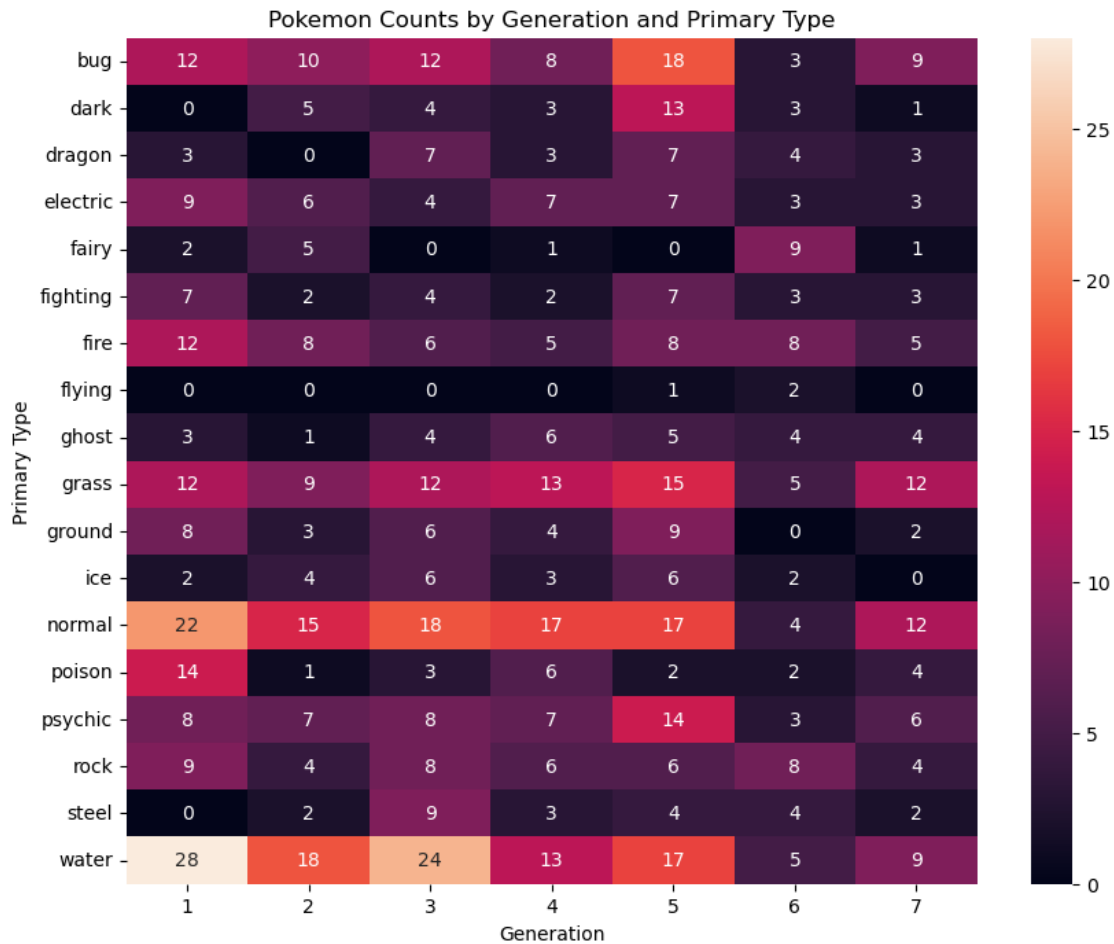
	8	9	10	11	12	13	14	15	16	\
generation	1	1	1	1	1	1	1	2	2	
primary type	ground	ice	normal	poison	psychic	rock	water	bug	dark	
name_count	8	2	22	14	8	9	28	10	5	

	17	18	19
generation	2	2	2
primary type	electric	fairy	fighting
name_count	6	5	2

```
[132]: pivot_table = type_generation_grouped.pivot_table(index='primary type',
↳ columns='generation', values='name_count', fill_value=0)
print(pivot_table)

# heat map
plt.figure(figsize=(10, 8))
sns.heatmap(pivot_table, annot=True)
plt.title('Pokemon Counts by Generation and Primary Type')
plt.xlabel('Generation')
plt.ylabel('Primary Type')
plt.show()
```

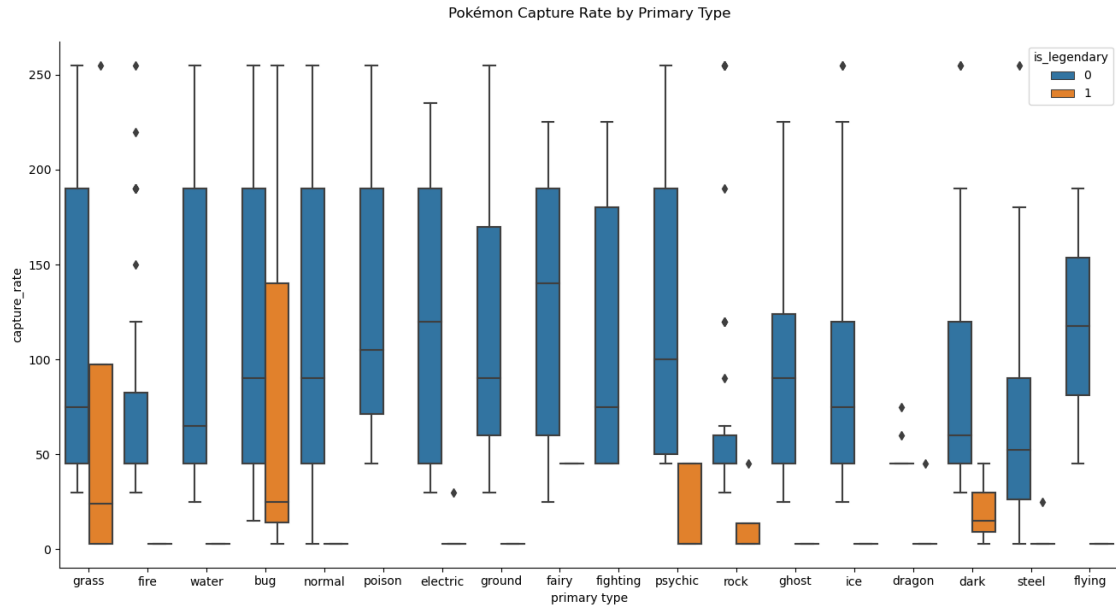
generation	1	2	3	4	5	6	7
primary type							
bug	12	10	12	8	18	3	9
dark	0	5	4	3	13	3	1
dragon	3	0	7	3	7	4	3
electric	9	6	4	7	7	3	3
fairy	2	5	0	1	0	9	1
fighting	7	2	4	2	7	3	3
fire	12	8	6	5	8	8	5
flying	0	0	0	0	1	2	0
ghost	3	1	4	6	5	4	4
grass	12	9	12	13	15	5	12
ground	8	3	6	4	9	0	2
ice	2	4	6	3	6	2	0
normal	22	15	18	17	17	4	12
poison	14	1	3	6	2	2	4
psychic	8	7	8	7	14	3	6
rock	9	4	8	6	6	8	4
steel	0	2	9	3	4	4	2
water	28	18	24	13	17	5	9



1.8 Pokemon Capture rate Analysis

```
[151]: plt.figure(figsize=(16,8))
ax = sns.boxplot(data=df, x='primary type', y='capture_rate',
                hue='is_legendary').set_title('Pokémon Capture Rate by Primary Type', pad=20)

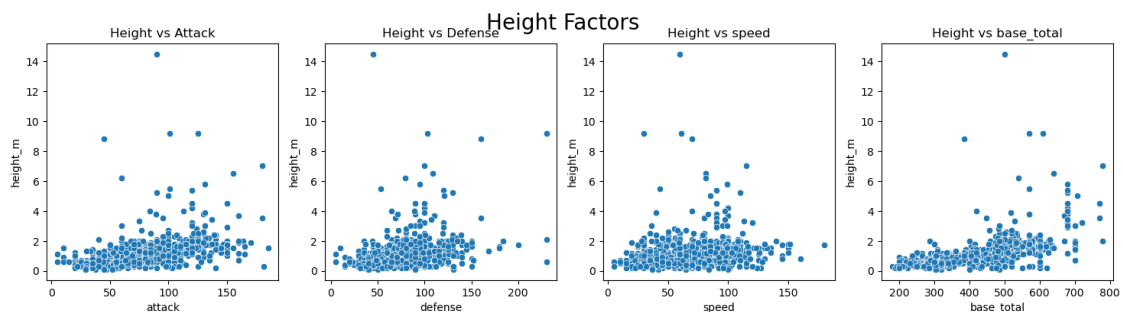
sns.despine(top=True, right=True)
plt.show()
```



1.9 Height of Pokemon with other attributes

```
[153]: # height vs different factors
fig, axes = plt.subplots(1, 4, figsize=(18, 4))
sns.scatterplot(data=df, x='attack', y='height_m', ax=axes[0]).
    ↪set_title("Height vs Attack")
sns.scatterplot(data=df, x='defense', y='height_m', ax=axes[1]).
    ↪set_title("Height vs Defense")
sns.scatterplot(data=df, x='speed', y='height_m', ax=axes[2]).set_title("Height_
    ↪vs speed")
sns.scatterplot(data=df, x='base_total', y='height_m', ax=axes[3]).
    ↪set_title("Height vs base_total")

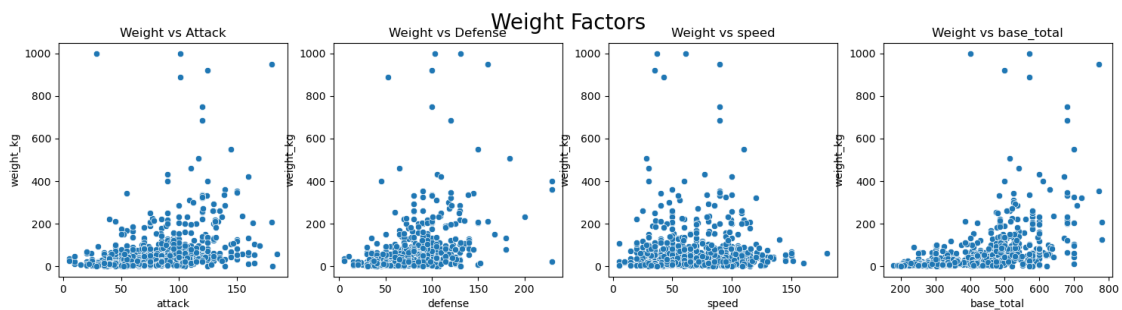
plt.suptitle("Height Factors", size=20)
plt.show()
```



1.10 Weight of Pokemon with other attributes

```
[154]: # weight vs different factors
fig, axes = plt.subplots(1, 4, figsize=(18, 4))
sns.scatterplot(data=df, x='attack', y='weight_kg', ax=axes[0]).
    ↪set_title("Weight vs Attack")
sns.scatterplot(data=df, x='defense', y='weight_kg', ax=axes[1]).
    ↪set_title("Weight vs Defense")
sns.scatterplot(data=df, x='speed', y='weight_kg', ax=axes[2]).
    ↪set_title("Weight vs speed")
sns.scatterplot(data=df, x='base_total', y='weight_kg', ax=axes[3]).
    ↪set_title("Weight vs base_total")

plt.suptitle("Weight Factors", size=20)
plt.show()
```



1.11 Legendary Pokemon

```
[159]: df.loc[df.is_legendary==1][['name', 'primary type', 'secondary type',
    ↪'abilities']].head()
```

```
[159]:
```

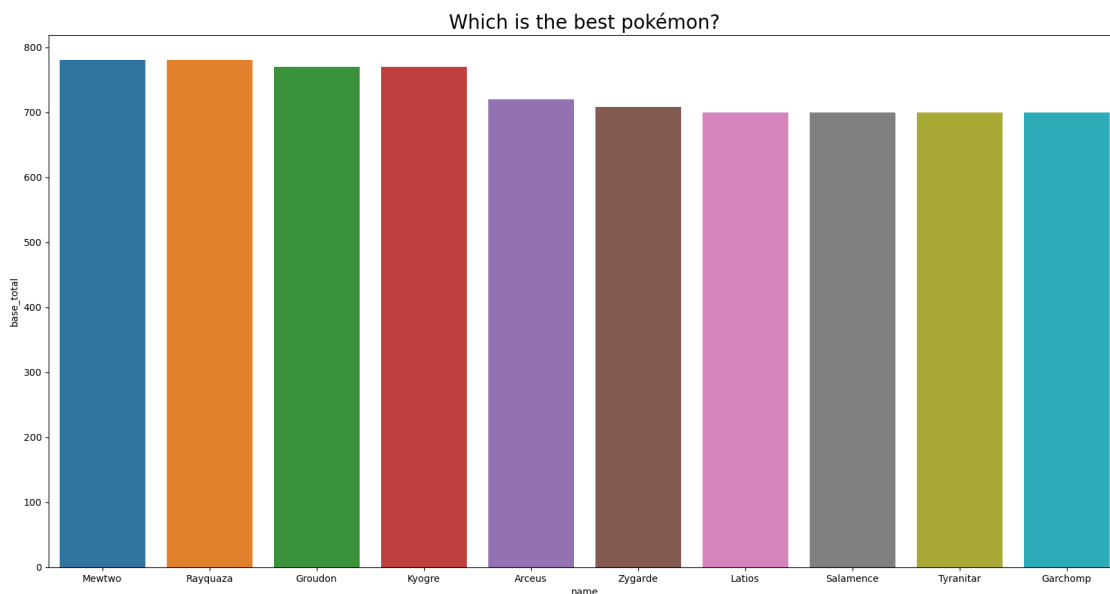
	name	primary type	secondary type	abilities
143	Articuno	ice	flying	['Pressure', 'Snow Cloak']
144	Zapdos	electric	flying	['Pressure', 'Static']
145	Moltres	fire	flying	['Pressure', 'Flame Body']
149	Mewtwo	psychic	None	['Pressure', 'Unnerve']
150	Mew	psychic	None	['Synchronize']

1.12 Strongest Type Of Pokemon

```
[181]: # strongest type of poekmon
top10 = df.sort_values(by='base_total', ascending=False)[:10]
top10

plt.figure(figsize=(20, 10))
sns.barplot(data=top10, x=top10['name'], y=top10['base_total'], orient='v').
    set_title("Which is the best pokémon?", size=20)
```

```
[181]: Text(0.5, 1.0, 'Which is the best pokémon?')
```



1.13 Strongest Pokemons V/S God Of Pokemon

```
[207]: import numpy as np

# Strongest Pokemon V/S God of Pokemons
attributes = ['attack', 'sp_attack', 'defense', 'sp_defense', 'hp', 'speed']

mewtwo = top10[top10.name=='Mewtwo'][attributes].values.tolist()[0]
rayquaza = top10[top10.name=='Rayquaza'][attributes].values.tolist()[0]
Arceus = top10[top10.name=='Arceus'][attributes].values.tolist()[0]

angles = np.linspace(0, 2 * np.pi, len(attributes), endpoint=False)
angles = np.concatenate((angles, [angles[0]]))

attributes.append(attributes[0])
```

```
mewtwo.append(mewtwo[0])
rayquaza.append(rayquaza[0])
Arceus.append(Arceus[0])
```

```
[223]: fig = plt.figure(figsize=(20, 10))
ax = fig.add_subplot(111, polar=True)

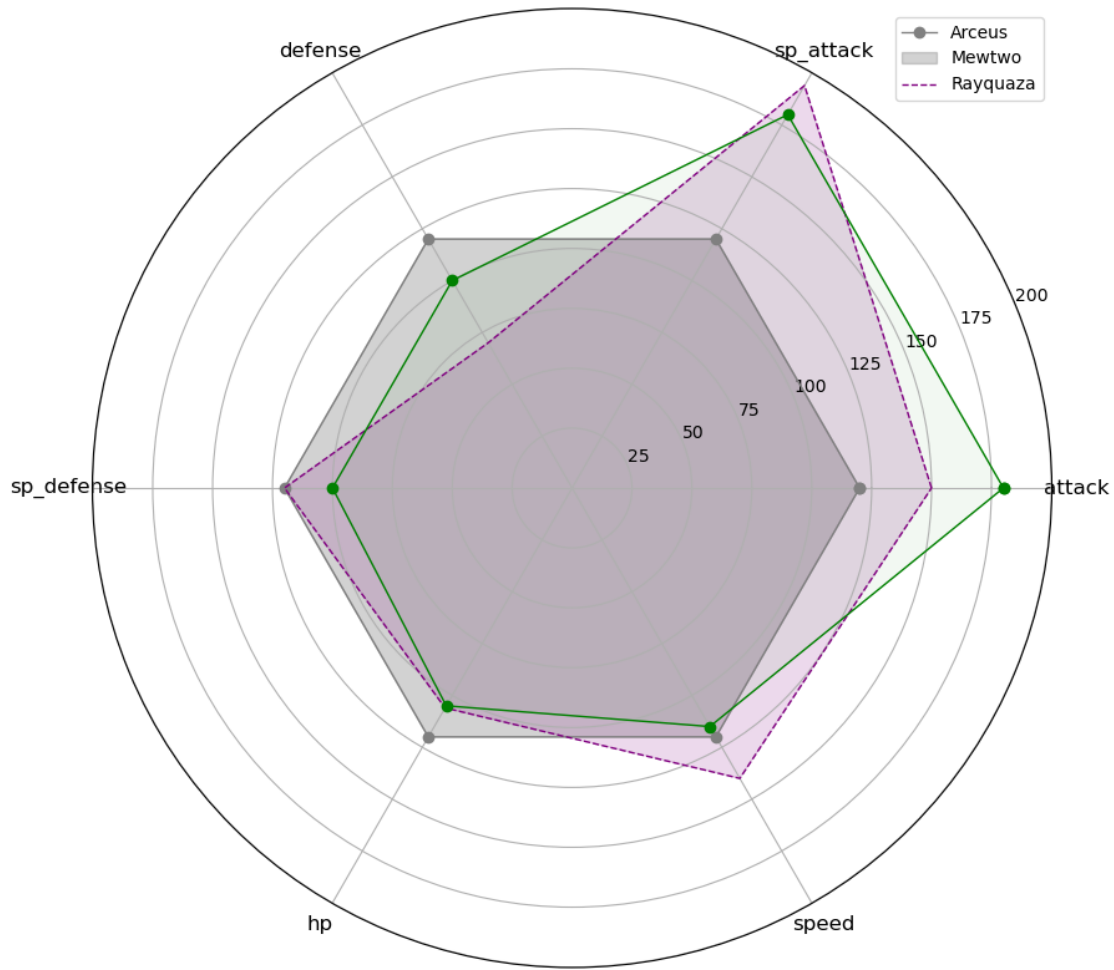
#Arceus Plot
ax.plot(angles, Arceus, 'o-', color='grey', linewidth=1, label='Arceus')
ax.fill(angles, Arceus, alpha=0.35, color='grey')

#mewtwo Plot
ax.plot(angles, mewtwo, '--', color='purple', linewidth=1, label='mewtwo')
ax.fill(angles, mewtwo, alpha=0.15, color='purple')

# Rayquaza Plot
ax.plot(angles, rayquaza, 'o-', color='green', linewidth=1, label='Rayquaza')
ax.fill(angles, rayquaza, alpha=0.05, color='green')

ax.set_thetagrids(angles[:-1]*180/np.pi, attributes[:-1], fontsize=12)
ax.legend(['Arceus', 'Mewtwo', 'Rayquaza'])
```

```
[223]: <matplotlib.legend.Legend at 0x1f5e195f580>
```

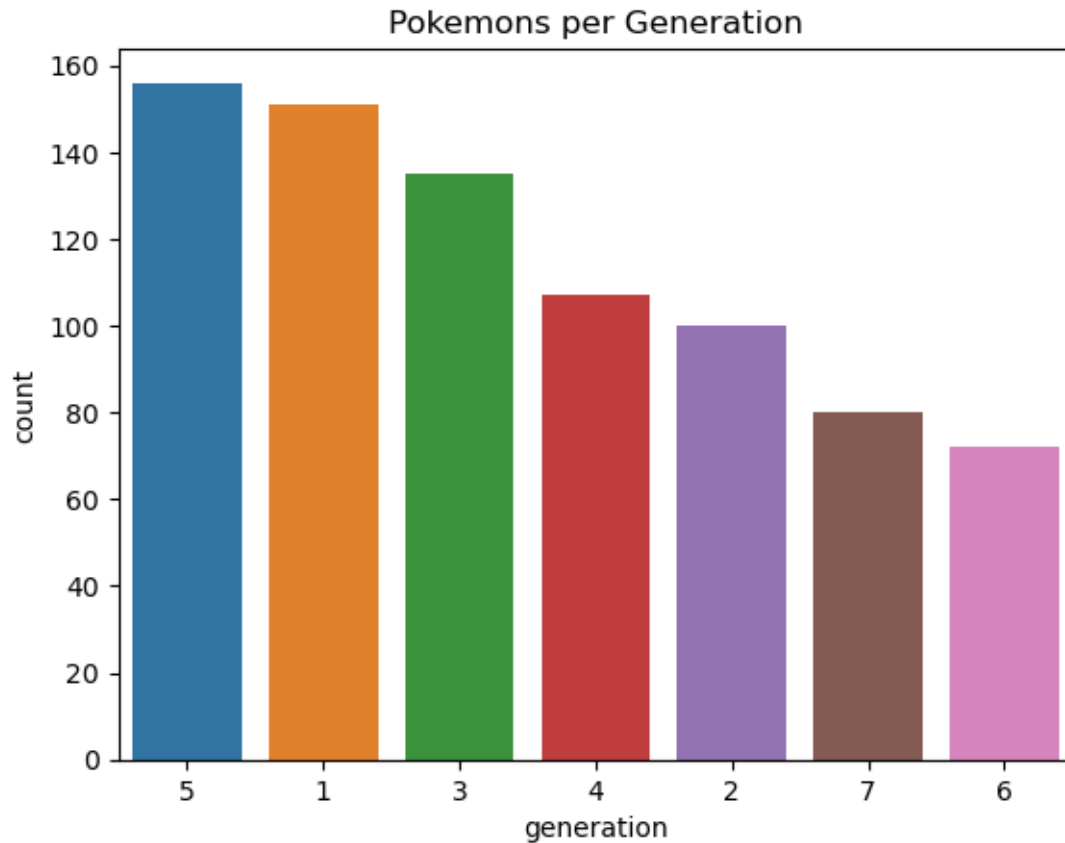



2 Task 2 :Make 5 story telling questions out of this dataset.

2.1 How does the distribution of Pokemon types vary across different generations in the dataset?

```
[229]: sns.countplot(data=df, x='generation', order=df.generation.value_counts().
        ↪index).set_title("Pokemons per Generation")
```

```
[229]: Text(0.5, 1.0, 'Pokemons per Generation')
```



2.2 Which legendary Pokemon have the highest and lowest capture rates?

```
[244]: print('Lowest Rate: \n{}'.format(df[df.is_legendary==1].
      ↪sort_values(by='capture_rate', ascending=True).head(1)[['name',
      ↪'capture_rate']]))
print('Highest Rate: \n{}'.format(df[df.is_legendary==1].
      ↪sort_values(by='capture_rate', ascending=False).head(1)[['name',
      ↪'capture_rate']]))
```

Lowest Rate:

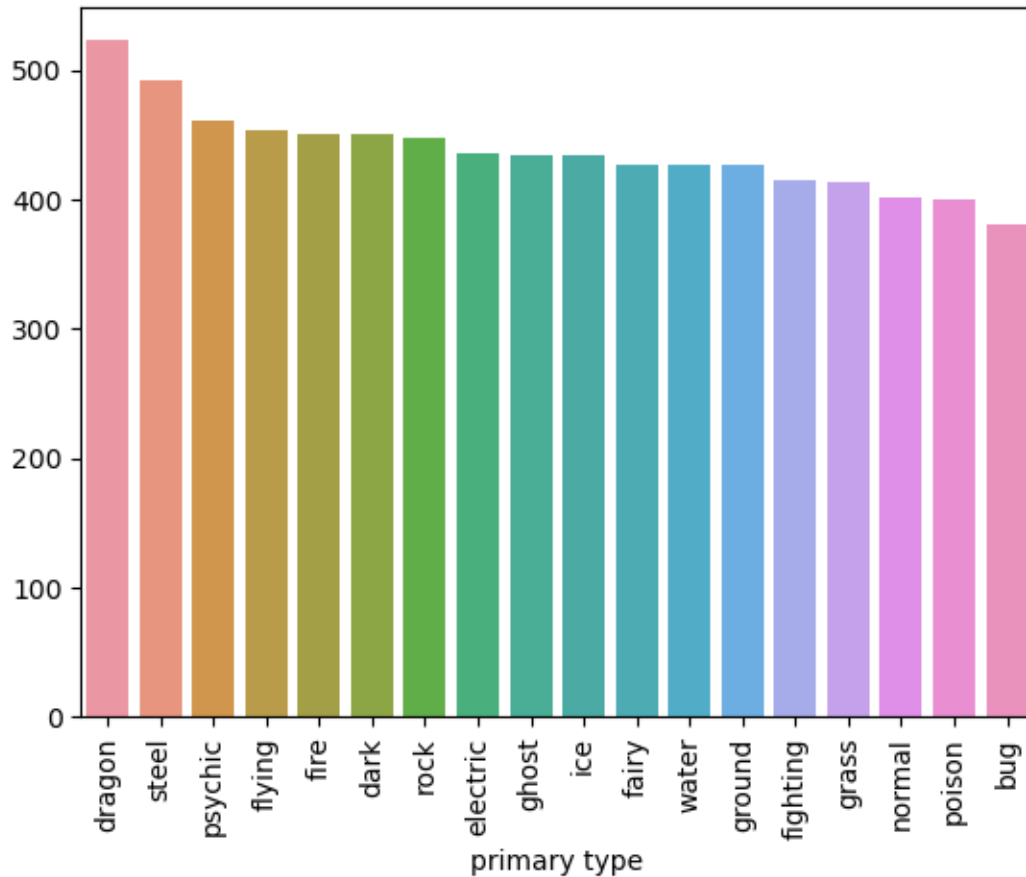
	name	capture_rate
143	Articuno	3

Highest Rate:

	name	capture_rate
797	Kartana	255

2.3 How does the average base stat total vary among different primary types, and which types tend to have the strongest overall stats?

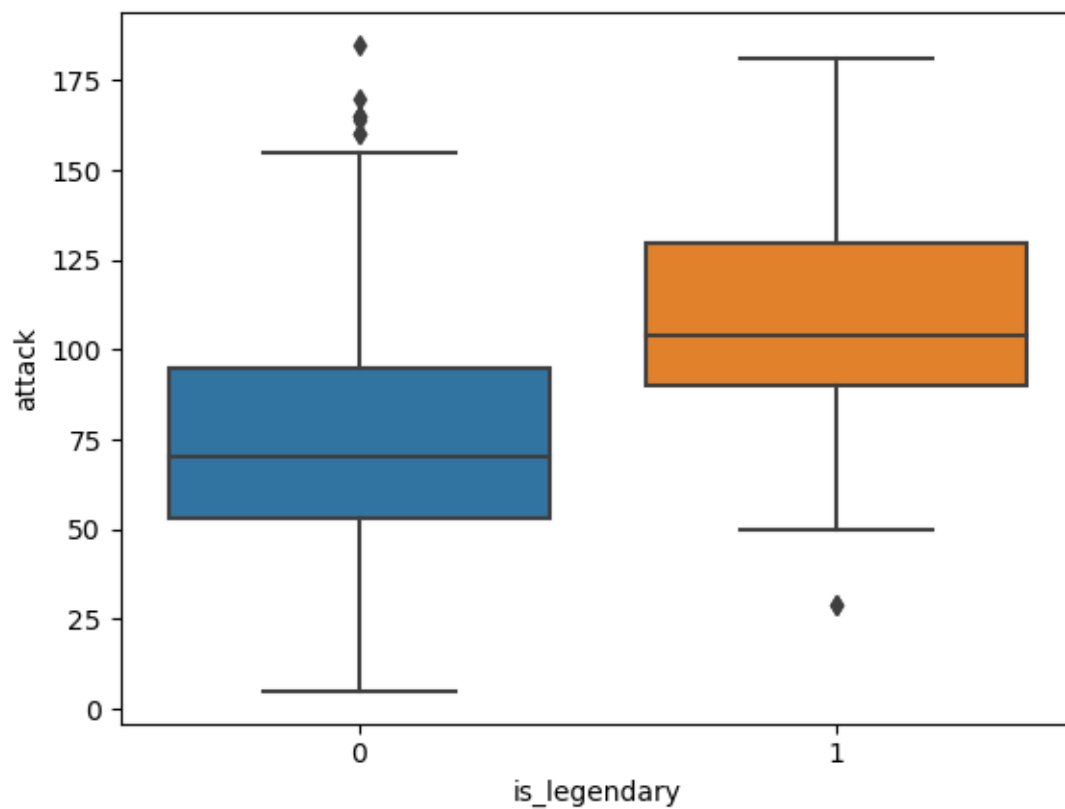
```
[253]: avg_base_stats = df.groupby('primary type')['base_total'].mean().  
        ↪sort_values(ascending=False)  
  
sns.barplot(x=avg_base_stats.index, y=avg_base_stats.values)  
plt.xticks(rotation=90)  
plt.show()
```



2.4 Are there any significant differences in the distribution of attack and defense attributes for legendary and non-legendary Pokemon? How do these attributes contribute to a Pokemon's classification as legendary?

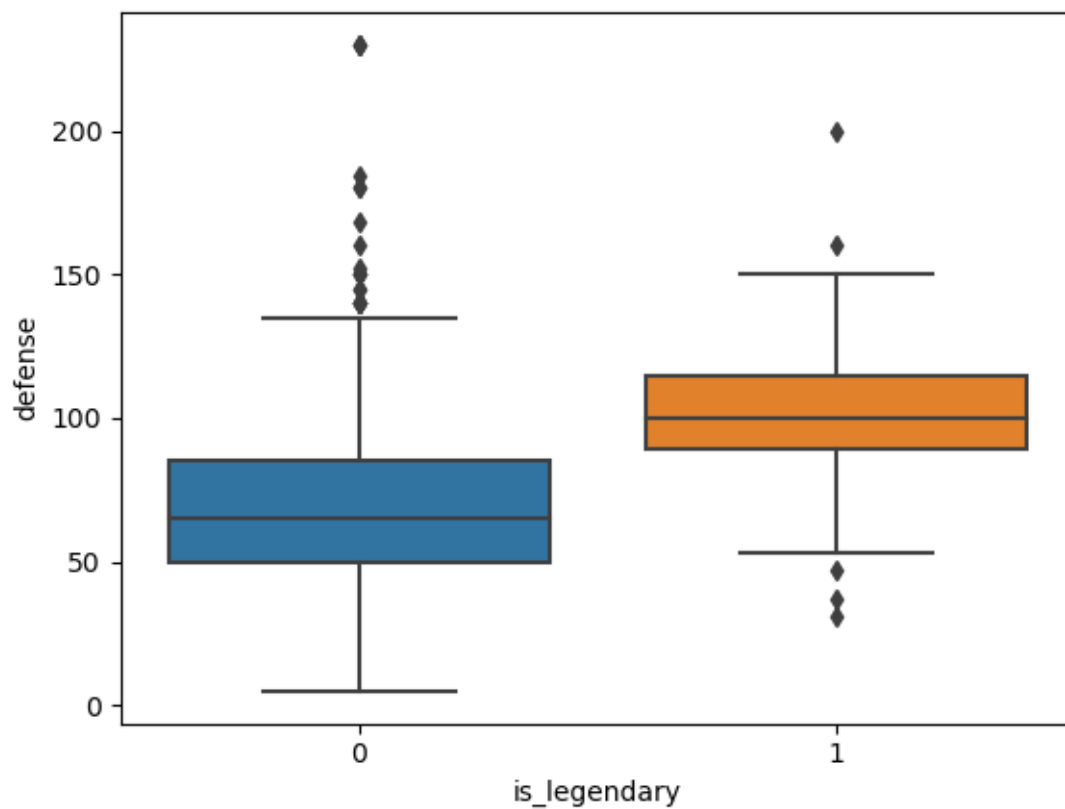
```
[254]: sns.boxplot(data=df, x='is_legendary', y='attack')
```

```
[254]: <Axes: xlabel='is_legendary', ylabel='attack'>
```



```
[255]: sns.boxplot(data=df, x='is_legendary', y='defense')
```

```
[255]: <Axes: xlabel='is_legendary', ylabel='defense'>
```



[]:

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[]: