An Exploratory Data Analysis on Pokémon Statistics

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Introduction

Overview

"Gotta catch 'em all" is *the* iconic motto for all Pokémon trainers as they fill up their Pokédexes and of course wonder "what Pokémon should I bring to battle?". Many different factors arise when answering this question which this paper answers through four different sub-questions. These sub-questions analyze Pokémon strength through four different lenses—how strong each generations' Legendary Pokémon are, predicting total stats when Pokémon types, the base stats of all Pokémon across all generations, and the distribution of Pokémon across the primary types. Within the answers to these questions, insights are produced for players and developers of the game. To contextualize our findings, it is necessary to define what a Pokémon generation is and what key characteristics Pokémon possess.

What is a Pokémon Generation?

A Pokémon generation is a selection of Pokémon that first appear in a specific game. Main series Pokémon games are either originals or remakes. Original Pokémon games contain brand new Pokémon in a brand new location or "region", each with their own unique stats and traits. Remakes are renewals of previous original Pokémon designed for newer game consoles with improved graphics and game mechanics. For example, an original Pokémon game is Pokémon Diamond which was later remade as Brilliant Diamond. For the purposes of this paper, only data from original games are included (Appendix A).

Pokémon Anatomy

Each Pokémon possesses various traits such as Pokédex number, primary type, secondary type, base stats, and moveset. A Pokémon's type determines what moves are most and least effective against it which subsequently determines damage taken when being attacked. Naturally,

highly effective moves cause greater damage than less effective moves. Additionally, a Pokémon's base stats indicate how well it will do in battle. A Pokémon's attack (ATK) and defense (DEF) reflect its ability to use and defend against physical attacks while special attack (Sp. ATK) and special defense (Sp. DEF) reflect its ability to use and defend against special attacks. Health points (HP) determine the maximum amount of damage Pokémon can take while speed (SPD) determines whether the Pokémon will strike first in battle. With six different base stats and numerous influences on a Pokémon's performance, this report focuses on the pure value of a Pokémon's stat total (TOTAL), and does not take into account different movesets and other external factors.

An example of a Pokémon is Pikachu (Appendix B), Pokédex entry #25, and is an Electric type. Pikachu takes double the damage from ground-type attacks and half the damage from electric, flying and steel-type attacks. Pikachu's base stats are listed in Appendix C**.** Pikachu's highest base stat is SPD (speed), meaning it has a higher chance of attacking first in battle, however it has average stats in all other categories. This analysis can be performed on all Pokémon by utilizing public databases, such as Pokémondb.net created by fans of the game.

Methodology

Web Scraping

To perform a significant analysis on Pokémon stats, quantitative data was necessary. The collected data was provided by Pokémon Database. Pokémon Database is an aggregate collection of every Pokémon, including each Pokémon's Pokédex number, name, elemental type, TOTAL, HP, ATK, DEF, Sp. ATK, Sp. DEF, and SPD. Our collection method was aided by Dataslice's YouTube tutorial. Per their recommendation, Chrome's "Selector Gadget" was used, which is a CSS method of data collection that parses through the HTML code to select page elements

containing information (Dataslice, 2020). Dataslice's recommendations and method allowed for efficient data collection that provided more time for analysis. Our group collected and cleaned the data in RStudio with the Rvest, Tidyr, and Dplyr packages. After the data was collected our group moved onto the cleaning stage; there were some noticeable issues with the imported data such as text not containing spaces and numbers being formatted as character type data. Ensuring that data was formatted as the right type was necessary to our group's analysis as we would not be able to perform tests on numeric data that were formatted as characters. This issue was resolved by piping the numeric data with the as.numeric() function. In order to properly format the character type data from, "ExampleText " to "Example Text", our group utilized regular expressions and the gsub() function (eh21, 2015). Furthermore, separating up the element types into two columns was required to provide further analysis on the most common primary type. Finally, once the data was cleaned our group formatted it into a dataframe called "PKMN_STAT" for analysis. For hypothesis testing our group decided to use a 95% confidence interval and an α level of 5%. All visuals were created in Excel by exporting the data frames from RStudio with the write.csv() function, and then importing it as text.

Question 1

Understanding how Pokémon have changed, in terms of base stats, provides trainers with an idea if one generation is stronger than the others. To investigate this, special class Pokémon (Legendaries, Sub-legendaries, and Mythicals) of each generation were analyzed as they are the strongest Pokémon in their respective generations (see Glossary). By creating a series of character strings (each containing the Pokedex entry number for a given generation), dplyr's %in% logical operator returns the groups of interest which were then categorized by generation via replicate() within a data frame. To measure the abilities of the special class Pokémon, only

those original forms were included (i.e., include Articuno but not Galarian Articuno). Another set of character strings was created to reflect this. This was necessary because the Pokedex reuses the same Pokedex entry number for both original and subsequent remakes of the same Pokémon. The subsequent data frame provided the average base stats of special class Pokémon by generation via colMeans() with the averages rounded to three decimal places. Using which.max(), data was filtered to return the generation with the highest stats. The largest percent change (using Generation 1 as the baseline for comparison) was calculated using lag() and apply() which led to a comparison table displaying the results. Because remakes of original legendary Pokémon were not included, it was subsequently necessary to test whether these new editions significantly improve upon the original design. To start, we subsetted the complete list of special class Pokémon into "classics" and "remakes". Once separated, the average of each list's respective stats was calculated using round() and colMeans() again. The data frame of displaying the comparison of averages was transposed such that "classics" and "redone" were row values and the base stats listed as columns. To test whether these averages were significantly different from one another, a paired t-test was used as both samples essentially reflect the "before and after" effect of redoing these Pokémon. The following hypotheses was used:

H_o: *the average base stats of classic special class PKMN* ***are the same*** *as those of the redone special class PKMN.*

H_a: *the average base stats of classic special class PKMN* ***are different*** *from those of the redone special class PKMN.*

The results of the t-test were stored and run through an ifelse() statement to decide whether to keep or reject the null hypothesis.

Question 2

Special class Pokémon represent the most powerful Pokémon of a generation, often with stats far above regular Pokémon that earn them the moniker of "Special class,". The opposite of Special class are Starter Pokémon (Starters). Starters have more balanced stats, which is indicative of all regular Pokémon in a generation. The three elemental types of Starters are grass, fire, and water, representing the rock, paper, scissors nature of battle in Pokémon. Our group decided to test our hypothesis on Starters to determine if Pokémon evolve predictably. Not all Pokémon have three evolutions; therefore, our group tested if the first evolution can predict the second evolution. If our group failed to reject the null hypothesis, we would test if the second can predict the third evolution.

$$H_o: \textit{Pokémon Evolve in a predictable fashion; } Mean_{actual} = Mean_{predicted}$$

$$H_a: \textit{Pokémon Do Not Evolve in a predictable fashion; } Mean_{actual} =/= Mean_{predicted}$$

Starters were analyzed by subsetting "PKMN_STAT" by indexing each of their names and returning all columns related to base stats. Our group created three empty data frames, one for each of a Starter's evolution. In order to fill the empty tables with each evolution of Pokémon, our group created an empty string that contains each name. Finally, using %in% our group filtered the "PKMN_STAT" data frame with the string of Starter names to fill the empty data frames. In order to answer the question, our group used prescriptive modeling. This was done by creating a linear regression where the TOTAL of the post evolution was predicted by the prior evolution's base stats. Then our group created a user defined function where we can input the prior evolution's name to predict what the post's TOTAL should be. The function used the coefficients of the linear model with its respective variables. This function allowed our group to use sapply() and the previous string of Starter names to return all predicted post evolution

TOTALs. Lastly, three new matrices were created for the actual TOTAL of the post evolution, another for the predicted TOTAL of the post evolution, and finally a third for the difference between actual and predicted TOTAL post evolution stats. This methodology was then repeated to determine if the second evolution's base stats can predict the third evolution's TOTAL.

Our group first needed to determine what test to use to test the hypothesis using a flow chart provided by Professor Scott Robinson (Appendix H). We compared two population's quantitative samples; the samples are naturally paired with equal lengths and a before and after effect. Our group tested normality with the Shapiro-Wilks Normality Test. Based on the overall results, post evolution TOTAL can be predicted. However, there was still room for improvement involving the base stats of Starters, given that they are the basis of balance for a generation. Using the previous user-defined functions and dataframes, we decided to create a function that would provide each prior evolution Starter with new base stats that, when predicted, would be close to its actual post evolution TOTAL. We used a for-loop to simulate 10000 different combinations of the base stats using the sample() function. Then our group took the difference between the actual TOTAL of the prior evolution and the sum of randomly assigned base stats. Our group then subsetted any difference that resulted in a number between -1 and 1, exclusively, as potential candidates for the prior evolution's new base stats. Our group then ran the potential candidates through a second for-loop that used the prediction function and the respective inputs of the prior evolution Pokémon's candidate base stats. Then our group took the difference between the post evolution's actual TOTAL to the adjusted predicted TOTAL, then using the which.min() and abs() function, found the one with the lowest difference and returned the candidate that achieves this. This function was then utilized in the sapply() function with a string of Starter names that will return all adjusted base stats.

Question 3

For the third question of our report, we analyzed the average stats of each primary type to determine which primary type was, on average, the strongest. To complete this, a for loop was written to filter the PKMN_STAT data frame for each primary type, and then store the results in a data frame named after the type being filtered for. This for loop was written with the filter() function to filter PKMN_STAT's type_1 column for each type, and used the parse(), paste(), and eval() functions to properly create new data frames for each type and store the filtered data in them. Once the filtering process was complete, a new data frame was created to store the average stat values, and then a for loop was written to run the mean() function on each of the columns in each of the different type data frames and store the results in the average stat values data frame. This for loop leveraged the parse(), paste(), and eval() functions to efficiently select the names of each of the data frames, run the mean function on each of the columns, and store the values in the appropriate locations. The average stats table was then exported as a csv file using the write.csv() function for visualization in Excel.

In addition, the sub question for question three, is there a negative correlation between ATK and DEF, and Sp. ATK and Sp. DEF was asked to confirm or deny if there were a significant number of Pokémon designed to be either strong attackers or defenders such that comparing the average stats of each type would be invalid. If there was in fact a significant negative correlation, the results from comparing averages in the main question would be invalid. This sub question was answered by applying the cor() function on the ATK and DEF, and Sp. ATK and Sp. DEF columns.

Question 4

The last part of our report looks into the frequency of all 18 different Pokémon types. Specifically, we wanted to find out which primary type is most common across every Pokémon in all eight generations. To do this, a new data frame was created with 18 columns, one per elemental type. Through the use of the sum() function and filtering accordingly, the data in each column is the number of Pokémon with the column name as their primary type. Applying the which.max() function to the new data frame told us which type was the most common. The second part of question 4, looks into whether a Grass or Electric type would be more beneficial to have in your party; as from the main question, we learn that Water is the most common primary type of Pokémon. Grass and Electric type Pokémon are super effective against Water types. To perform this analysis we gathered data on the average ATK power of Electric types and the average ATK power of Grass types. Next, we compared those results to the average HP of the types they are super effective against. More precisely, we compared the average ATK of Grass to the average HP of Ground types, then Rock types, and then finally Water type Pokémon. Next, we compared the average ATK power of Electric type Pokémon to the average HP of Water type Pokémon and then to Flying type Pokémon. This data was plotted in a bar chart to visualize results. The final step was to take the average HP of Ground, Rock, and Water type Pokémon and compare that number to the average ATK power of Grass type Pokémon. Then, we compared the average HP of Water and Flying type Pokémon to the average ATK power of Electric type Pokémon. It is important to note that because we wanted to capitalize on the weakness of Water type Pokémon–Grass and Electric type–we only looked at ATK power and HP.

Results

Question 1

After classifying special class Pokémon by generation, it was found that certain generations of special class had, on average, certain higher base stats than others. For example, Generation 8 scored the highest for average HP but Generation 6 scored the highest for average ATK power (Appendix D). Though there are differences between generations, the percent change calculations show that the differences are quite small (Appendix E). For example, compared to the first generation of Pokémon, Generation 8 showed a 0.150% improvement to average HP and Generation 6 showed a 0.179% improvement to ATK power. When comparing classic special class Pokémon to their redone counterparts, the paired t-test revealed a p-value of 0.022. Since the p-value is less than 0.05 (α), the null hypothesis is rejected. Therefore, the base stats of special class Pokémon are significantly different from their original designs.

Question 2

Each evolution boosts the prior evolution's TOTAL that our group seeked to predict with prescriptive modeling using linear regression. Our group used the TOTAL category as the responding variable with HP, ATK, DEF, SP. ATK, SP. DEF and SPD as the independent variables. The equation to predict the second evolution's TOTAL statistic is as follows:

$$TOTAL_{second} = 1.1538(HP_{first}) + 0.3550(ATK_{first}) + 0.2963(DEF_{first}) + 0.3563(Sp.\ ATK_{first}) + 0.4013(Sp.\ DEF_{first}) + 0.7693(SPD_{first}) + 238.97$$

The graph breakdown of the mean base stats contributing to the overall TOTAL is located in Appendix F. The actual mean TOTAL for the first evolution is 312.54, while the actual mean TOTAL for the second evolution is 412.50. After testing each first evolution Starter, we now know what its predicted TOTAL should be when it evolves as shown in Appendix G. We

compared two population's quantitative samples; the samples are naturally paired with equal lengths and a before and after effect. Our group tested normality with the Shapiro-Wilks Normality Test. The result of testing the second evolution's actual TOTAL provides a p-value of 7.15*10-6, meaning it is not normally distributed. The results of testing the second evolution's predicted TOTAL provide a p-value of 0.04298 and is not considered normally distributed. The normality test indicates using the Wilcoxon Signed Rank Test. The results of the test was a p-value of 0.8081. Based on the results, we fail to reject the null hypothesis. An individual can indeed predict the TOTAL of the second evolution using the first evolution's base stats. Given the results of the first hypothesis test, our group determined if the base stats of the second evolution can predict the TOTAL of the third evolution using the same testing method. The equation to predict the third evolution's TOTAL based on the second evolution's base stats is as follows:

$$TOTAL_{third} = -0.11194(HP_{second}) - 0.02419(ATK_{second}) - 0.08472(DEF_{second}) - 0.02838(Sp.\ ATK_{second}) - 0.09992(Sp.\ DEF_{second}) - 0.04100(SPD_{second}) + 555.95233$$

The graph in Appendix F demonstrates each base stat's mean contribution towards the TOTAL for the second and third evolutions. After running the second evolution Starters through our prediction function, we are provided with the following graph (Appendix I). Again, our group tested for normality using the Shapiro-Wilks Normality Test. The actual TOTAL has a p-value of 0.002588 and is therefore not normally distributed; however, the predicted TOTAL has a p-value of 0.233 and is normally distributed. Although we had this result, we were still required to use the Wilcoxon Signed Rank Test since one sample is not normally distributed; the two-sided test provided a p-value of 0.8977, and failed to reject the null hypothesis. Therefore, overall a prior evolution's base stats can predict the post evolution's TOTAL.

An interesting observation was made during our analysis process when taking the difference between the actual and predicted TOTAL from these results. Pokémon that had a negative difference have a higher predicted than actual TOTAL, therefore, they negatively benefited from evolving, arguing that evolving is not as good a decision. However, a positive difference indicates a benefit from evolving. A player's decision to evolve or not evolve an individual Pokémon can be determined when observing appendix J, K, and L which plot the difference between actual and predicted TOTAL. The discrepancy indicates an issue with the prior or post evolution base stats. Our group then wondered how to decrease the difference between actual and predicted TOTAL, which will be addressed in the discussion section.

Question 3

To answer the third question, we compared the average individual base stats of each Pokémon type as well as the stats of each Pokémon type. Referring to Appendix M, it is clear that Dragon and Fighting primary types, on average, have a higher ATK stat than other primary types, with averages of 85.2 and 72.9 respectively. The ATK stat determines how well a Pokémon performs physical moves in battle and the DEF stat determines how well it defends against physical attacks. Referring to Appendix N, Steel and Rock type Pokémon, on average, have higher DEF stats than any other primary type, with averages of 117.1 and 97.97 respectively. From Appendix O, primary Psychic type Pokémon have, on average, a higher Sp. ATK base stat with an average of 99.1, while Dragon, Electric, and Fire type Pokémon follow behind, with averages of 91.7, 89.5, and 86.4 respectively. A Pokémon’s Sp. ATK stat determines how well it performs Sp. ATK moves, and a Pokémon’s Sp. DEF stat determines how well it defends against special attack moves. In Appendix P, Pokémon whose primary type is Fairy or Psychic, on average, have the highest Sp. DEF base stats with averages of 89.2 and 87.7

respectively. In support of the third main question, the results of sub question three are found in Appendix Q and R. In contrast with the main question, these scatter plots do not use averages. After conducting the analysis of the correlation between each of the two stat pairs, correlation coefficients of 0.45767 for the ATK and DEF, and 0.51198 for the Sp. ATK and Sp. DEF were produced. These coefficients do not suggest that there is a negative correlation between the stats in each pair. Instead, there is actually a moderate positive correlation for each of the two pairs, implying that as ATK or Sp. ATK base stats increase, DEF or Sp. DEF has a good chance of increasing.

Question 4

Through our analysis, we found that Water is the most common primary type among all Pokémon (Appendix S). The starting hypothesis states that a Grass type Pokémon would be more effective than Electric types. For Grass and Electric respectively, their average ATK power was 81.82 and 79.41. Continuing the analysis, subtracting the average ATK power of Electric and Grass type Pokémon from the HP of each of their respective super effective types as shown in Appendix T. Next the average HP of Water, Rock, and Ground type Pokémon against the average ATK power of Grass types was investigated. Simultaneously, the average ATK power of Electric type Pokémon was subtracted from the average HP in Water and Flying type Pokémon. Results are as follows:

(Average Water and Flying HP) - (Average Attack Power Electric) = - 3.89

(Average Water, Ground, Rock HP) - (Average Attack Power Grass) = - 8.83

These results confirm our initial hypothesis that Grass type Pokeomon would be more beneficial than an Electric type Pokémon.

Discussion

Question 1

Though one may expect that Pokémon improve in subsequent generations, the results imply otherwise. However, it is important that Pokémon stay relatively equal in terms of base stats and abilities. A central part of the Pokémon games is the ability to trade and battle other trainers in real time. If a single generation were to be designed more powerfully than other generations, it would offer an unfair advantage in training and battle. It is *because* each Pokémon possesses unique abilities in an overall equal environment ensures fair game play and truly tests a trainer's ability to manage their team in battle.

Question 2

Foremost, our group does not mean to change the actual TOTAL of a Pokémon, only the base stats themselves. Our group assigns Pokémon random base stats then simulate different combinations. Our rebalancing method focuses on changing the prior evolution's base stats using our prediction function to find a combination of base stats that provide the lowest difference between actual and predicted TOTAL. Something to be considered is that there are multiple combinations of base stats and it can be re-run until a satisfying result is discovered. The effectiveness can be measured by observing that the adjusted difference is less than the predicted. The following graphs clarify how the stats changed to decrease the gap between actual and predicted (Appendix U and V). Based on these results, if the developers decide to rebalance the Starter Pokémon's base stats they could use our function to do so.

Question 3

The type rankings synthesized through the analysis of question 3 provide insights about the relative strength of each primary type for each of the four stats–ATK, DEF, Sp. ATK, and Sp.

DEF. For ATK, Dragon, Fighting, and Ground primary types rank highest, and for DEF, Steel, Rock, and Ground primary types rank highest. What is interesting about these findings is that both Steel and Rock type Pokémon are weak to Fighting type moves, meaning that although they both have high DEF stat values, their shared weakness lowers their potential ranking. Additionally, Steel type Pokémon are resistant to Dragon type moves, potentially lowering Dragon type Pokémon's usability in battle. For Sp. ATK, Psychic, Dragon, and Electric primary types rank highest, and for Sp. DEF Fairy, Psychic and Dragon rank the highest. These rankings highlight that Psychic type Pokémon on average both perform and defend against special moves well. In addition to their high stats, they are also super effective against Fighting type Pokémon, potentially impacting the strength Fighting type have in battle. As well, Dragon type Pokémon rank highly in both Sp. ATK and Sp. DEF however their weakness against Fairy types, the type with the highest average Sp. Def stat, potentially impacts their usability in battle. In terms of the sub question, what this analysis implies is that the analysis of each primary Pokémon type's base stats is valid. This is due to the moderate positive correlation between ATK and DEF, and Sp. ATK and Sp. DEF.

Question 4

Across all generations, Water type Pokémon are most common. Therefore, Pokémon trainers would want to have either an Electric or Grass type Pokémon. Additionally, the ATK power of the standard Grass type outweighs the ATK power of the standard Electric type. While each Pokémon trainer will organize their party differently and--while there are many factors to consider in battle--it is statistically beneficial to keep Grass type Pokémon on hand. Consequently, this analysis serves as a starting point for any Pokémon trainer wanting an intelligent and objective approach to gameplay.

Conclusion

Through our analysis, we have determined that there is no correct answer to the question "what Pokémon should I bring to battle?" as there are many factors at play. That being said, our analysis also provides trainers with some reasons to narrow their selection. Through question one, we determined that although there is not a large difference between the raw strength of special Pokémon across generations, some generations specialize in a specific stat category. In question two we determined that Pokémon do evolve in a predictable manner and that it is usually beneficial to evolve one's Pokémon to their highest stage. In question three we uncovered that depending on which move is being performed or defended against, that different types have an advantage. Finally, in question four, we determined that Water type Pokémon are the most common, and in preparation for that, should bring a Grass type attacker.

Our findings through this analysis align with the main objective of the Pokémon games as players are meant to craft their own team of six Pokémon based on what Pokémon they expect to face, and the strategies they want to employ. These findings should aid in narrowing Pokémon selection as trainers catch 'em all.

References

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Glossary

Base Stats - the individual statistics that contribute to a Pokémon's total

- TOTAL = HP + ATK + DEF + Sp. ATK + Sp. DEF + SPD
    - HP: health points
    - ATK: attack
    - DEF: defense
    - Sp.ATK: special attack
    - Sp.DEF: special defense
    - SPD: speed

Prior Evolution - First evolution or second evolution

Post Evolution - Second evolution or third evolution

Legendary Pokémon - Pokémon that are especially rare and powerful and cannot be found in the wild. Players must complete all of the quests in their respective generation before having a chance to capture these final bosses.

Sub-legendary Pokémon - Pokémon that are especially rare and powerful and cannot be found in the wild. Players must complete one or more specific quests before having a chance to capture these Pokémon.

Mythical Pokémon - Pokémon that are especially rare and are unlocked during specific events. These types often have special abilities beyond those Pokémon that can be found in the wild.

Appendices

Appendix A - Table of New Pokémon in Each Generation

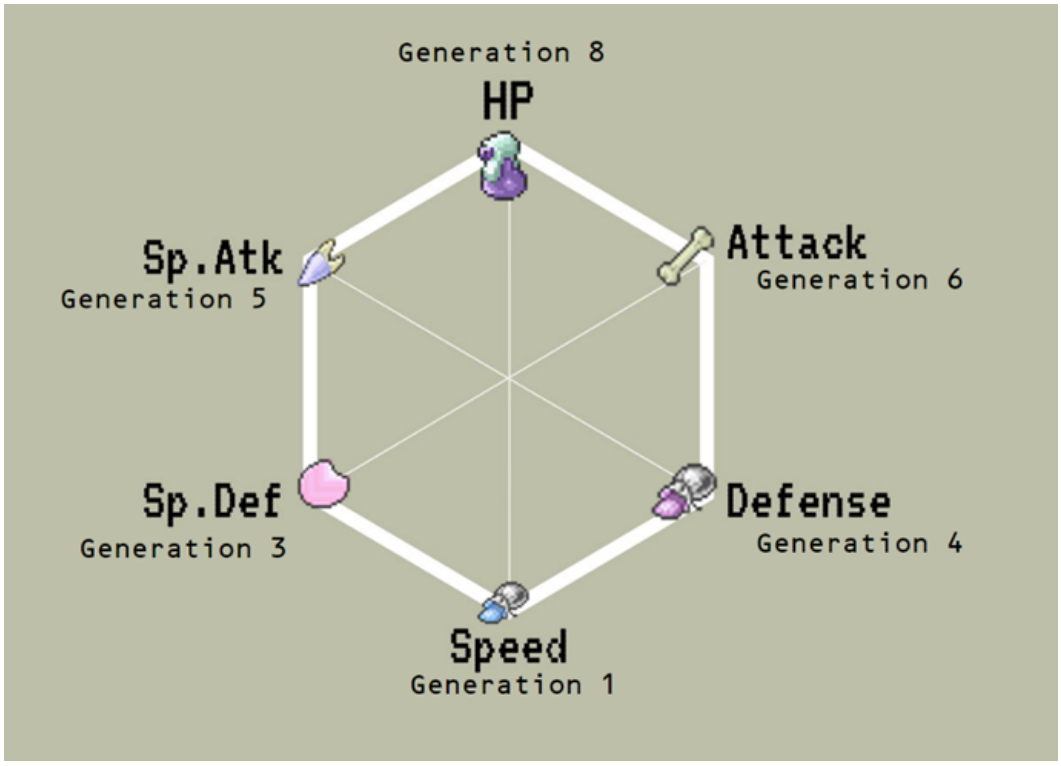
Pokémon Generation	Original Game	Location	Number of New Pokémon
Generation One (I)	Red & Yellow	Kanto	151
Generation Two (II)	Gold & Silver	Johto	100
Generation Three (III)	Ruby & Sapphire	Hoenn	135
Generation Four (IV)	Diamond & Pearl	Sinnoh	107
Generation Five (V)	Black & White	Unova	156
Generation Six (VI)	X & Y	Kalos	72
Generation Seven (VII)	Sun & Moon	Alola	88
Generation Eight (VIII)	Sword & Shield	Galar	92

Appendix B - Image of Pikachu

Appendix C - Pikachu's Base Stats

Health Points (HP)	Attack (ATK)	Defense (DEF)	Special Attack (Sp. ATK)	Special Defense (Sp. DEF)	Speed (SPD)
35	55	40	50	50	90
				Total Statistics (TOTAL)	**320**

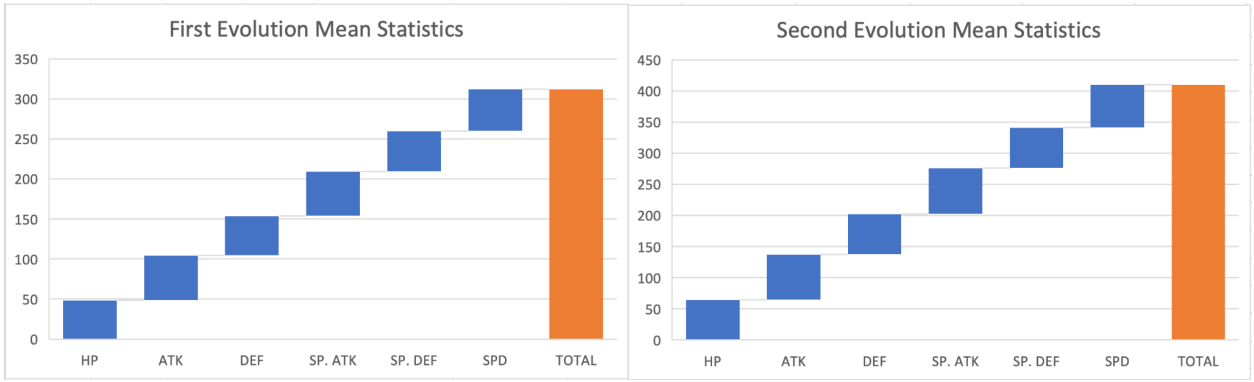
Appendix D - The Top Pokémon Generations for Each Stat on Average



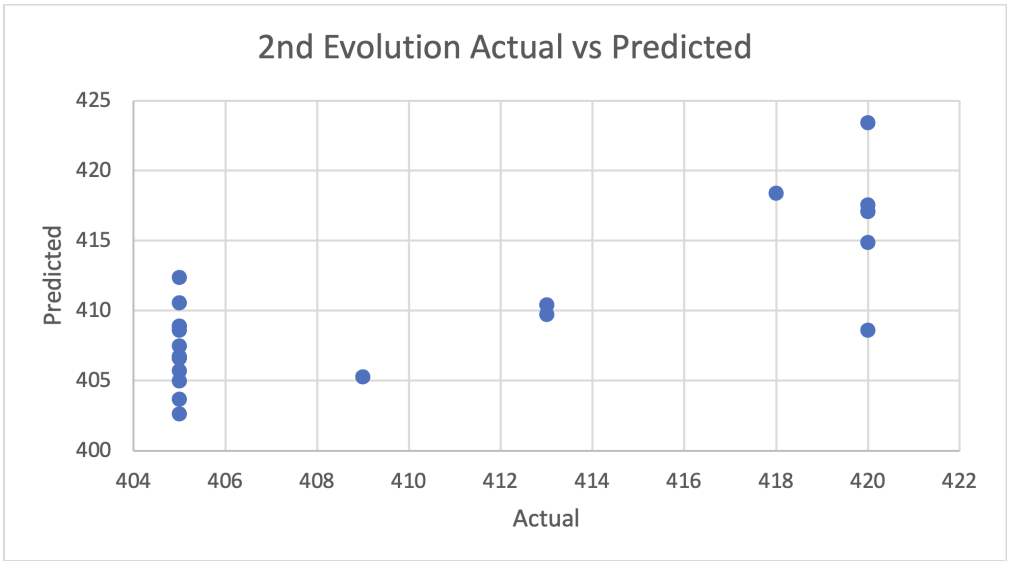
Appendix E - Largest Percent Change Between Generation I and Following Generations

Base Stat	**Largest Percentage Change** *(using Generation 1 as baseline for comparison)*	**Generation Number**
HP	0.150	8
ATK	0.179	6
DEF	0.130	4
Sp.ATK	-0.010	2
Sp.DEF	0.202	3
Speed	0.018	5

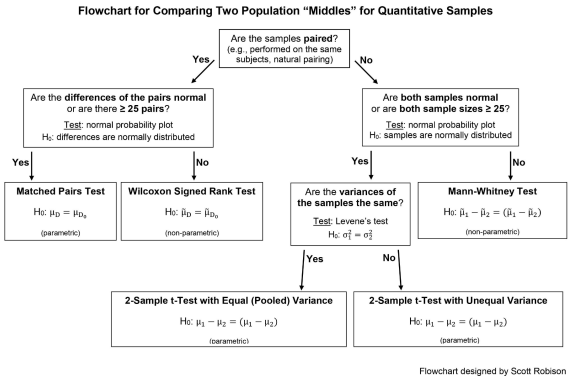
Appendix F - Graphical Breakdown of the Main Base Stats Contributing to Overall Total



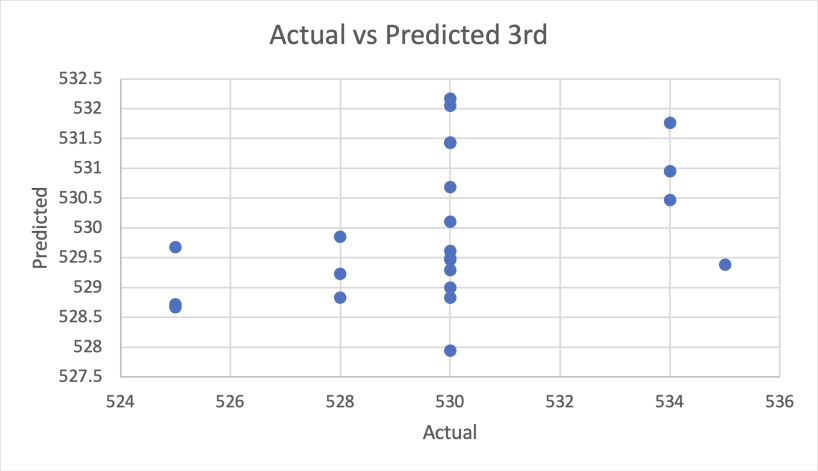
Appendix G - Starter Pokémon's Actual 2nd Evolution Stats vs Predicted



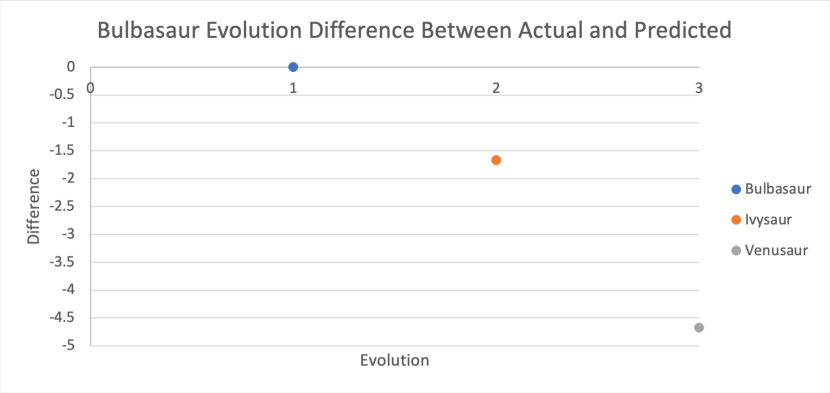
Appendix H - Flowchart for Comparing Two Population "Middles" for Quantitative Samples



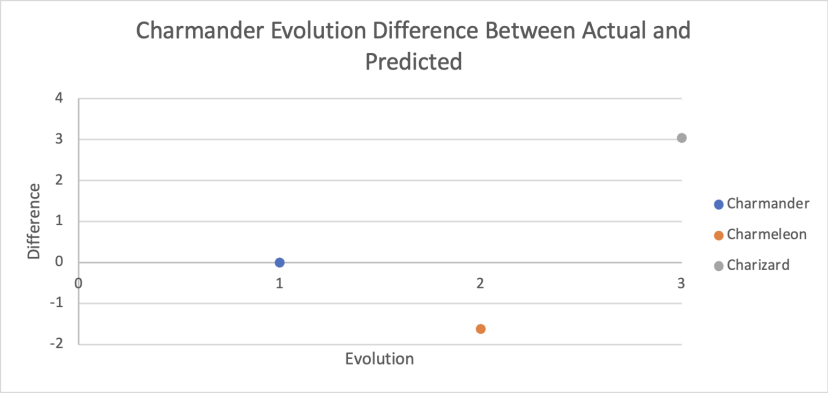
Appendix I - Starter Pokémon's Actual 3rd Evolution Stats vs Predicted



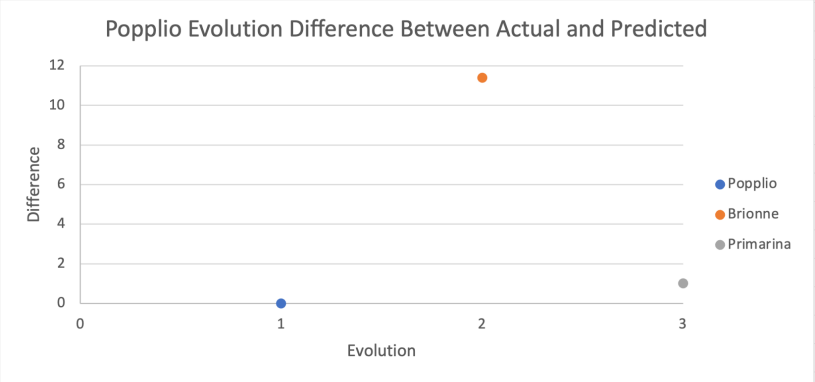
Appendix J - Bulbasaur Evolution Difference Between Actual and Predicted



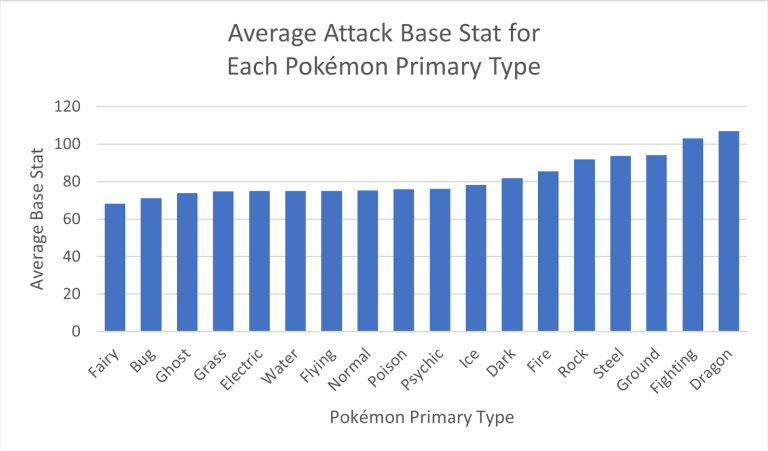
Appendix K - Charmander Evolution Difference Between Actual and Predicted



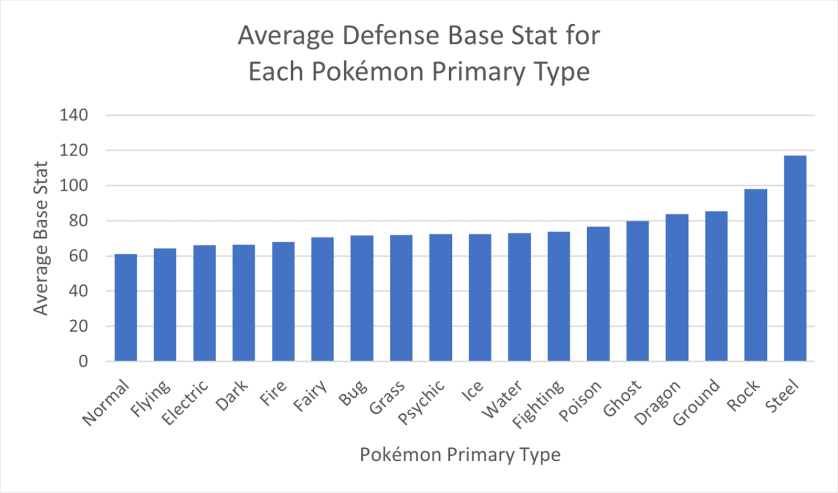
Appendix L - Popplio Evolution Difference between Actual and Predicted



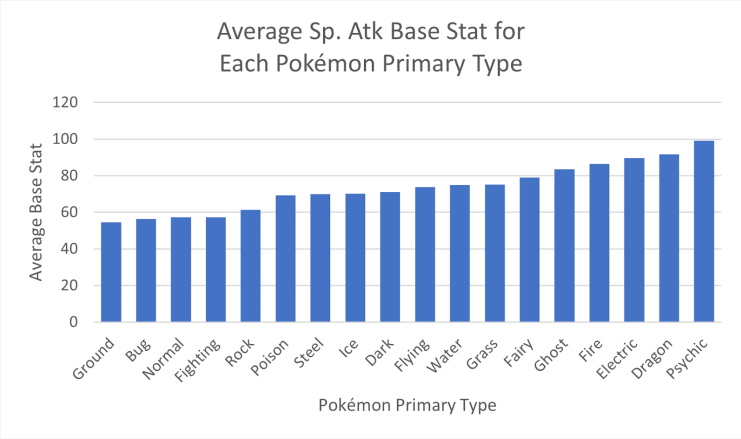
Appendix M - Average Attack Base Stat for Each Pokémon Primary Type



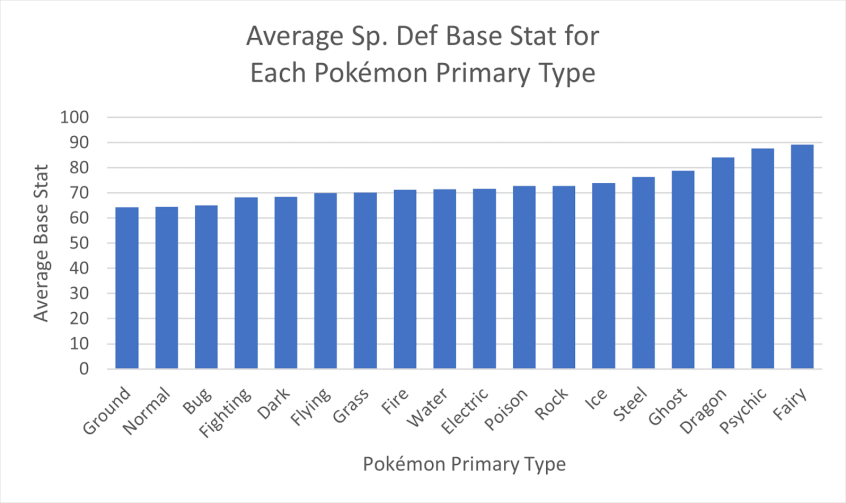
Appendix N - Average Defense Base Stat for Each Pokémon Primary Type



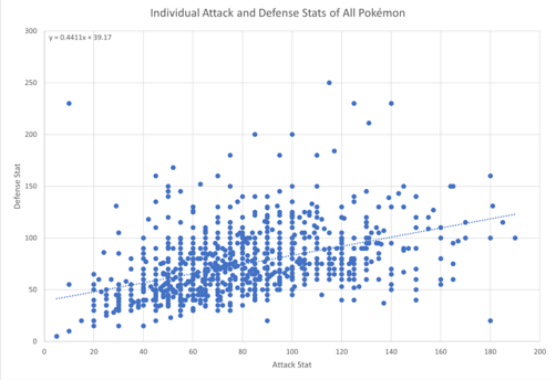
Appendix O - Average Sp. ATK Base Stat for Each Pokémon Primary Type



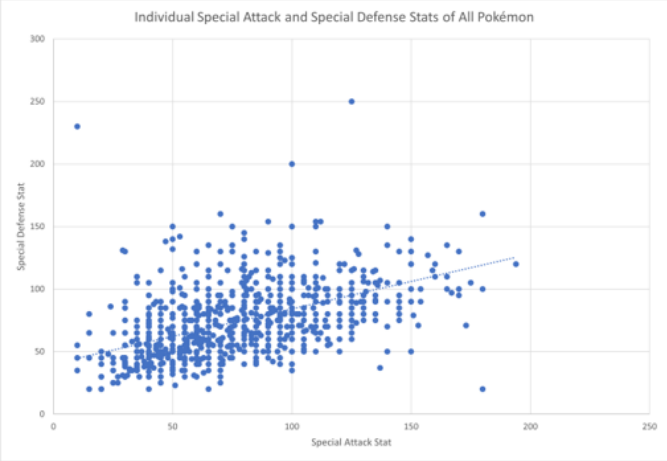
Appendix P - Average Sp. DEF Base Stat for Each Pokémon Primary Type



Appendix Q - Individual Attack and Defense Stats of All Pokémon Scatter Plot



Appendix R - Individual Sp. ATK and Sp. DEF Stats of All Pokémon



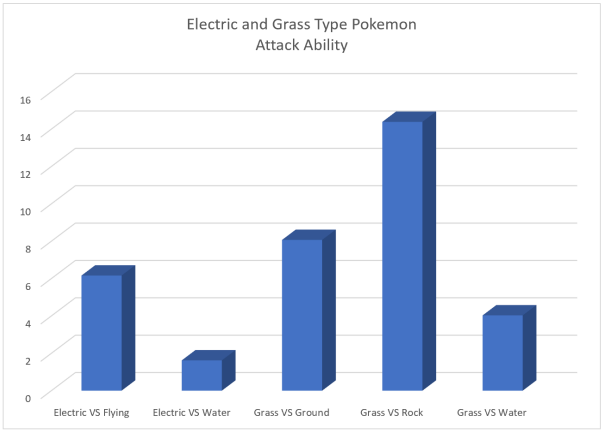
Appendix S - Number of Pokémon of Each Primary Type

Normal	Fire	Water	Grass	Flying	Fighting
115	65	134	91	8	42

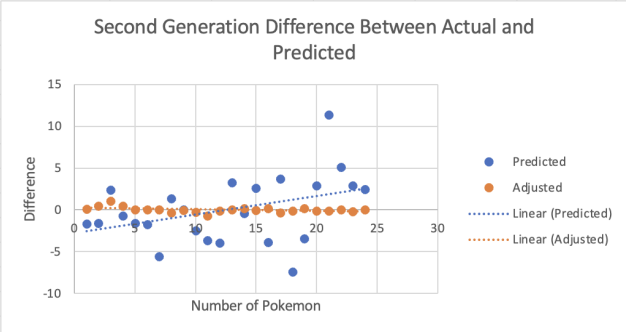
Poison	Electric	Ground	Rock	Psychic	Ice
41	62	41	60	79	39

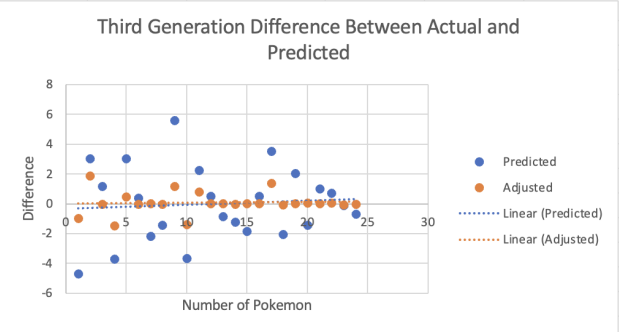
Bug	Ghost	Steel	Dragon	Dark	Fairy
81	42	36	41	46	22

Appendix T - Electric and Grass Type Pokémon Attack Ability



Appendix U - Second and Third Generation Difference Between Predicted and Actual Stats





Appendix V - 1st and 2nd Evolution, Actual Average Stat vs Expected Average Stat