**World of Warcraft**

**PLAYER VS PLAYER (PVP) Character Analysis**

**Final Project**

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**Program Description**

Gaming has transformed since its popularity rise in 1980. If you have ever picked up a controller to enter a world outside of the one you walked through daily, then whether you believe it or not you have entered the world of gaming. The way in which games and video consoles were enjoyed started with visiting a video arcade to having video consoles for your personal television to games being held in your hand (portables and smart phones) or enjoyed virtually. There were a time people counted down the minutes and seconds before they were able to go to the arcade with a pocket full of change for the machines. The life has quickly changed when video games became portable. Then they changed even further when games were accessible through smart phones. They went from “portable and handheld” to “portable and smart”.

This program is designed to pull in data from the Blizzard Application Programming Interface (API). This project focuses on the 3 versus 3 (3v3) Player versus Player (PVP) leaderboard. Our goal was to gather insights about the selections and statistics that make up a winning player in PVP.

Before diving into the data, it is important to understand some key facts about the World of Warcraft (WoW). There are two types of players in this game. Those who play against the environment (PVE) and those who play PVP. The various types within the PVP realm, include: there are various types. There is world PVP, or PVP that occurs openly on the game server; there are battlegrounds, specific servers in which players engage in a specific fight with an objective such as capture the flag and others; then there are Arenas, 2v2 and 3v3 in which teams of either 2 or 3 players battle.

It is also important to understand the different choices that a player has when creating a character in the game. Players can choose one of two factions, Horde or Alliance which are pitted against each other within the game. Within those factions, players can choose a race that is allied with that faction. The next step is to select the class of character you would like to play. These classes all come with their own abilities and fill specific roles within the game. Designed specifically for PVE, those roles are tanks: players that intentionally encourage the environmental enemies in the game to attack them, damage dealers (DPS): players who attack and attempt to burn down the health of the environmental enemies and healers: players who spend most of their time healing tanks or DPS players. Players in PVE typically have the goal of defeating more difficult environmental enemies with the goal of gaining better looking and more powerful items for use in the game that will improve your statistics.

Beat an enemy, get equipment, eventually fight a stronger enemy, repeat.

While there are additional pieces to the puzzle, this is the main gameplay for PVE players. For PVP players, the task is similar, however, equipment is earned through winning in any of the above PVP environments described. More wins mean more currency which allows for better equipment to be purchased from in-game vendors. Our focus during this analysis was to Graphical user interface, website

Description automatically generatedA screenshot of a video game

Description automatically generated with medium confidencelook at the 3v3 Arena.

**Task and Roles of Team Members**

The two team members for this project were Noah Mott and Leticia Spencer.  Both team members contributed to all aspects of the analysis.  The research of the subject matter was jointly completed.  Utilizing token assigned to Noah Mott.

Although we collectively worked on all items in this project the lead was assigned for the following roles ensuring proper completion:

Project Manager (Leticia Spencer):

* Develop the code
* Map the code to ensure questions are answered
* Develop visualizations
* Add notes to program code

User Documentation Specialist (Leticia Spencer):

* Organize report documentation
* Track project timeline and backlog on Microsoft Teams
* Develop project proposal
* Develop project PowerPoint presentation
* Ensure proper versioning of program code

Tester (Noah Mott & Leticia Spencer):

* Using all available project artifacts, such as requirements, design, software, and the user documentation artifacts, to construct the test plans
* Implementing tests and generating the test reports
* Ensure code and notes are easily understandable

**Data and its Source:**

The data used for this project was taken from the Blizzard API. The data was acquired from two endpoints. The first endpoint was used to create a leaderboard for the 3 Vs 3 PVP tournament that is currently in its 30th season on World of Warcraft. The second endpoint was used to secure player traits for each of the members on the leaderboard in order to drive some analysis of what attributes a player might possess in order to have more wins or higher win percentages. In order to gather the appropriate data from the second endpoint, it was necessary to reduce our initial data frame from the more than 5000 players on the leaderboard to 1,000 players for the sake of time. The importance of this is that in order to gather the player data, each player’s name and server would have to be entered as an individual endpoint, pull the data, and then move on to the next player. This was achieved with a for loop and took approximately 12 minutes each time the program was run. Additionally, in order to demonstrate an ability to work with Mongo DB, the data pulled from the leaderboard API was first uploaded to a Mongo DB database and then extracted from that database for use in our project.

The final data frame used for analysis included 1000 player characters with 28 variables, seen in this snip of the column names:

Text

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The metadata descriptions are below:



**Data Exploration and Data Cleaning:**

The data was cleaned through several processes. While the data provided by the API was in an organized format, it was necessary to home in on the specific data that would provide some level of insight. We selected data that we felt would provide information about the abilities and characteristics of the highest level PVP players in the current 3v3 tournament. We then set about cleaning the data. One issue we me early on was that while the leaderboard was maintained, certain characters might have been deleted or renamed, etc. That being the case, when looping through the data, while the character existed on the leaderboard, they might not exist in the profile statistics endpoint. This was causing errors, so we were forced to add a pass and then, after merging the data frames, we removed the NAs. We also ran into an issue in which the API was returning the stats values only as objects. Luckily, pandas provides us an ‘infer’ option that infers the data type and assigns it.

Once we had our master data frame, we added an additional column to get win percentage and assign that to a character. We also began slicing up the data and using grouping to do counts by factions, class, current specializations, etc. We also created separate data frames for the role that a character plays based upon their current class. These roles are healers, damage dealers, and tanks. This allows us to dig a little deeper into specific roles and determine if certain statistics are more relevant for those classes.

**Methods of Analysis:**

The multi-purpose programming language, Python was used for this project and the code was primarily developed using the Colab cloud infrastructure provided by Google. Assistance was provided by individual users on StackOverflow which are referenced in our code. We also used the Mongo DB Atlas cloud database to both store and access the data pulled from the Blizzard API. This is not a necessary step but valuable should you wish to store the data for later analysis.

The first step was to use my Blizzard Developer client credentials to gain an access token for access to the API. You can see the output was delivered in JSON format.



The access token was then used to form the endpoint necessary for access to the 3v3 leaderboard data. The constructed url is shown below:



Graphical user interface, text, application, email

Description automatically generatedThe next step we took was to pull in the data from the leaderboard and then upload the dictionary files to a Mongo DB Collection. You can see an example of the uploaded data inside the Mongo DB data base below:

Table

Description automatically generatedAfter the data was uploaded to the Mongo DB database, it was necessary to pull in that information to form a dataframe of all the results in python for analysis. The results of that leaderboard data frame are below:

Graphical user interface, application

Description automatically generatedAfter getting the leaderboard data, it was necessary to provide a lookup function with the Blizzard API to look up each character’s statistical information and add those fields to the leaderboard dataframe. This was accomplished using a for loop to construct the endpoint urls and extract the necessary data. A sample of the final leaderboard dataframe is below:

The next task was to utilize Seaborn and Matplotlib, packages in Python, to visualize the data and answer some questions about our data. The questions, plots, and analytical responses are below in the Questions Section.

**Questions and Fields Used:**

* Question#1: What is the distribution of the top 1000 3v3 players by faction choice?

We can see from the results below the specific counts of the 1000 players on the 3v3 leaderboard. Note the disparity in horde players vs alliance players. More than twice as many players on the leaderboard have selected horde characters.

Chart, bar chart

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* Question#2: Does there appear to be a relationship between winning percentage and the distribution by faction?

We wanted to then determine if, given the disparity between the factions, if there appeared to be an advantage to one faction over the other. We noticed that while Horde characters were twice as numerous as Alliance players, Alliance players averaged higher in win percentage, if only slightly.

Chart, box and whisker chart

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* Question#3: What is the distribution by class on the 3v3 leaderboard?

Chart

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* Question #4: What is the distribution of the top 1,000 in 3v3 by the role of the player?

Noticeable right away is the vast difference between the different roles. This disparity is due to two factors. First, there are simply far more damage dealer specializations in the game as opposed to each of the other two. This accounts for a larger number of damage dealer roles. However, the number of tanks is interesting. Such a low number is indicative of the fact that players who typically play against other players as opposed to playing against the environment of the game like the utility that damage dealers and healers have access to. Players tend to be far more unpredictable, so a role that is designed specifically for taking damage by keeping a non-player character (NPC) focused on them is somewhat useless when a human player will know quickly where the biggest threat is coming from and adapt to deal with it.

Chart, bar chart

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Table

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* Question #5: Is there a relationship between win percentage and the class selected?

Chart

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* Question #6: Does there appear to be a relationship between total wins and class as opposed to win percentage?

We do see some disparity here. We note that Death Knights and Rogues have much less total wins despite being in the middle of pack of selected classes. Paladin total wins also seem low compared to other classes.

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* Question#7: Does there appear to be a relationship between total wins and spell\_power for healers?

We decided it was also important for us to look deeper into one of the roles and see if there are abilities that lend an advantage to those players. While there is a clustering of the number of won games at around the 1700 spell power mark there does not really appear to be any specific advantage to having a higher spell power. What we do note is that the Holy specialization for both Paladins and Priests sit higher in spell power while Discipline Priests tend to be lower in spell\_power.

Chart

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* Question 8: Is there an advantage to higher health that comes from a higher stamina statistic for healers?

This question has two parts. First, is there a relationship between higher intellect and higher stamina (or health/survivability)? Second, is there a relationship between higher intellect and more wins?

Chart, diagram

Description automatically generatedDiagram

Description automatically generatedWithin this question, we find that there is indeed an indication that higher intellects breed higher stamina for healers. This, in turn, leads to a slight increase in wins by intellect values. What this tells us is that if you are a healing class, your focus should be to stack as much intellect as possible to allow for more survivability in PVP combat.

* Question #9: What is the distribution of the classes by faction of how many games won and matches played.

As you review the breakdown of games won by class and separated them according to the faction, they belong to you will see another representation of the higher participation among the HORDE faction. There is also a clear view that the largest subset of games won also played the most games which statistically aligns.

This further confirms Paladin, Priest and Warrior in the HORDE faction has the higher distribution of matches played and won.

Chart, scatter chart, bubble chart

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Question #10: Does a character’s gender make a difference for faction selection and games won by class?

In order to answer this question, we first needed to confirm the distribution of gender by faction. To properly provide an answer the weight of wins by gender for the percentage of players in each gender class was important. The distribution of Female characters shows that 669 of which 254 are in the ALLIANCE faction while 411 belong to the HORDE faction. Of 309 male characters, 55 belong to the ALLIANCE faction while 254 belong to the HORDE faction. While the data shows that 68% of winners were female while only 32% of winners where male there is no clear correlation that the gender was the contributing factor to the win. It is validated that the Priest and Paladin class in the HORDE faction still remains in the lead despite character gender.

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**Chart, bar chart

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**Conclusion of Results:**

After conducting this basic level of analysis on the Blizzard 3v3 PVP leaderboard, we have been able to glean a few things. First, World of Warcraft has, for the most part, been able to balance out their characters with relation to power and abilities. Players can choose classes and abilities that they would like and can expect to be evenly matched against other players with similar skill levels. That said, there are some issues still with the game. Tank classes are still horrible for PVP and aren’t often selected. This means that if you want to play both versus the environment or vs other players you must shift between specializations and equip completely different sets of items. Additionally, though the data doesn’t necessarily show that win percentage changes, the belief is still strong that Demon Hunters are a broken class for PVP.

As far as statistics that seem most useful for success in PVP, intellect seems to be the best predictor of total wins. So, if you choose to be a healer, Discipline Priests with higher levels of intellect seem like the best choice to eke out those wins.