

# Exploring the network of Warcraft characters and their factions

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The characters of the fictional Warcraft universe are generally divided into factions, the foremost of these being the Alliance and the Horde. The characters of the universe are described on the Wowpedia (1) website, where they are linked to other characters who they are connected to or have interacted with. Using characters as nodes and hyperlinks to other character pages as edges, a network can be created. Using network analysis and language processing tools can give an understanding of the dynamics of the characters and between the Alliance and Horde factions. A sentiment analysis of the characters in the Horde and Alliance did not provide a clear indication of which faction is the most positively described, and more advanced natural language processing techniques are likely required to draw a definitive conclusion. It was found that the most important characters in terms of centrality are also major characters in the lore. But the analysis also indicates that there are non-major characters who are central in the network and perhaps deserve to be recognised as a major character among the others on Wowpedia.

Warcraft | network science | sentiment analysis | Louvain | centrality

The Warcraft universe is a vast universe of fantasy characters, locations, and lore. Initially starting in 1994 with the video game “Warcraft: Orcs & Humans”, the Warcraft universe has since been expanded to include several video game titles, books, and a feature-length film (2).

A central theme in the Warcraft universe is the war between two political factions: the Horde and the Alliance. Each political faction is made up of different races with humans, ironforge dwarves, night elves, gnomes, etc. being loyal to the Alliance, and orcs, trolls, undead, blood elves etc. being loyal to the Horde. Additionally, there are many more characters who are non-aligned and loyal to neither faction.

Even though there is no definitive good and evil side, one might associate the Alliance with good and the Horde with evil. In this paper, we want to investigate if there is a bias in favour of the Alliance, i.e. that the Alliance characters are described more positively than those of the Horde and whether the Alliance characters are more important in the lore. To better investigate our hypothesis, we have formulated the following research questions:

- Is the Alliance more positively described?
- How does the sentiment change for Horde and Alliance characters throughout the expansions?
- Are Alliance characters more important than Horde characters? Furthermore, which non-major characters are most important and should they be major characters?

## Methods and data

In the following sections, we describe the methods used in the project, and how the data was collected.

**Data collection.** The dataset was collected from the Wowpedia website. Initially, we scraped all the **major characters** that appear in the Warcraft & World of Warcraft (WoW) games, as well as their expansions, up to World of Warcraft: Dragonflight\*. Then for each major character, we identify all hyperlinks that link to character pages and add them to the dataset.

For each character, we scrape the following information from its wiki page: **Race**, **Affiliation**, **Clean Text** and **Outgoing links**. The **Race** attribute denotes the race of the character, the **Affiliation** attribute denotes which political faction the character belongs to: Alliance, Horde, or non-aligned. The **Clean Text** attribute denotes the cleaned text that is extracted from the wiki page. Finally, the attribute **Outgoing links** denotes which other characters in the dataframe that the wiki page of the character links to.

In addition, we also scrape some meta data for the major characters. This includes which games the major characters appear in, as well as their **importance** in the lore according to Wowpedia. The importance rating is divided into 4 categories:

- Red: One of the most important characters in Warcraft lore
- Orange: A very influential character
- Yellow: A somewhat important character
- Green: A noteworthy character

**Processing of data.** Some characters have multiple aliases, examples being Rhea and Rheastrasza, and Sylvanas Windrunner which has six aliases: Sylvanas, Lady Sylvanas Windrunner, Lady Sylvanas, Queen Sylvanas, and Banshee Queen. The aliases are added to the dataset as distinct characters, yet all link to the same Wowpedia page.

These aliases are found by comparing the first 100 words of **Clean Text**. If the alias belongs to a major character, the original alias of the character is kept. If it is a non-major character, the alias which is mentioned on the most other characters’ Wowpedia pages is kept. Hereafter, all other aliases are removed from the dataset. Finally, the outgoing links for each character in the dataset is updated, such that the correct character name is used.

**Network.** From the new dataset mentioned in the previous section, we construct a network using the characters as nodes and the outgoing

\*World of Warcraft: Dragonflight was released on the 28th of November 2022 and has therefore not been included in the analysis.

## Significance Statement

We study the network composed of central characters from the Warcraft Universe. The current paradigm of ranking the importance of the characters is highly subjective. We present an approach for identifying the most important characters, based on centrality metrics on a network of Warcraft characters. Furthermore, we perform a sentiment analysis of the characters in the network to investigate how the sentiment differs between the rivalling factions, the Horde and the Alliance, over different games.

M.A. worked on sentiment analysis. A.H. worked on the network. Y.F. scraped the data and did word clouds and box plot. All Authors wrote the paper. We consider all authors to have contributed equally.

links as edges. Each node is initially assigned an attribute `Race` and `Affiliation`. Another attribute `concatRace` is created, which concatenates races such as Zandalari troll, Jungle troll, and Forest troll into a single race, “Troll”. Modularity scores are computed for these 3 attributes, as well as the Louvain partition.

Using degree centrality and betweenness centrality as measures, we analyse which characters are important. The degree centrality distributions for each of the 4 importance levels for major characters are also analysed. To test significance in importance measures, one-way ANOVA tests are conducted.

**Text analysis.** The text analysis is based on the clean text from the wiki pages. Using the tokenised text, the sentiment score can be computed for each character. The sentiment score is based on the corpus with happiness ratings from Dodds et al. (2011) (3). A “directed” sentiment score is also calculated for each directed edge between two characters. The “directed” sentiment for an edge is calculated from the sentences in a character’s wiki-page text that directly mentions the other character.

Additionally, the TF-IDF statistic (4) is used to analyse the Louvain communities and find the most descriptive terms for each community.

The explainer notebook can be found [here](#).

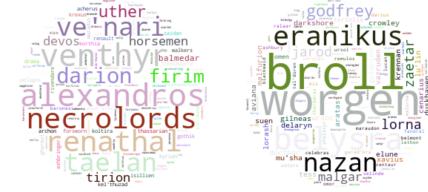
## Results

The final network of Warcraft characters contains 1961 nodes and 9648 edges in the network. In the following section we explore different partitions. The partition for the graph shown on figure 2A has a modularity score of just 0.071. This makes sense, as the partition `Affiliation` has the categories Horde, Alliance, and Other, and as the category Other essentially encompasses all other characters of many other factions that are not affiliated with the Horde or Alliance. As these other factions consist of characters that are unrelated, it will not be a good community. Moreover, there are almost as many purple edges, i.e. connecting Alliance and Horde nodes, as there are red and blue edges, indicating that the Warcraft characters are quite connected across affiliation, worsening this partition further still.

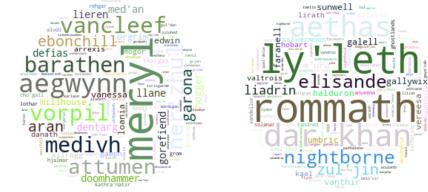
The graph for the `Race`, `concatRace`, and Louvain partitions are shown on figure 2B-D, and their respective modularity scores are 0.203, 0.255, and 0.469. As the modularity score is higher when concatenating the races, it seems that partitioning races too finely leads to a more suboptimal partition. We see from figure 2D that e.g. pandaren and trolls are separated quite nicely, while e.g. humans and orcs seem to be more intertwined. It is hard to say exactly why this is the case, but as much of the lore is based on conflicts between especially humans and orcs, it makes sense that these are more connected as opposed to pandaren, which have more of a separate lore, hailing from the mysterious island of “[Pandaria](#)”.

Nevertheless, both race partitions fall quite short of the modularity score of the Louvain partition. We wish to inspect the Louvain communities further and understand what they represent. The TF-IDF statistic is computed for the tokenised `Clean Text` of each character belonging to the 10 largest communities.

Community 3      Community 4



Community 2      Community 10



Community 11      Community 0



Community 9      Community 6

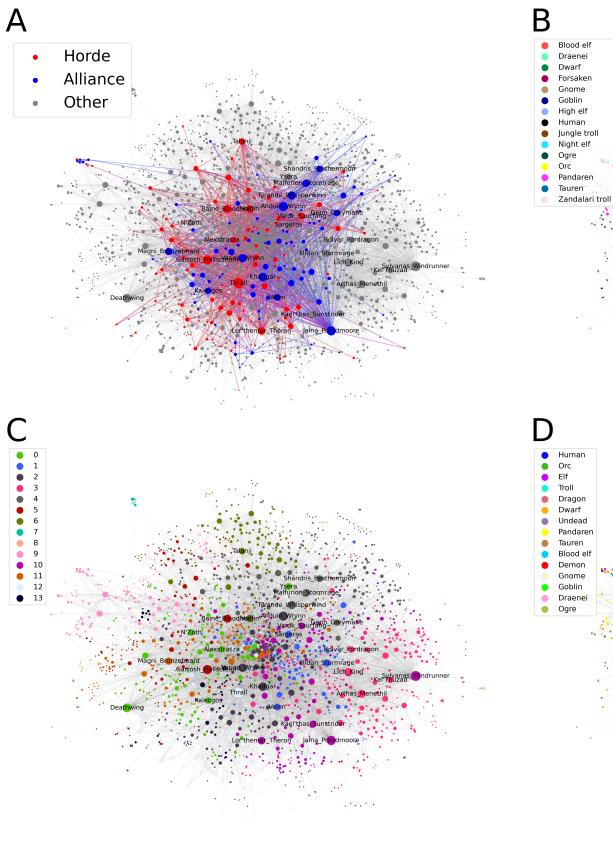


Community 1      Community 12



**Fig. 1.** Word clouds for the 10 largest Louvain communities. The size of the words in the word clouds are proportional to the TF-IDF. The communities are shown in descending order in terms of number of nodes. The largest community is community 3 with 235 nodes, and the smallest is community 12 with 128 nodes.

We can identify several recurring themes on the word clouds in figure 1. Community 3 seems to be centered around the story of Alexandros Mograine, with keywords such as horsemen, Arthas Menethil, Frostmourne (the infamous sword of the Lich King), Tirion Fordring, Kel’thuzad, Uther Lightbringer, Renault Mograine, and Darion Mograine. According to the wiki entry of [Alexandros Mograine](#), Kel’Thuzad managed to manipulate his son Renault Mograine into killing Alexandros,



**Fig. 2.** 4 graphs showing different partitions of the same network with 1961 nodes and 9648 edges, where each node is a character in the Warcraft universe and an edge is added between two characters if their Wowpedia pages are linked in either direction. For all 4 graphs, the 30 biggest characters in terms of degree are labelled. **A:** “Affiliation”, modularity score = 0.071. Red edges are Horde to Horde (4.4%), blue edges are Alliance to Alliance (4.2%), purple edges are Alliance to Horde and vice versa (3.9%), grey edges are everything else (87.5%). The grey nodes labelled “Other” are every affiliation other than Alliance/Horde. **B:** “Races”, modularity score = 0.203. In total there are 273 races in this partition, but only the 15 largest are coloured and shown in the legend. **C:** “Louvain partition”, modularity score = 0.489. All 14 Louvain communities are shown. **D:** “Concatenated races”, modularity score = 0.255. In total there are 213 races in this partition, but only the 15 largest are coloured and shown in the legend.

as well as causing the death of his other son Darion Mograine. Kel’thuzad later resurrects Alexandros and Darion as death knights, making Alexandros the leader of the Four Horsemen and placing Darion under the control of the Lich King, Arthas Menethil. Alexandros later tries to help free Darion from the Lich King’s control, but is then captured by the sword Frostmourne. Uther Lightbringer manages to destroy Frostmourne, freeing the soul of Alexandros.

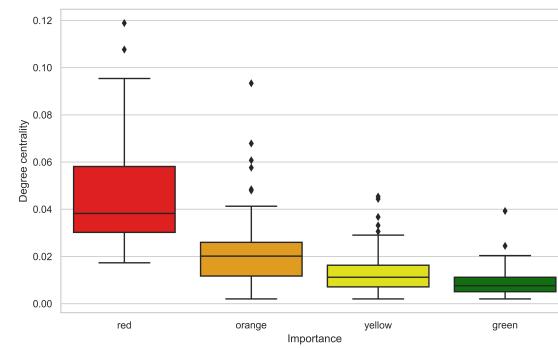
Community 4 seems to be centered around the night elf race. The characters Broll Bearmantle, Belysra Starbreeze, Malfurion Stormrage and Jarod Shadowsong are all night elves, and Cenarius, Zaetar, and Ursoc are demigods worshipped by the night elves.

Lastly, community 9 seems to be focused on characters from the land of Pandaria and Draenor. There are several pandaren characters who inhabit Pandaria, such as Chen Stormstout, Li Li Stormstout, and Emperor Shaohao, but also Arakkoa characters that inhabit Draenor, such as Terokk, Talon King Ikiss, and Darkweaver Syth. Also present on the word cloud is the word “brewery”, which is associated with the pandaren brewmasters. An interesting observation is that pandaren and Arakkans do not interact in the lore, yet are grouped in the same Louvain community.

The word clouds show that characters with the same race are not necessarily grouped together into one Louvain community. Instead, it seems that the best partition stems from a combination of different kinds of connections between characters, being both race, affiliation, and key storylines in the lore.

In the following section, we investigate whether the impor-

tance rating is justified using the network we constructed. One would expect the most important characters to be referenced a lot by other characters, as well as having a substantial participation in the lore. Therefore, we would expect important characters to have a high degree centrality.



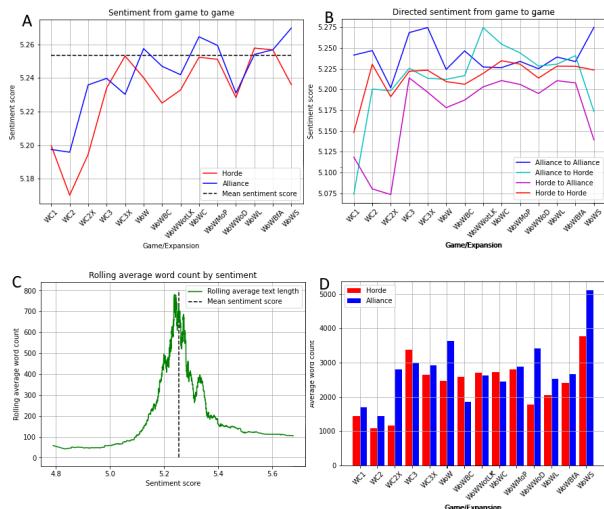
**Fig. 3.** Box plots of degree centrality for major characters of different levels of importance. Here, importance refers to the colour designated to each major character on Wowpedia, red being most important and green being least important. The whiskers extend to the furthest datapoint within 1.5 times the interquartile range (IQR). A one-way ANOVA test reveals that importance has a significant effect on in-degree ( $p < 2 \cdot 10^{-16}$ ).

The box plots on figure 3 and the one-way ANOVA test show that the more important characters do indeed tend to have a higher degree centrality, as expected. Especially the characters of red importance level have a high degree centrality.

Looking at table 1, we see that the the most important major characters according to the both centrality metrics (degree

centrality and betweenness centrality) are of red importance, indicating that both metrics predicts Wowpedia's importance level adequately. Qualitatively, it makes sense that characters such as Thrall, Sylvanas, and Jaina score highest in degree centrality, as these 3 are pivotal characters in the Warcraft universe. Interestingly, a character such as Deathwing and Garrosh are 2nd and 3rd highest for betweenness centrality, respectively, indicating that they connect many characters - perhaps this can be explained by the fact that they both act as main villains at points in the lore.

For the non-major characters, we see that the character Mathias Shaw tops in both centrality metrics quite handily. This character shares connections with many of the most important characters of the Alliance. Looking at figure 3, a degree centrality of 0.039 (ranked 37th of all characters) puts him around the median of the red importance characters, giving him a solid case of being considered as a major character himself. However, a high degree centrality might not be exactly equivalent with being important in the lore. The 9 other non-major characters in table 1a have degree centrality scores sitting in the yellow-orange range in the box plot, and could therefore also be considered as major character candidates. However, in many cases the high score may stem from less important measures such as family bonds to pivotal characters, e.g. Calia Menethil (sister of Arthas Menethil), Derek Proudmoore (brother of Jaina Proudmoore), which should be taken into account when evaluating importance.



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**Fig. 4.** The mean sentiment scores of the factions for major characters changes across games/expansions, with the games/expansions being denoted by their respective acronyms(see appendix). **A:** Mean sentiment scores for major characters of the specified faction that appeared in the given game/expansion. **B:** Mean "directed" sentiment from major characters of a given faction towards another major character. The plot shows whether characters of opposing/the same faction interact positively or negatively. **C:** The rolling average shows how the text length for a character correlates with the sentiment score. As the text length increases, the sentiment scores approach the mean of the dataset. **D:** The average word count of the texts associated with the major characters appearing in the given game.

In the introduction, it was hypothesised that Alliance characters would be more important than Horde characters. From table 1, we see that the mean degree centrality for Alliance is 0.016, while it is 0.0119 for Horde. For betweenness centrality, the mean score for Alliance is 0.00552 while it is 0.00396 for Horde. In other words, both scores are indeed higher

for Alliance. Nevertheless, because of the large variances in centrality scores for both Alliance and Horde distributions, one-way ANOVA tests do not reveal a significant difference between Alliance and Horde for either metric ( $p = 0.125$  and  $p = 0.338$ , respectively). Therefore, it cannot be concluded that Alliance characters are more important than Horde characters based on the centrality metrics.

The sentiment scores on figure 4A show that major Alliance characters tend to have more positive descriptions. The only game where the featured Horde characters have a noticeably more positive sentiment than the featured Alliance characters is WC3X. The sudden rise in mean sentiment score for Horde from WC2X to WC3 suggests that the cast of Horde characters in the game are described more positively. However, this could also be attributed to the increase in the text amount from WC2X to WC3 for Horde-aligned characters, which figure 4D shows. Since more text generally causes the sentiment score to move towards the dataset mean of 5.253, as can be seen on figure 4C, it becomes unclear whether the featured characters' traits and actions are the reason for the increase in sentiment score. The sentiment of the interactions of Horde characters with Alliance characters also becomes more positive, as the Horde to Alliance sentiment is only slightly lower than the intra-Horde sentiment as shown on figure 4B. Curiously, the Alliance to Horde sentiment score for WoWWotLK is higher than the intra-Alliance score. This is caused by characters such as Brann and Muradin Bronzebeard from the Alliance having an above average sentiment score with Lor'themar Theron of the Horde, as they attended his wedding. This indicates that they share a positive relationship, proving that characters of opposite factions are not always bitter enemies. Overall it is hard to conclude that there is one side that is clearly good or evil based only on the mean sentiment scores as it is difficult to determine whether a character with a lot of associated text is good or evil based on this metric.

## Discussion

When considering the presented results, one must be aware of the limitations of the analysis. One such limitation is how the affiliation of each character is based on the latest expansion. However, throughout the lore there are several characters that have changed their affiliation, for instance Sylvanas Windrunner, who has been part of both the Alliance, Horde, and is currently non-aligned. This aspect of characters which have had multiple affiliations throughout the lore creates inaccuracies in both our network analyses and in the sentiment analysis. Had these characters been included in factions that they belonged to in earlier parts of the timeline, the centrality statistics and sentiment scores for that faction would likely change. This means that having each character belonging to only one faction limits the insight we are able to get.

The sentiment analysis is based on wiki articles, that are usually written to be neutral. This may obscure the actual sentiment of how the characters are written in the story and makes it difficult to make any actual conclusion on the basis of the sentiment scores. This effect could be remedied if the text was only sourced from the game script. However, we were unable to find complete scripts for any of the games besides WC3 and its expansion. Another issue preventing conclusions from being made from sentiment scores is the fact that longer texts sentiment scores tend towards the mean sentiment score,

which makes the sentiment score correlated with the length of text as seen on 4C. It is also difficult to draw conclusions from the “directed” sentiment, as the text in which other characters are mentioned in a character’s wiki-page is not entirely descriptive of a character’s sentiment towards another. It does, however, give some insight into the circumstances under which the two characters are connected.

Additionally, it is important to keep in mind that while sentiment scores are calculated for each game/expansion, the game/expansion only filters for the major characters included in those games, while the text related to those characters is kept in full, i.e. the wiki-text is the same for said character is the same no matter the expansion. This means that the body of text used to calculate the sentiment score of a given game also includes information from other points in the timeline. This further entails that the sentiment score will not change for a given character from one game to another, even if the character’s characteristics or behaviour changes. This likely dampens the effect of filtering for a given game, which could hide interesting shifts in sentiment.

If further work was to be put into this topic, one point of improvement could be gathering the relevant text from all games, which could make sentiment scores better reflect the actions of the characters and circumstances surrounding them. Furthermore, if the actual text was to be sectioned according to the timeline, the sentiment change over time could be observed better. Moreover, the happiness ratings from Dodds et al. (3) is, although being computationally simple, quite a crude score, not taking e.g. word context into account. If it were possible to get the actual transcripts of Warcraft characters, there would most likely be interesting conclusions to be drawn by using a more advanced metric.

The network is constructed with the major characters as a basis and then branching out one level from their links. This makes the network centralised around those particular characters, and it means that centrality measures could be biased towards these characters. Due to time constraints, only

characters found from branching out one level was included in the network<sup>†</sup>, but it would be possible to expand the network by branching out more levels. Branching out would likely only introduce more niche characters, meaning the current centrality scores would be a good estimator of the true centrality scores. Another idea could be to branch out from random seed characters in the Warcraft universe. In general, finding a way to include every single Warcraft character and their links in the final network would be ideal for drawing the best conclusions in terms of the importance and centrality of the characters and making sure centrality biases are avoided.

1. Wowpedia, Wowpedia (<https://wowpedia.fandom.com/wiki/Wowpedia>) (2022) [Online; accessed 14-December-2022].
2. Wikipedia, Warcraft — Wikipedia, the free encyclopedia (<http://en.wikipedia.org/w/index.php?title=Warcraft&oldid=1126231529>) (2022) [Online; accessed 11-December-2022].
3. PS Dodds, KD Harris, IM Kloumann, CA Bliss, CM Danforth, Temporal patterns of happiness and information in a global social network: Hedonometrics and twitter. *PLOS ONE* **6**, 1–1 (2011).
4. Wikipedia, Tf-idf — Wikipedia, the free encyclopedia (<http://en.wikipedia.org/w/index.php?title=Tf-idf&oldid=1123031029>) (2022) [Online; accessed 13-December-2022].

## Appendix

Abbreviations for games and expansions:

- WC1: Warcraft: Orcs & Humans
- WC1: Warcraft II: Tides of Darkness
- WC2X: Warcraft II: Beyond the Dark Portal (expansion)
- WC3: Warcraft III: Reign of Chaos
- WC3X: Warcraft III: The Frozen Throne (expansion)
- WoW: World of Warcraft
- WoWBC: World of Warcraft Burning Crusade (expansion)
- WoWWoLK: World of Warcraft Wrath of the Lich King (expansion)
- WoWC: World of Warcraft Cataclysm (expansion)
- WoWMoP: World of Warcraft Mists of Pandaria (expansion)
- WoWWoD: World of Warcraft Warlords of Draenor (expansion)
- WoWL: World of Warcraft Legion (expansion)
- WoWBFa: World of Warcraft Battle for Azeroth (expansion)
- WoWS: World of Warcraft Shadowlands (expansion)

<sup>†</sup>The run time for just finding all the characters at depth 1 was around 6 hours.

| Degree centrality       |       |            |                      |       |      | Betweenness centrality |       |            |                      |        |      |
|-------------------------|-------|------------|----------------------|-------|------|------------------------|-------|------------|----------------------|--------|------|
| Major characters        |       |            | Non-major characters |       |      | Major characters       |       |            | Non-major characters |        |      |
| name                    | score | importance | name                 | score | rank | name                   | score | importance | name                 | score  | rank |
| Thrall (H)              | 0.119 | red        | Mathias Shaw         | 0.039 | 39   | Thrall (H)             | 0.103 | red        | Mathias Shaw         | 0.0094 | 62   |
| Sylvanas Windrunner     | 0.108 | red        | Bwonsamdi            | 0.028 | 68   | Deathwing              | 0.069 | red        | Bwonsamdi            | 0.0076 | 81   |
| Jaina Proudmoore (A)    | 0.095 | red        | Calia Menethil (H)   | 0.027 | 72   | Garrosh Hellscream (H) | 0.066 | red        | Zekhan (H)           | 0.0041 | 130  |
| Anduin Wrynn (A)        | 0.093 | orange     | Zekhan (H)           | 0.021 | 99   | Sylvanas Windrunner    | 0.064 | red        | Theradras            | 0.0037 | 140  |
| Garrosh Hellscream (H)  | 0.092 | red        | Derek Proudmoore (H) | 0.019 | 116  | Khadgar (A)            | 0.054 | red        | Tyr                  | 0.0034 | 11   |
| Deathwing               | 0.084 | red        | Med'an               | 0.017 | 122  | Jaina Proudmoore (A)   | 0.052 | red        | Calia Menethil (H)   | 0.0033 | 149  |
| Khadgar (A)             | 0.080 | red        | Nazgrim              | 0.016 | 130  | Anduin Wrynn (A)       | 0.051 | orange     | Reshad               | 0.003  | 156  |
| Lich King               | 0.077 | red        | Pelagos              | 0.014 | 146  | Lich King              | 0.046 | red        | Nazgrim              | 0.0027 | 160  |
| Varian Wrynn (A)        | 0.076 | red        | Saidan Dathrohan     | 0.014 | 147  | Varian Wrynn (A)       | 0.039 | red        | Dath'Remar           | 0.0027 | 162  |
| Tyrande Whisperwind (A) | 0.075 | red        | Rakeesh              | 0.014 | 153  | Baine Bloodhoof (H)    | 0.035 | orange     | Tormmok              | 0.0027 | 163  |

**Alliance Mean: 0.016**

**Horde Mean: 0.0119**

**(a) Left:** degree centrality for major characters and their importance level. **Right:** degree centrality for non-major characters and the ranked position of their degree centrality score (out of a total of 1961 characters).

**Alliance Mean: 0.00552**

**Horde Mean: 0.00396**

**(b) Left:** betweenness centrality for major characters and their importance level. **Right:** degree centrality for non-major characters and the ranked position of their betweenness centrality score (out of a total of 1961 characters).

**Table 1.** The top 10 degree centrality and betweenness centrality scores for major and non-major characters of the network. For the characters, (A) means Alliance, (H) means Horde, the rest are non-aligned. The mean scores are calculated from all characters in the network, i.e. not only the ones shown in the table. According to one-way ANOVA tests, the distributions for degree centrality and betweenness centrality do not differ significantly between Horde and Alliance characters ( $p = 0.125$  and  $p = 0.338$ , respectively).