Final Data Assignment

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I. Introduction: Hunger Games Background

"The Hunger Games" is a trilogy of novels written by Suzanne Collins that were later adapted into movies by directors Francis Lawrence and Gary Ross. The story of this world begins with Katniss Everdeen, a 17-year-old girl from District 12 inside of the dystopian country of Panem. Panem's structure relies on the obedience of its 12 districts and the resources they provide for the Capitol, the city where the ruling class lives. Each district is assigned one resource that they cultivate for the Capitol and ruling class to use and exploit in exchange for law and order. District 12, where a significant portion of this story takes place, is full of coal mines, and their society is built around coal as their resource. District 1 supplies the capital with luxury items and jewelry, District 2 manufactures weapons for the Capitol's military, District 3 produces technology and electronics, District 4 is responsible for the fishing industry, District 5 is in charge of power and electricity, District 6 supplies transportation, District 7 produces trees and lumber, District 8 supplies the textile industry, District 9 produces grain, District 10 focuses on the livestock industry, and District 11 mainly serves as the agricultural center of Panem (Collins). Each district serves a purpose for the Capitol, but they are not all treated the same. The districts closer to the Capitol are seen as more civilized and high class, while those from what are called "outlier" districts are seen as less than, like Katniss.

Each year, to ensure that all of the districts are aware of their place within the system, the Capitol and its president, President Coriolanus Snow, require them all to participate in the gruesome spectacle known as the Hunger Games. The Hunger Games requires one male and one female tribute to be selected from each district from all children ages 12 to 18. These tributes are selected in a reaping ceremony, and being chosen for many is a death sentence. The Hunger Games are essentially a fight to the death in an enclosed arena, with Game-makers from the Capitol adding additional challenges and deadly threats as the Games continue. Each tribute attempts to win the Hunger Games by outliving their peers, either by killing them or successfully hiding until all others have passed (Collins).

In the districts neighboring the Capitol, namely District 1, District 2, and District 4, certain children go through training in a special academy until they are 18. They then volunteer to become their districts' tributes as highly trained killers, known as Careers. The Careers are the only ones who volunteer for such a position, as no one else would want to subject themselves to the torture and violence that is the Hunger Games, that is until Katniss Everdeen (Collins).

Katniss' 12-year-old sister Primrose is selected to become District 12's tribute, which quickly prompts Katniss to volunteer in her place. She believes that, at 17, she is better prepared to stand against the Careers and other tributes. Her close friend Gale Hawthrone promises to look after her family after she volunteers, and it is clear that they share an intimate relationship and deep care for one another. Katniss, along with fellow tribute Peeta Mallark, takes the Capitol by surprise, quickly becoming a fan favorite tribute. Katniss and Peeta eventually win the Hunger Games, but in doing this they start what all of the outlier districts have been waiting for: the Revolution against the Capitol and President Snow. Katniss sparks this Revolution, but is punsihed for it by being sent back into the Hunger Games with new tributes selected from the existing pool of victors, former winners of the Hunger Games (Collins).

After surviving her second Hunger Games and further pushing rebellion onto the districts with her defiant actions, Katniss is taken to the underground complex of District 13. District 13 was forced below ground

during the previous rebellion against the Capitol, and it has been gathering military power and strength ever since. Katniss, with the help of President Coin of District 13, leads the districts into a rebellion against the Capitol, and eventually successfully overthrows President Snow and inputs a new government (Collins).

My Interest and Main Network Relationships

My interest in this series began with the novels, as my family and I are science fiction and action fans, so this trilogy is right up our alley. Katniss' story captivates me, as the plot, the complex relationships, and the amazing detail and cinematography of the films make it unforgettable. I find myself obsessing over details when I watch it back, as well as the nuances in the characters' interactions and relationships, so I felt it was the perfect choice for this project.

The main relationship ties I selected are friendship ties, romantic ties, and strategic ties to get a better understanding of the social network within this series. I selected friendship ties because, although many of the characters who interact regularly throughout this series might not be friends in the typical sense, the label of "friendship" helps me and those who do not really understand this world see that these nodes are closely tied together. Labelling these unique and complicated ties under the blanket term "friendship" demonstrates that they rely on each other for either emotional support or relief or they interact on such a regular basis that it is hard to imagine they are not close in some sense. I also wanted to include romantic ties in this network analysis because "the Hunger Games" is infamous for the deeply complicated love triange between main characters Katniss, Gale, and Peeta. Therefore, I wanted to see how big of a role romance plays in the series because of how recognized the romances within it have become. Lastly, I included stragetic ties in my network plots and analysis because of how important alliances become throughout the movies and the Hunger Games themselves. It seems to be common knowlege that a tribute cannot win the games without help from allies, either from their district or others. Similarly, characters need allies in the Revolution they fight against the Capitol, therefore alliances are prominent even outside of the Hunger Games. Alliances differ from friendships because, while tributes or other characters might not get along personality wise, they need each other to survive in the circumstances they are in. Hence the importance and inclusion of alliances within my social network analysis.

Data Importation

Here I will load the necessary packages to import my data:

```
library(statnet)
library(UserNetR)
library(tidyverse)
```

In this line, I will import my node and edge data and characteristics from my data collection in excel, which is saved in my working directory. After importing, I turn my raw data into a matrix. This code also turns my edgelists into networks. I then am assigning the node characteristics to their appropriate nodes for each network and then doing the same with the edge characteristics.

```
setwd("~/Desktop/Network Data R")

edge1 <- as.matrix(read_csv("HG Friendship Edgelist.csv", col_names = F))
edge2 <- as.matrix(read_csv("HG Romantic Ties.csv", col_names = F))
edge3 <- as.matrix(read_csv("HG Stragetic Ties.Edgelist.csv", col_names = F))

frnship <-network(edge1, matrix.type = "edgelist", directed = F)
romance <-network(edge2, matrix.type = "edgelist", directed = F)
strategy <-network(edge3, matrix.type = "edgelist", directed = F)

fnodes <- read_csv("HG Friendship Node List.csv")
```

```
rnodes <- read_csv("HG Romantic Node List.csv")
snodes <- read_csv("HG Strategic Node List.csv")

frnship%v%"Node" <- fnodes$Node
frnship%v%"District" <- fnodes$District
frnship%v%"Tribute" <- fnodes$Tribute
frnship%v%"Loyalty" <- fnodes$Loyalty


romance%v%"Node" <- rnodes$Node
romance%v%"District" <- rnodes$District
romance%v%"Tribute" <- rnodes$Tribute
romance%v%"Loyalty" <- rnodes$Loyalty


strategy%v%"Node" <- snodes$Node
strategy%v%"District" <- snodes$District
strategy%v%"Tribute" <- snodes$Tribute
strategy%v%"Loyalty" <- snodes$Loyalty

edge_atts1 <- read_csv("HG Friendship Edge.characteristics.csv")
edge_atts2 <- read_csv("HG Romantic Edge.characteristics.csv")
edge_atts3 <- read_csv("HG Stragetic Edge.characteristics.csv")

frnship%v%"Strength" <- edge_atts1$Strength
romance%v%"Strength" <- edge_atts2$Strength
strategy%v%"Strength" <- edge_atts3$Strength
```

II. Exploratory Visualizations of the Network

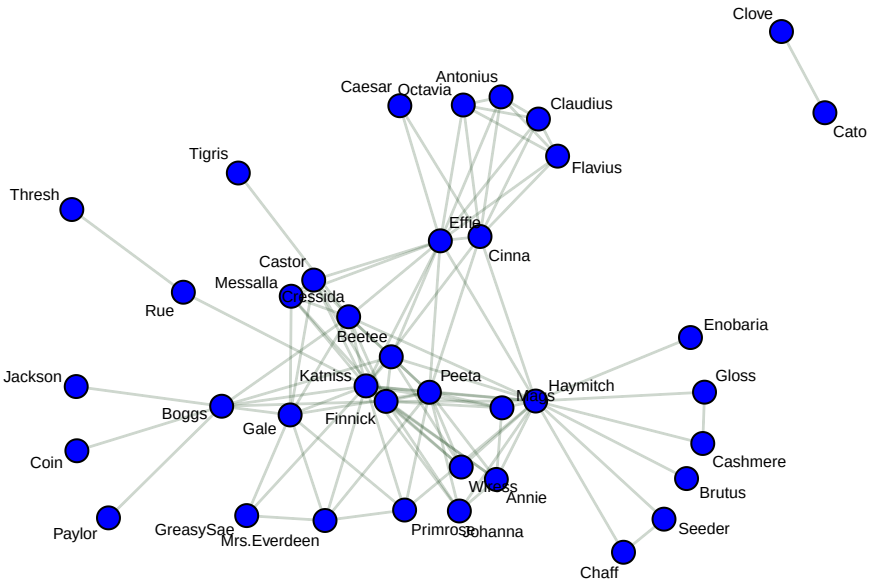
Preliminary Visualizations

First, I will demonstrate the first visualizations I created for these networks. I did not factor in any nodal attributes, edge attributes, centrality, or clustering in these visualizations, so they are simply the nodes and their ties for my three network types: friendship, romantic relationships, and strategic ties.

Friendship Network

Here is the visualization for the Friendship network:

```
par(mar = c(0,0,1,0))
plot(frnship, vertex.cex = 1.5,  main = "Friendship Ties",
     displaylabels = T, label.col = "black", label.cex = 0.5,
     vertex.col = "blue", edge.col = rgb(0,50,0, alpha= 50,
                                         maxColorValue = 255))
```



Basic Analysis The Friendship Ties plot seems to be the most telling about close relationships within this network structure. The main characters of this series, Katniss and Peeta, seem to be the most well connected within this network structure, while more minor characters, like Tigris and Thresh, have limited numbers of friendship ties. This is because the story focuses on the friends and acquaintances of Katniss, so the close ties more minor characters may have outside of this series are not shown in the movies or books. Similarly, it correlates that Katniss should have the most friendship ties because she is the main character of this series and it follows her through her relationships with other characters.

Many characters also serve as gatekeepers attached to bridges in this network, mainly those who have a tie to Katniss, Gale, or Peeta but are a apart of a different cluster, or district overall. Characters like Haymitch, who is Katniss and Peeta's mentor but a victor of previous games, making him a gatekeeper in this structure to other victors from various other districts, are important to the way the network is structured. Haymitch has these ties to other victors because he won the Hunger Games himself and had been mentoring with the other victors for years before this series began, so these ties were expected to be prominent in this network. Effie and Cinna, who also serve as mentors and close friends to Katniss, are also gatekeepers to their peers in the Capitol who are not connected to the rest of the network in this way. Effie and Cinna live and work in the Capitol, so it is expected that they have friends and ties there, but they are the stylists and mentors for District 12 for the Hunger Games, so their role as gatekeeper and their ties to Katniss and the rest of the network is not surprising. The final node that appears to be a gatekeeper in the friendship network is Boggs, who connects the rest of the leaders of District 13 to Katniss and the other victors. Boggs becomes a mentor and close friend to Katniss because he supports and believes in her even when others do not, so his close tie to her is expected. Boggs also lives and works for District 13, so he has friendship ties with his peers and superiors there as well, which makes him a gatekeeper. These gatekeepers are extremely important to the network, as articulated by Ronald Burt. Burt's theory of a nodes proximity to structural holes applies here because this network has many holes bridged by gatekeepers, who in turn have the most bridging captial and are more prone to good ideas (Burt).

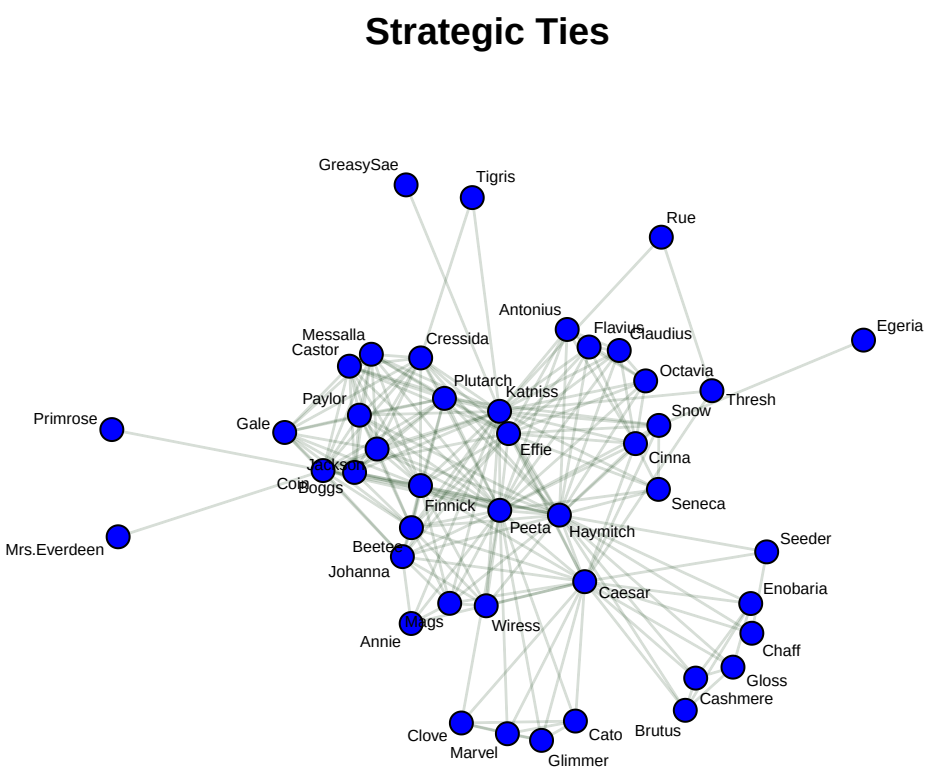
It also seems like there is a centralized, dense cluster among victors of previous games who were also selected to serve in an additional Hunger Games later in the series. Katniss, Beetee, Finnick, Peeta, Mags, Johanna, Wiress, and Haymitch are all in this dense, transitive cluster. The only nodes that are not attached to the rest of the network cluster are Cato and Clove, who are Careers from District 2 and isolate themselves through

feelings of superiority and therefore have no relationship to any of the other nodes. They are not victors, so they do not have connection to Haymitch, and they are not friendly or tied to Katniss or Peeta in any way, making them a separate component in this network.

Strategic Ties Network

Here is my strategic ties network visualization:

```
par(mar = c(0,0,1,0))
plot(strategy, vertex.cex = 1.5, main = "Strategic Ties",
     displaylabels= T, label.col = "black", label.cex = 0.5,
     vertex.col = "blue", edge.col = rgb(0,50,0, alpha= 40,
                                         maxColorValue = 255))
```



Basic Analysis The strategic ties network is the largest network included in my data collection. This network has a centralized piece that appears to be very dense and transitive, but it also has gatekeepers, bridges, and structural holes like the friendship network. Alliances are clearly very important in this universe, as all nodes need to be allied or strategically connected with at least one other to survive. Similar characters are also at the center of this network. Katniss and Peeta appear to have the most strategic connections, as they had alliances in both of the Hunger Games they competed in and had strategic ties in the Revolution later in the series, tying them in one way or another to almost all of the nodes or clusters of nodes. Haymitch, Finnick, and Effie also appear to have a lot of strategic ties, as they all were involved with the Hunger Games and the Revolution, giving them allying ties from both of these areas. Haymitch again serves as sort of a gatekeeper to the rest of the victors from previous Hunger Games, but Caesar also bridges them to the rest of the network.

Caesar has a strategic tie to all of the characters who served as tributes in the Hunger Games, as he interviewed them and closely monitored them throughout the Games. He appears more central in this network than I would have thought, but his ability to maneuver through the series without close friends or enemies shows that his strategic ties are very important, which appears clearly in the plot. Caesar and Peeta are the only nodes in the large, dense cluster in the center of the network connected to the Careers from the first Hunger

Games in this story, Cato, Clove, Marvel, and Glimmer, again showing Caesars widespread allies. Peeta aligns himself with this group of characters for protection in the first Games because everyone is seeking out fan-favorite Katniss. Peeta is the only tribute to knows and understands Katniss, so the Careers use him to help find her, which is why he is connected to them in this network.

The leaders and major characters of District 13 appear to have their own dense, transitive group within this network. Boggs, Coin, Plutarch, Paylor, Jackson, Castor, Cressida, Messalla, and Gale are a part of this cluster, and they all play integral roles in the structure and triumph of District 13, so their dense cluster of strategic ties is not surprising.

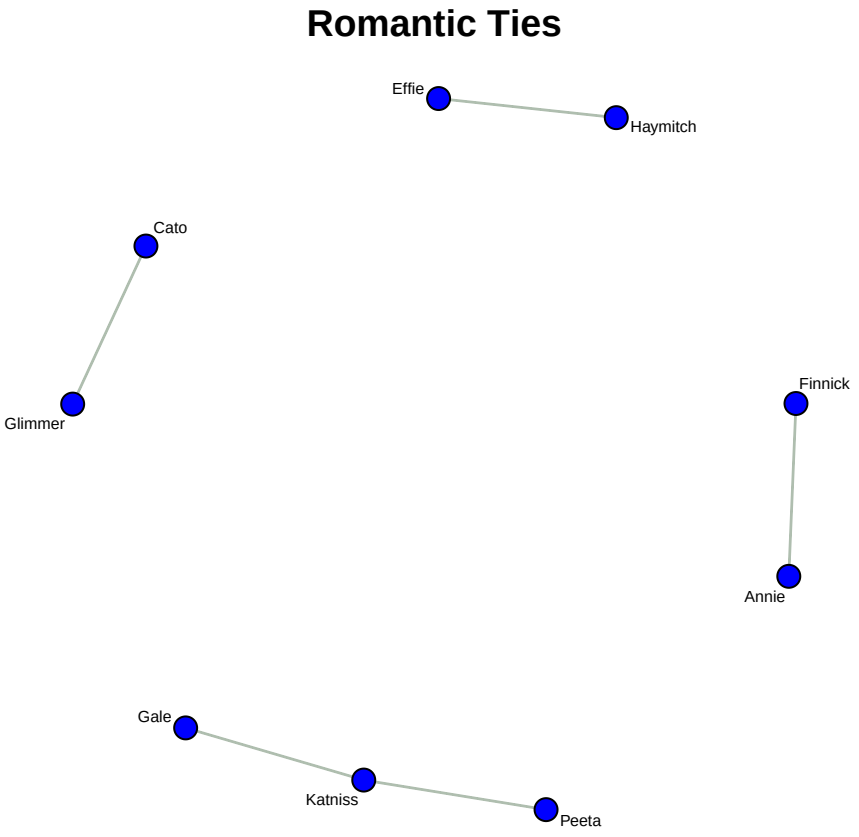
Katniss' prep and makeup team are also in a more transitive section of this network and they are bridged into the rest of the network by Katniss and her main stylist Effie. Effie is tied to Katniss, Peeta, Haymitch, and many of the other tributes and victors because of her role as Katniss' mentor and stylist. Octavia, Flavius, Claudius, and Antonius serve as her subordinates, so they have fewer social interactions with other tributes and characters, leading to them having fewer strategic ties as seen in the plot.

The minor characters in this network, like Mrs. Everdeen, Primrose, Greasy Sae, Tigris, and Egeria, have only one or two strategic ties, as they are each not heavily involved in the Revolution and none of these characters compete in the Hunger Games. This lack of involvement results in them having fewer ties, and their role in the series as minor characters is clear in this plot.

Romantic Ties Network

My final preliminary visualization is my romantic relationship network:

```
par(mar= c(0,0,1,0))
plot(romance, vertex.cex= 1.5, main = "Romantic Ties",
     displaylabels= T, label.col = "black", label.cex = 0.5,
     vertex.col = "blue", edge.col = rgb(0,50,0, alpha= 80,
                                         maxColorValue = 255))
```



Basic Analysis This network is smaller than I would expect based on how often I relate romance to this series. The main reason I associate romance with parts of this series is the on-going love triange between Katniss, Gale, and Peeta. Katniss clearly cares deeply for both of them, so the theme of her conflicted emotions and their complicated love story is prominent throughout the series, but they are some of the only characters involved in romantic relationships in this series. Because Katniss, Peeta, and Gale are featured in more of this story than all other characters, it reasonable that there feels like more romance among other characters than actually exists due to how often their specific romance is discussed or shown.

Another component featured in this network is the romantic relationship between Finnick and Annie. Finnick and Annie's relationship is another romantic tie that was prominent in the series, so it is not surprising that it appears in the plot. Finnick openly declares his love for Annie multiple times, and it seems that they are in a serious relationship throughout the whole series.

Cato and Glimmer's component in this network is definately less intense than those analized above. Cato and Glimmer are clearly in some sort of romantic relationship during the first Hunger Games shown in the series, so they should be included in this network, but their tie feels more like a fling than a full fledged relationship like those of Annie and Finnick and Katniss, Gale and Peeta. Because there are so few romantic ties in this network, it was surprising to see their tie featured so prominently, but again that is the result of so much of the story in this universe focusing on Katniss and her romantic interests.

Haymitch and Effie's romantic tie is one that is not as strong or defined as the others in this network. They seem to have a love-hate relationship that first appears as a friendship tie in this series. However, in one of the final moments in this series it is revealed that they are romantically involved, which is why they are depicted on this plot.

Visualizations with Nodal Attributes

Here I am going to plot all three of my network types using the statnet package. I am categorizing my nodes based on the nodal attribute "District" in hopes to see if where these nodes are from impacts their clustering. First, I used the RColorBrewer package to assign colors to each district number to ensure there are no repeats. While there are 12 districts total, I only have 10 districts represented within the nodes featured in this network, which is why I only assigned 10 unique colors.

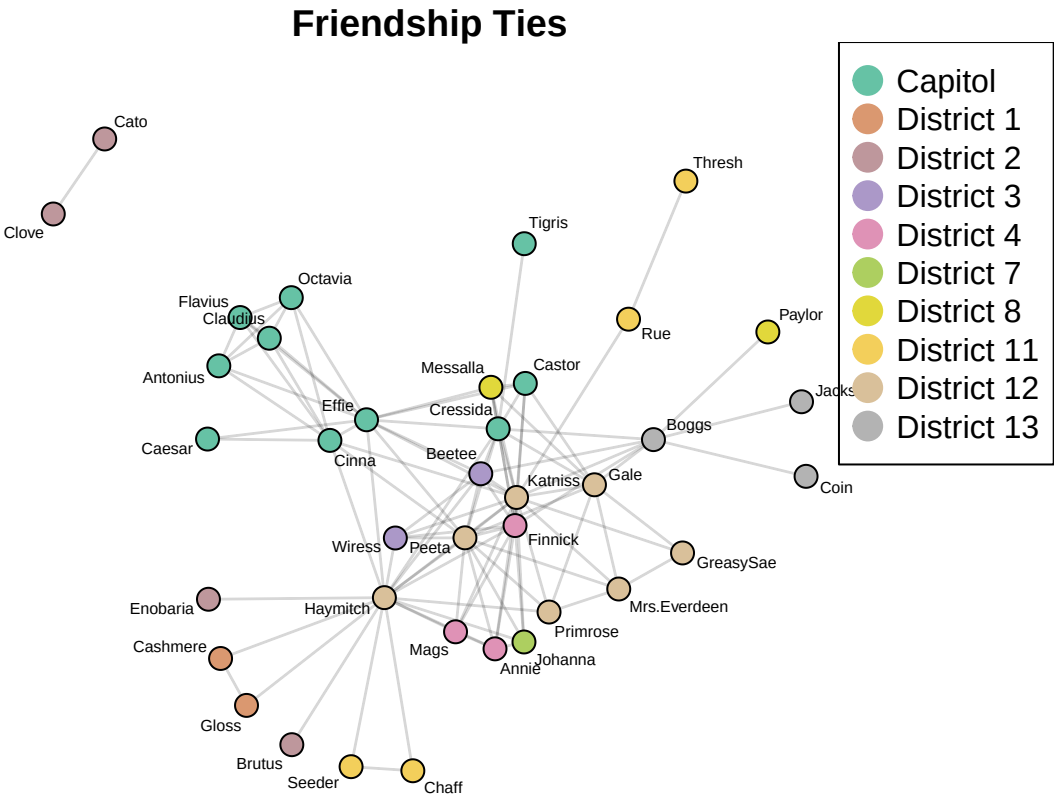
```
library(RColorBrewer)
nb.cols <- 10
mycolors <- colorRampPalette(brewer.pal(8, "Set2"))(nb.cols)
```

Friendship Network

Now I will plot the friendship network while including "District":

```
par(mar = c(0,0,1,0))
District <- as.factor(get.vertex.attribute(frnship, "District"))
plot(frnship, vertex.cex = 1.5,  main = "Friendship Ties",
     displaylabels = T, label.col = "black", label.cex = 0.5,
     vertex.col = mycolors[District], edge.col = rgb(0,0,0, alpha=40,
                                                     maxColorValue = 255))

legend("topright", legend = c("Capitol", "District 1","District 2","District 3",
                              "District 4","District 7","District 8","District 11",
                              "District 12","District 13"), col = mycolors, pch= 19, pt.cex = 2)
```



Analysis In the friendship ties network plot, it is evident that nodes are friends with more nodes from their same district than those from others. This is preliminary evidence of selective mixing within this network, especially with the characters from the Capitol (Class discussion). All of the characters from the Capitol in this network are clustered together, and many of them, like Caesar, Flavius, Anontius, Octavia, Claudius, and Tigris, are only tied to one node that is not from the Capitol, or none in Caesar's case. For the rest of these characters, the only node they are tied to outside of the Capitol is Katniss, which demonstrates her importance but also how isolated their community is with the rest of Panem.

Other districts appear to have clusters of selective ties as well, like the characters from District 13. Boggs is the only character from District 13 with ties outside of his district, as Jackson and Coin are only tied to him in this network. District 13 is also isolated from the rest of Panem at the beginning of the series, as they are in hiding underground, so this is expected. District 12 also has some characters that only have ties within the district, like Primrose and Greasy Sae, who do not leave District 12 until they are forced to in the Revolution. Because they spend all of their time in District 12, it is reasonable that they have limited ties elsewhere and demonstrate evidence of clustering within their network based on this shared nodal attribute.

Rue and Thresh, both from District 13, are in an isolated string of ties as well, but this appears to be to their limited screen time, as we do not see either of them interact with anyone other than Katniss or each other. Clove and Cato are also only tied to one another in this network, and this seems to be a pattern with all Careers across this franchise. The Careers, namely Clove, Cato, Cashmere, and Gloss, are only tied to other Careers in this network, demonstrating their superiority complex again because they believe they are well trained and strong enough to survive on their own.

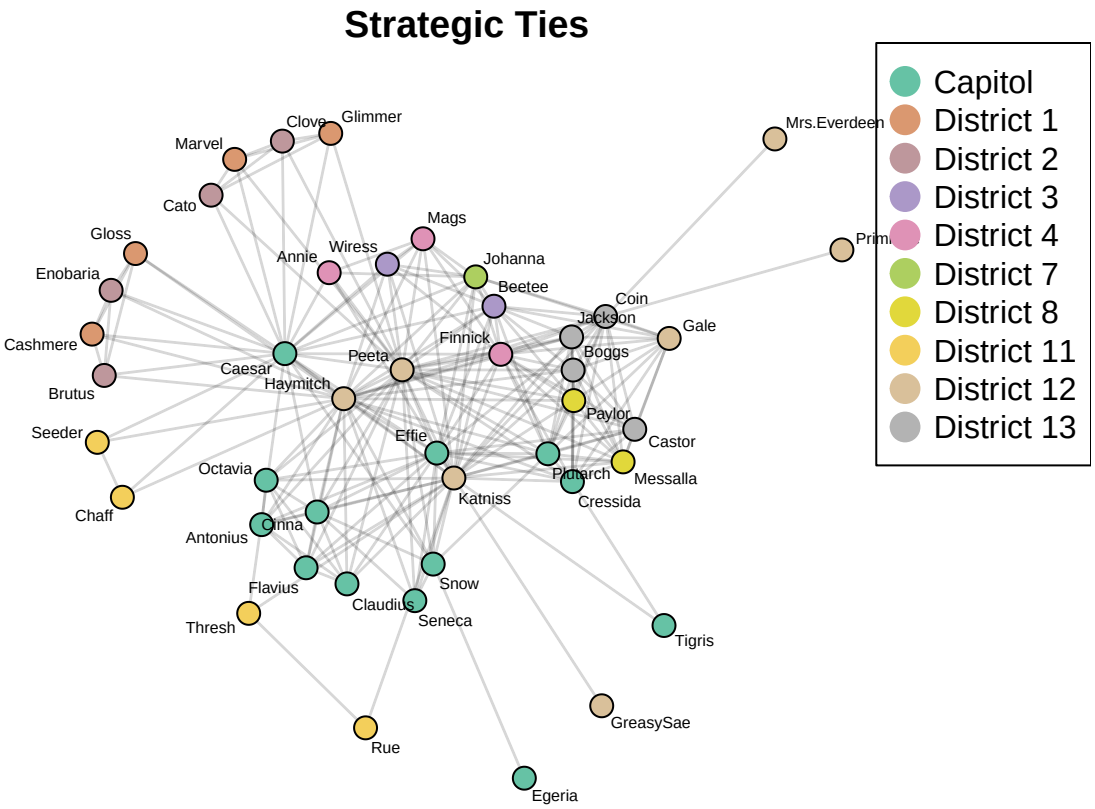
Strategic Ties Network

Next I will plot the strategic ties network including the nodal attribute "District":

```
par(mar = c(0,0,1,0))
District <- as.factor(get.vertex.attribute(strategy, "District"))
plot(strategy, vertex.cex = 1.5, main = "Strategic Ties",
```

```
     displaylabels= T, label.col = "black", label.cex = 0.5,
     vertex.col = mycolors[District], edge.col = rgb(0,0,0, alpha= 40,
                                                     maxColorValue = 255))

legend("topright", legend = c("Capitol", "District 1","District 2","District 3",
                              "District 4","District 7","District 8","District 11",
                              "District 12","District 13"), col = mycolors, pch= 19, pt.cex = 2)
```



Analysis The strategic ties network plot demonstrates a similar phenomena to the patterns witnessed in the friendship ties plot. Characters from the Capitol again seem to be the most prominent example of clustering in this network, showing that many nodes from the Capitol form ties based on this shared nodal attribute of district. These nodes are very interconnected and clustered together in this network, which further emphasizes the Capitol's isolation and "us versus them" mentality. Characters from the Capitol seem to believe they are the more refined class in Panem, so it is clear that they do not associate with other characters not of their similar class and status. The Careers in this network also cluster together based on district, as they appear to stick together in two separate subgroups (Class discussion). Cato, Glimmer, Marvel, and Clove make up one of these groups and Cashmere, Gloss, Brutus, and Enobaria make up the other. The only reason these two groups are not connected is because Cato, Glimmer, Marvel, and Clove do not survive long enough to create a strategic tie to the older group of Careers, but they are still demonstrating homophily through their selective ties even though they are not all connected.

Thresh and Rue are also in a similar position in this network as they were in the friendship ties, but they are both now tied to Katniss and Caesar, expanding the districts that each of them are connected to through strategic ties.

I think the most surprising aspect of this specific network is how widespread the characters from District 12 are. Haymitch, Gale, Peeta, and Katniss all are very connected in this network and appear to have many ties to other districts, showing little to no evidence of clustering based on the shared attribute of district. This is

striking because these characters are all together fairly often throughout the series, but their strategic ties are considerably different and widespread. Greasy Sae, Primrose, and Mrs. Everdeen again do not appear to have many other ties other than to Katniss or to President Coin, who saves them in a strategic move to remain in Katniss' good graces.

Many characters from other districts in this network are only distantly connected to one another, or do not share a lot of the same ties. Messalla and Commander Paylor are an example of this. They are both from District 8, but Messalla seems to be more connected to characters from the Capitol and Paylor appears to be strategically linked the leaders and decision makers of District 13. Finnick, Annie, and Mags are all from District 4, but their strategic ties are very different as well. Finnick is strategically tied to more tributes and chracters involved in the Revolution, whereas Annie and Mags are tied to one another and a limited number of other nodes, mostly because of their strategic ties to Finnick.

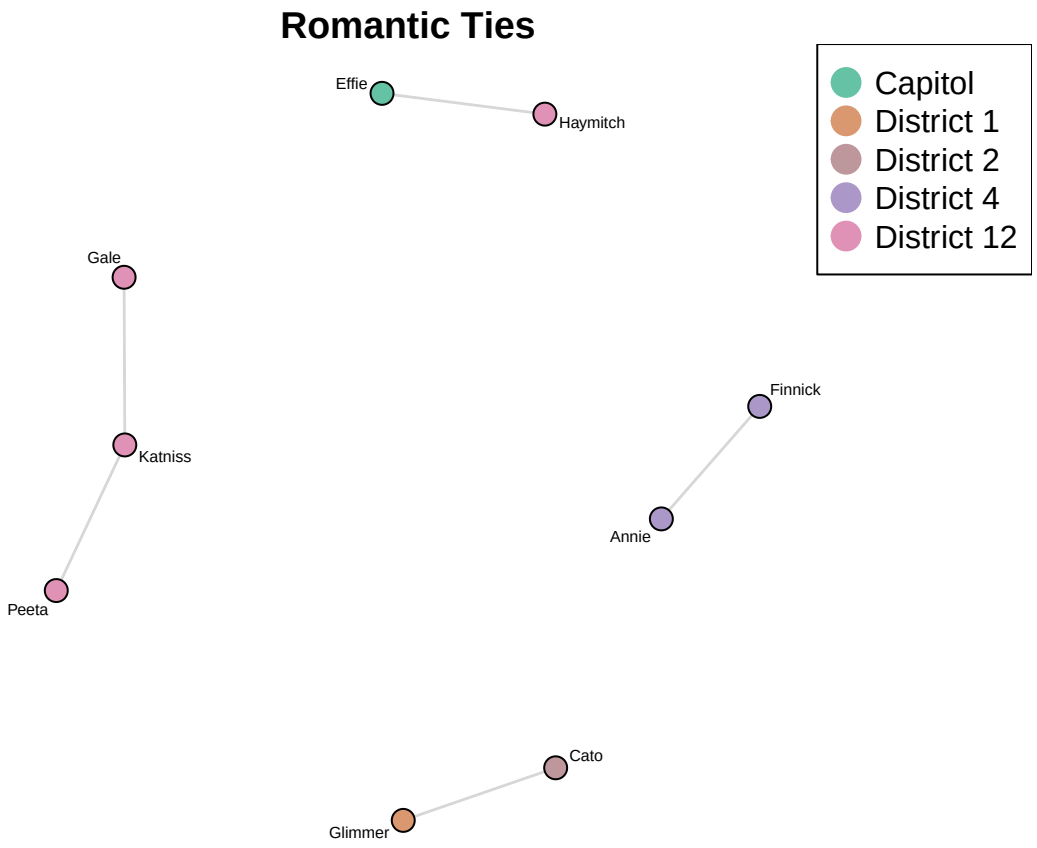
Overall, there seems to be far less clustering based on the shared nodal attribute of district in this network than in the friendship network, likely due to the need for strategic ties from a wide range of districts and professions.

Romantic Ties Network

Lastly, I will plot my romantic ties network, also including "District" as a nodal attribute:

```
par(mar = c(0,0,1,0))
District <- as.factor(get.vertex.attribute(romance, "District"))
plot(romance, vertex.cex= 1.5, main = "Romantic Ties",
     displaylabels= T, label.col = "black", label.cex = 0.5,
     vertex.col = mycolors[District], edge.col = rgb(0,0,0, alpha= 40,
                                                     maxColorValue = 255))

legend("topright", legend = c("Capitol", "District 1","District 2",
                              "District 4","District 12"), col = mycolors, pch= 19, pt.cex = 2)
```



Analysis In the romantic ties network plot, there are two components containing nodes from other districts tied to one another, and two components that only have ties between nodes from the same district. Katniss, Peeta, and Gale are all from District 12, and they are showing evidence of clustering based on this attribute because they only have romantic ties to characters within their district, as Katniss is romantically tied to both of them and no other characters in this series. Annie and Finnick are also both from District 4 and only are romantically tied to one another in this series, again showing evidence of clustering based on district because they are not tied to other districts in this way (Class discussion).

Haymitch and Effie, however, are from opposite sides of Panem but share a romantic tie in this network. They become romantically involved because of their work as mentors for Katniss and Peeta for the Hunger Games, so they are brought together outside of both of their districts and form a romantic tie. Glimmer and Cato are from different districts as well, and they form a romantic tie during their training for the Hunger Games. There is a pattern of consistent crossover needed from characters from different networks to form a romantic tie due to the personal and intimate nature of this relationship, so both Haymitch and Effie and Cato and Glimmers relationships were only possible because they were operating outside of each of their districts in a space where they could interact regularly and build this bond.

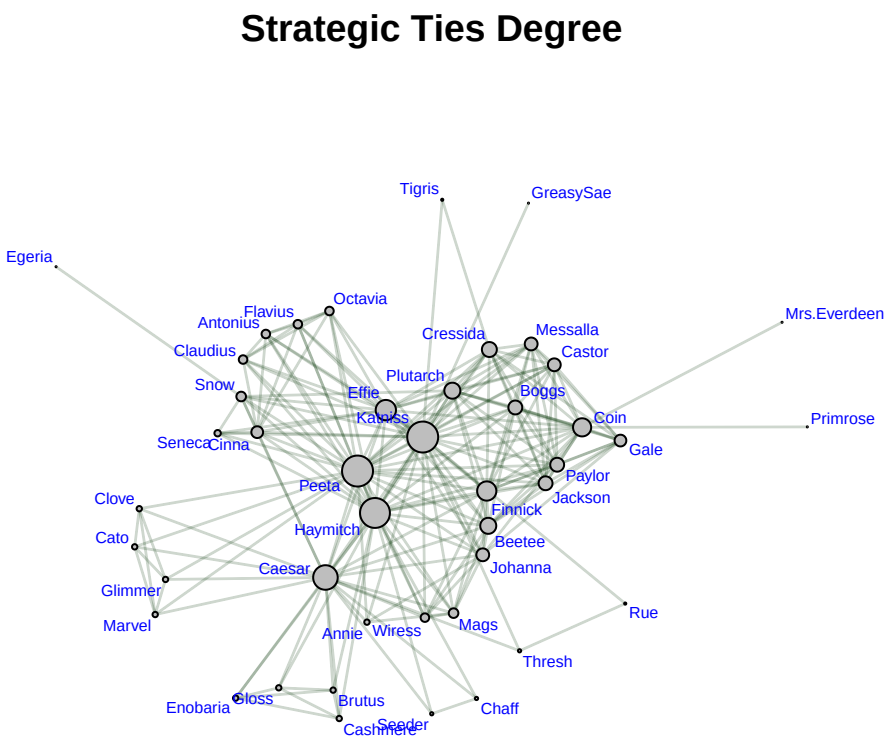
III. Strategic Ties - Actor Prominence

In this section I am exploring the degree, closenness, and betweenness centrality of the nodes in my strategic ties network to determine which nodes are prominent actors. Based on my previous visualizations, strategic ties seem to be the most common in the Hunger Games universe. These ties seem to be the most indicative of the overall network structure of this universe, so I have chosen to closely examine prominent actors within this relationship type to get a complete picture about what nodes are most prominent in this universe as a whole.

Degree Centrality

Here I will plot my strategic ties network while factoring the degree centrality of the nodes in this network to determine actor prominence.

```
par(mar = c(0,0,1,0))
deg <- degree(strategy, rescale = T)
plot(strategy, displaylabels = T,
      vertex.cex = deg*30,
      vertex.col= "grey", label.cex = 0.5, label.col = "blue",
      edge.lwd=0,edge.col = rgb(0,50,0, alpha= 50, maxColorValue = 255),
      main = "Strategic Ties Degree")
```



Analysis

This network structure indicates that more nodes have more direct strategic ties than friendship ties. Many nodes are more prominent actors in this network structure than in the friendship network, showing how important and widespread strategic ties are in the Hunger Games universe.

Haymitch, Katniss, and Peeta are still the most prominent actors in this network, as they are central characters with many ties, noted above in my friendship network analysis. They have many strategic ties and high degree centrality because they are well connected to different groups in order to survive in the Hunger Games and during the Revolution. Strategic ties are the most important in this universe, so the main characters in this series are expected to have a lot of ties in this network, making them prominent actors in the degree centrality plot.

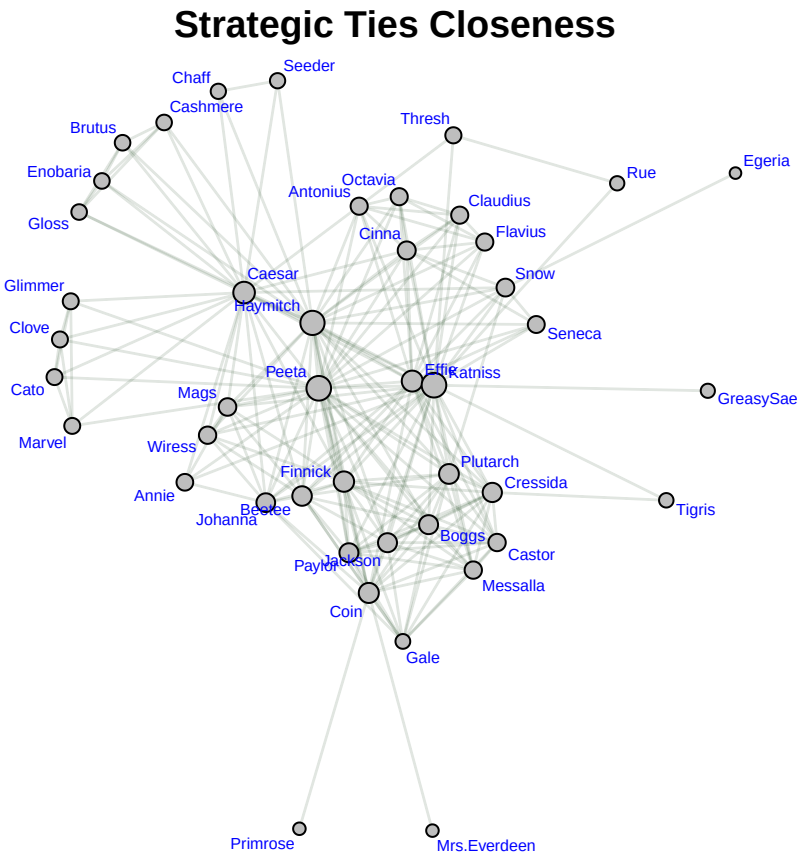
Some nodes in this network are more prominent than they were in the friendship degree centrality plot, like Caesar. Caesar was not a prominent actor in the friendship network because he has very few friendships due to the nature of his role as a broadcaster and interviewer for the Hunger Games in the Captiol. However, Caesar is well connected in the strategic relationship plot because he utilizes allies and connections from across Panem to advance and survive in this series. Caesar has access to all Districts and the Capitol through interviewing and getting to know all of the tributes, so he is well connected with many different groups of nodes. This gives him high degree centrality and makes him a prominent actor in this plot.

Similarly, the group of characters central to Katniss' cluster in District 13 appear to have much more prominence in this network than in the friendship network. Cressida, Castor, Messalla, Jackson, Gale, Paylor, Coin, and Boggs are all in this dense, central group of nodes that appears to have high degree centrality. They are prominent in this network because they have many strategic ties to one another due to the fact that they all rely on each other for survival during the Revolution. They each bring something crucial to District 13's success, but they are from such a wide range of backgrounds and Districts that they do not have solid friendships and instead are reliable allies.

Closeness Centrality

Now I will plot this network while factoring in the closeness centrality of the nodes within this network to determine actor prominence.

```
par(mar = c(0,0,1,0))
cls <- closeness(strategy, rescale = T)
plot(strategy, displaylabels = T,
      vertex.cex = cls*50,
      vertex.col= "grey", label.cex = 0.5, label.col = "blue",
      edge.lwd=0,edge.col = rgb(0,50,0, alpha= 30, maxColorValue = 255),
      main = "Strategic Ties Closeness")
```



Analysis

This network demonstrates a similar phenomenon seen in the friendship network because of how relatively compact this network is. The diameter of this network is four, meaning the furthest away nodes can be from one another is four ties. Because of this, a lot of nodes are close together through indirect ties, which gives them all similar levels of closeness centrality and prominence. Even characters with very few direct ties seem to be almost equal in prominence to those with more strategic ties, like Egeria and Rue.

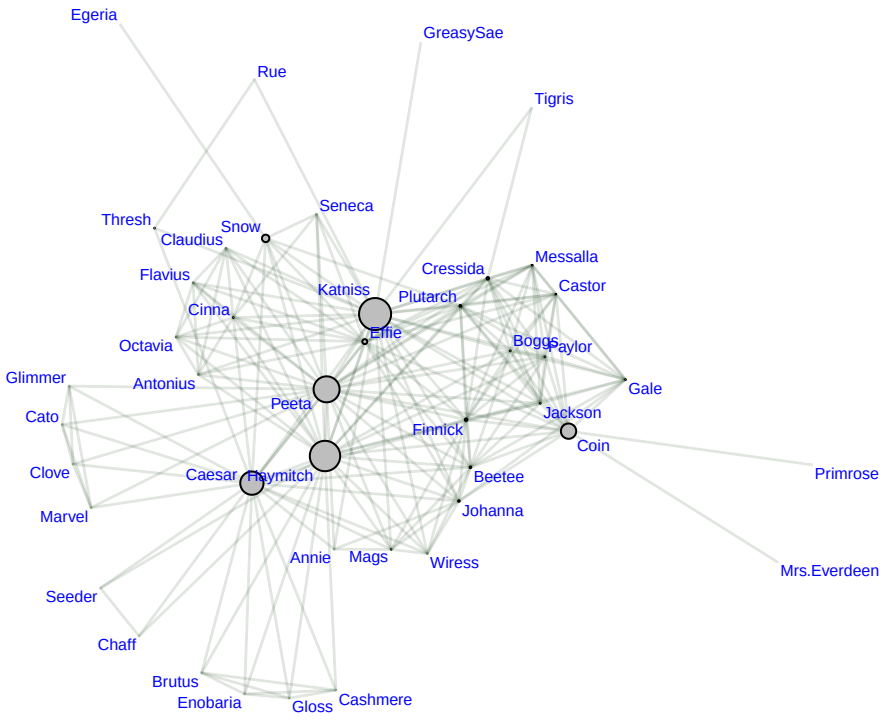
Caesar once again seems to be prominent in this network structure, which contrasts his lack of centrality in the friendship network plots. Caesar seems to have high closeness in his structure due to all of his strategic ties seen in the initial plot of this network structure. Because of all of his strategic ties, Caesar is closer to a lot of other ties because of how many direct ties he has in this strategic ties network. These ties pull him into the centralized group of nodes in this network structure and therefore lead to him having higher closeness centrality.

In general, it seems like the closeness for all of the nodes in this network increased when compared to the closeness of these same nodes in the friendship network. This is because there are more strategic ties in this series than there are friendship ties, so all nodes have more direct and indirect ties, making them all more prominent than in the previous network.

Betweenness Centrality

Here I will plot this network while factoring in the betweenness centrality of these nodes to determine actor prominence.

```
par(mar = c(0,0,1,0))
btwn <- betweenness(strategy, rescale = T)
plot(strategy, displaylabels = T,
      vertex.cex = btwn*10,
      vertex.col= "grey", label.cex = 0.5, label.col = "blue",
      edge.lwd=0,edge.col = rgb(0,50,0, alpha= 30, maxColorValue = 255),
      main = "Strategic Ties Betweenness")
```



Analysis

This network plot highlights the gatekeepers and bridges in the strategic ties network structure. Betweenness demonstrates this phenomenon because the extent to which a node exists between two nodes and has control

over the flow of information between these nodes indicates its betweenness, which also indicates its status as a gatekeeper.

Haymitch and Katniss both appear to have high prominence in this plot, which is similar to their prominence in the friendship network due to their roles as gatekeepers for different groups of nodes, which I explained above for the friendship network. They have the same status in this network because they are just as connected strategically as they were with friendships due to their main roles in this series. They are gatekeepers once more and therefore have high betweenness centrality and prominence in this plot.

Peeta and Caesar also have high betweenness centrality and prominence in this network plot. This is different from their position in the friendship network plot because they did not have high betweenness centrality, nor were they prominent actors in this network plot. They are prominent in this plot, however, because of their wide array of strategic ties they develop throughout the series. Peeta allies himself with many different groups of nodes during his time fighting in the Hunger Games as well as in the Revolution. He becomes allies with the Careers and their strategic ties during his first Games, and then shares Katniss' allies for the rest of the series, which gives him varying and numerous allies from many Districts. Caesar's strategic ties are numerous due to his position as an interviewer and commentator, as noted above for degree and closeness centrality.

IV. Exponential Random Graph Models

In this section I will be creating several exponential random graph models (also called "ergms") to determine which attributes and factors create the structure of my strategic ties network. I hope to identify which nodal attributes indicate higher sociality and therefore more ties, which attribute brings on the most dyads between nodes and therefore more homophily, and how much triadic closure there is within my network through these various models.

Null Model

Here I will run an ergm that only factors in "edges" from my strategic ties model. I then exponentiate the coefficients to make them easier for me to analyze.

```
library(ergm)
e1 <- ergm(strategy ~ edges)
summary(e1)
```

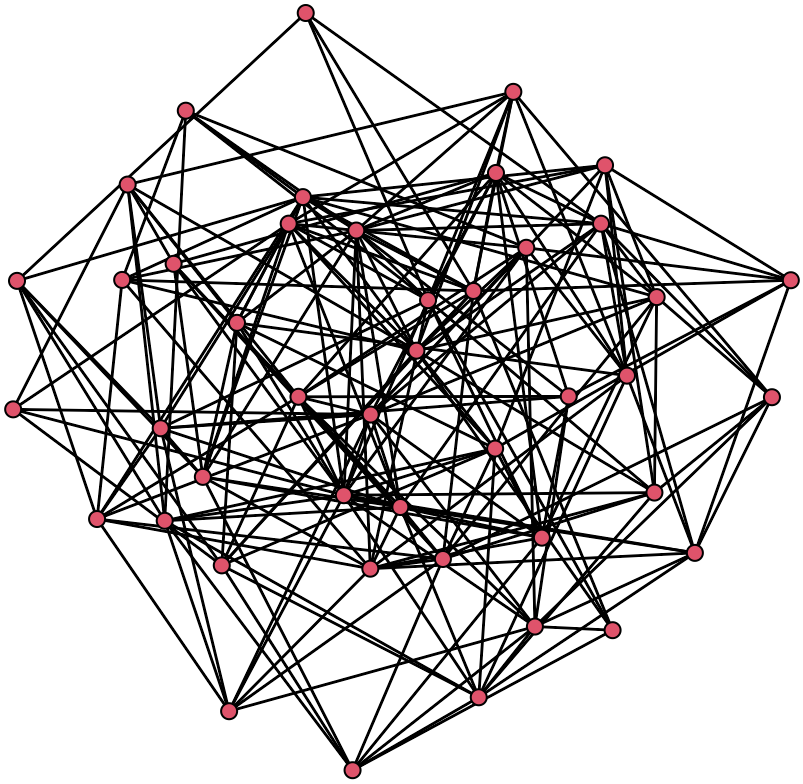
```
## Call:
## ergm(formula = strategy ~ edges)
##
## Maximum Likelihood Results:
##
##       Estimate Std. Error MCMC % z value Pr(>|z|)
## edges -1.22378    0.07758      0  -15.77   <1e-04 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##      Null Deviance: 1311  on 946  degrees of freedom
##  Residual Deviance: 1014  on 945  degrees of freedom
##
## AIC: 1016  BIC: 1021  (Smaller is better. MC Std. Err. = 0)
```

```
exp(coef(e1))
```

```
##     edges
## 0.2941176
```

Now I will plot a simulated network structure based on the null model I created above.

```
sim1 <- simulate(e1, nsim = 1, seed = 42)
op <- par(mar = c(0, 0, 0, 0))
plot(sim1)
```



Analysis

For this model, I am creating the null or baseline to compare my other models to. The AIC and BIC for this model are very high, at 1016 and 1021, respectively. The only piece of this network that was factored into this model was the edges, meaning factors like nodal attributes, dyadic predictors, and triadic closure predictors were not included in the making of this model. The coefficient for the edges in this exponential random graph model was 0.2941176. The estimation of this coefficient also has a p-value of 0, meaning it is a very accurate estimation and it is unlikely to be due to chance or random error. Edges acts as an intercept for the model, and ensures that the simulated networks have the same number of edges as the observed network. The coefficient produced by edges gives the overall density of network, which is 0.2941176 in this model (Luke).

Nodal Predictors

Here I am running an ergm that factors in the edges between nodes as well as the nodal attributes of loyalty, tribute status, and district. I then exponentiate the coefficients to make them easier for me to analyze.

```
e2 <- ergm(strategy ~ edges +
                nodefactor("Loyalty") +
                nodefactor("Tribute") +
                nodecov("District"))
summary(e2)
```

```
## Call:
## ergm(formula = strategy ~ edges + nodefactor("Loyalty") + nodefactor("Tribute") +
##     nodecov("District"))
```

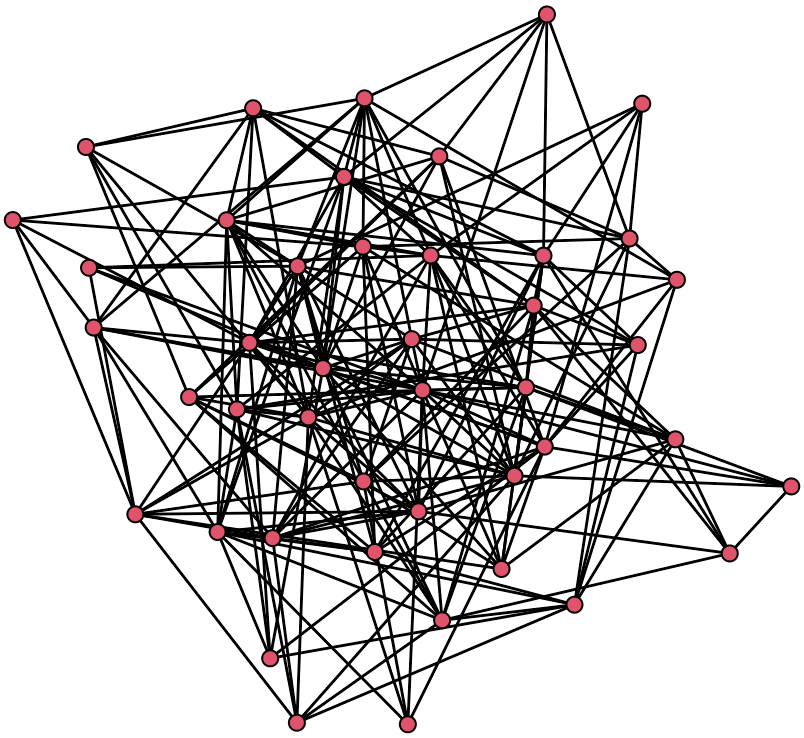
```
##
## Maximum Likelihood Results:
##
##                         Estimate Std. Error MCMC % z value Pr(>|z|)
## edges                   -0.38267    0.27011      0  -1.417    0.157
## nodefactor.Loyalty.S    -0.89521    0.16408      0  -5.456   <1e-04 ***
## nodefactor.Tribute.yes -0.01664    0.11371      0  -0.146    0.884
## nodecov.District        -0.01943    0.01412      0  -1.376    0.169
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##      Null Deviance: 1311.4  on 946  degrees of freedom
##  Residual Deviance:  973.6  on 942  degrees of freedom
##
## AIC: 981.6  BIC: 1001  (Smaller is better. MC Std. Err. = 0)
```

```
exp(coef(e2))
```

```
##                   edges   nodefactor.Loyalty.S nodefactor.Tribute.yes
##               0.6820382              0.4085227              0.9835019
##       nodecov.District
##               0.9807567
```

Now I will plot a simulated network structure based on the model I created above.

```
sim2 <- simulate(e2, nsim = 1, seed = 42)
op <- par(mar = c(0, 0, 0, 0))
plot(sim2)
```



Analysis

This model appears to be only slightly better than my baseline model. The AIC value for this model is 981.6 and the BIC value is 1001, showing that this model has improved, but not significantly. This model more accurately displays the structure of this strategic ties network because it factors in edges and the nodal attributes I identified as important in this network structure and the Hunger Games series in general, which were a node's district, their loyalty in the revolution, and their tribute status in the Hunger Games.

The coefficient for edges in this network is 0.6820382, which increased from 0.2941176 in my null model, showing the density increased from the first model to the second. The estimation of this coefficient also has a p-value of 0, meaning it is a very accurate estimation and it is unlikely to be due to chance or random error.

The coefficient for the nodal attribute loyalty, specifically loyalty to President Snow during the Revolution which takes the label "S" in my data, is 0.4085227 in this structure. The estimation of this coefficient also has a p-value of 0, meaning it is a very accurate estimation and it is unlikely to be due to chance or random error. This demonstrates that loyalty does not play a significant role in creating the structure of this network and nodes associated with this attribute do not have very many ties, or high sociality, in this structure compared to other attributes.

The coefficient for the attribute of tribute, specifically those who were tributes in the Hunger Games and are labelled "yes" in my data, is 0.9835019. This nodal attribute has the highest coefficient of any of the other factors in this model, showing that it contributes the most to the structure of the network when these attributes are factored into an ergm because it indicates that nodes associated with this attribute have high sociality and more ties than other attributes. This coefficient is so high because a node's tribute status seems to indicate a lot about the ties it will form with other nodes, at least according to this model. Tribute status is important in this universe because participating or not participating in the Hunger Games indicates a lot about a character's identity in this universe, as those who do are more central to the plot of the story due to Katniss, who is the main dictator of the plot, and her participation in these games.

The coefficient for the attribute of district in this model is 0.9807567, which is only slightly lower than that of tribute status, indicating that this attribute also is a significant dictator of the structure of this network according to this model. A node's district seems to factor heavily into the ties they form, as this coefficient signifies high sociality and more ties for nodes associated with this attribute, showing how this attribute creates the network structure of these nodes within this ergm. District is an important node attribute in the strategic ties network and the Hunger Games series because it is the foundation of a node's identity in this series. Nodes are often only identified by which district they are in, and they spend most of their time in their district of origin working for Panem and its Capitol. Many nodes only leave their district a few times throughout the course of the series, and some do not at all, which is why numerous nodes only have ties within their district, as they never encounter nodes from different districts and therefore cannot form strategic ties with them.

Nodal and Dyadic Predictors

Now I am running an ergm that factors in the edges the nodes have, the nodal attributes of loyalty, tribute status, and district, as well as dyadic predictors for each of these nodal attributes. I then exponentiate the coefficients to make them easier for me to analyze.

```
e3 <- ergm(strategy ~ edges +
             nodematch("Tribute") + nodematch("Loyalty") +
             absdiff("District") + nodefactor("Tribute") +
             nodefactor("Loyalty") + nodecov("District"))
summary(e3)
```

```
## Call:
## ergm(formula = strategy ~ edges + nodematch("Tribute") + nodematch("Loyalty") +
##     absdiff("District") + nodefactor("Tribute") + nodefactor("Loyalty") +
##     nodecov("District"))
```

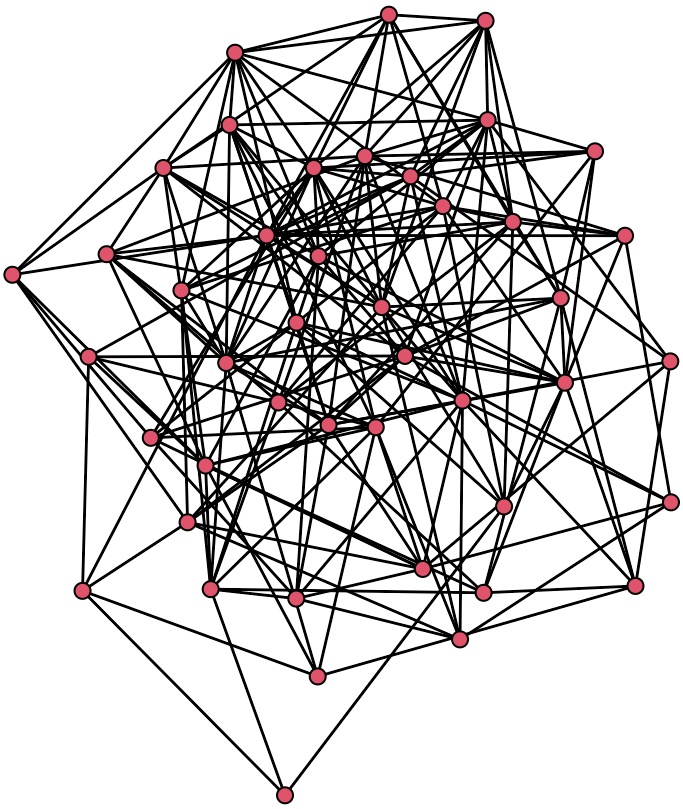
```
##
## Maximum Likelihood Results:
##
##                          Estimate Std. Error MCMC % z value Pr(>|z|)
## edges                   -1.613209   0.388335      0  -4.154  < 1e-04 ***
## nodematch.Tribute        0.602052   0.165209      0   3.644 0.000268 ***
## nodematch.Loyalty        1.119539   0.206742      0   5.415  < 1e-04 ***
## absdiff.District         0.001003   0.020191      0   0.050 0.960375
## nodefactor.Tribute.yes   0.011406   0.110895      0   0.103 0.918078
## nodefactor.Loyalty.S    -0.551594   0.167036      0  -3.302 0.000959 ***
## nodecov.District        -0.021055   0.014722      0  -1.430 0.152686
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##      Null Deviance: 1311.4  on 946  degrees of freedom
##  Residual Deviance:  925.7  on 939  degrees of freedom
##
## AIC: 939.7  BIC: 973.6  (Smaller is better. MC Std. Err. = 0)
```

```
exp(coef(e3))
```

```
##                  edges      nodematch.Tribute      nodematch.Loyalty
##              0.1992472              1.8258621              3.0634401
##       absdiff.District nodefactor.Tribute.yes   nodefactor.Loyalty.S
##              1.0010037              1.0114714              0.5760312
##       nodecov.District
##              0.9791654
```

Here I will plot a simulated network structure based on the null model I created above.

```
sim3 <- simulate(e3, nsim = 1, seed = 42)
op <- par(mar = c(0, 0, 0, 0))
plot(sim3)
```



Analysis

The AIC value of this model is 939.7 and the BIC value is 973.6, showing that this model is better than both the previous models, as these values have decreased. While my ergm models continue to improve, the AIC and BIC numbers are not dropping significantly, showing that this model is still not very accurate in showing the reasons behind the actual structure of my strategic ties network. However, this model still more accurately displays the structure of this strategic ties network because it factors in the edges within this network, the nodal attributes of a node's district, their loyalty in the revolution, and their tribute status in the Hunger Games, and it considers dyadic predictors for each of these attributes.

The coefficients of factors I have used in previous models have changed considerably in this model after I included dyadic predictors. The coefficient for edges in this model is 0.1992472, which is significantly lower than its coefficient in the two previous ergms I ran, which were 0.6820382 and 0.2941176. The estimation of this coefficient also has a p-value of 0, meaning it is a very accurate estimation and it is unlikely to be due to chance or random error. This means that the density of this network decreases considerably when dyadic factors are included in a model.

The coefficient for the nodal attribute of tribute "yes" – meaning nodes that were tributes in the Hunger Games – changed from 0.9835019 to 1.0114714 in this model, showing that the nodes associated with this tribute status have more sociality and therefore more ties when dyadic predictors are included. This shows the importance of tribute status within this relationship and universe, as it plays a large role in dictating the structure of this network.

The coefficient of the nodal attribute loyalty "S" – meaning nodes who are loyal to President Snow in the Revolution – changed from 0.4085227 to 0.5760312 in this ergm. The estimation of this coefficient also has a p-value of 0, meaning it is a very accurate estimation and it is unlikely to be due to chance or random error. This increase in the coefficient means that nodes associated with this attribute have higher socialtiy and more ties than they had in the previous model, but still not as much as those associated with "yes" tribute status.

The final coefficient that changed when factoring in dyadic predictors in this exponential random graph model

was district, which changed from 0.9807567 to 0.9791654. District's coefficient changed very little from the previous model, showing that it carries the same importance to the creation of the structure of this model than it did in the previous one. Once again, district is the second highest coefficient in this model, indicating that nodes affiliated with the district attribute have relatively high socialtiy and a lot of ties.

The coefficients of the predictors added to this model also demonstrate how different attributes and factors influence the overall structure of the network.

The coefficient for the attribute district as a dyadic predictor is 1.0010037. While this coefficient is the lowest of all of the dyadic predictors, it still indicates that there is a level of homophily or selective mixing among nodes who share the same district because nodes who share this attribute are likely to form dyads with one another. According to this model, district generates a level of homophily, and this is likely because the district a character is essential to the identity of different characters. Panem is divided into these districts, and each is responsible for one resource or business, so all characters from the same district both live and work together. Many characters never leave their district, which may be why there is a lot of homophily within this attribute. Likewise, those nodes who do have ties in other districts are those who are forced out of their district of origin by becoming a tribute in the Hunger Games or fleeing for the Revolution. This again shows why many nodes may form dyads or clusters with other nodes who share their same district.

The coefficient for the attribute tribute as a dyadic predictor is 1.8258621. The estimation of this coefficient also has a p-value of 0, meaning it is a very accurate estimation and it is unlikely to be due to chance or random error. This means that nodes with the same tribute status are likely to form dyads with one another, suggesting there is a level of homophily or selective mixing among nodes who share this attribute, even more so than among those who share the same district. Tribute status generates homophily or selective mixing within nodes who share the same tribute status (at least according to this model) because tribute status is a defining characteristic of a character's identity within this universe. Further, those who are in the Hunger Games likely have a lot of ties with others who were also in the Hunger Games because they need strategic ties to survive in these fights to the death. Similarly, nodes who are not tributes likely have a lot of strategic ties with others who are not tributes because they remain together when tributes are sent off to the Hunger Games to fight for their district, removing them from other nodes and making it more difficult for these non-tribute nodes to form ties with them.This dyadic predictor influences the shape of the network as a whole more than any of the nodal attributes.

Loyalty as a dyadic predictor has the highest coefficient within this model with 3.0634401. The estimation of this coefficient also has a p-value of 0, meaning it is a very accurate estimation and it is unlikely to be due to chance or random error. This means that nodes who share the same loyalty attribute are the most likely in this model to form dyads with one another, meaning loyalty produces the most amount of homophily of any attributes factored into this ergm. Loyalty generates the most homophily within this model because the strategic ties many of the nodes in this network form are based solely on their loyalty. Therefore, all nodes partake in a level of selective mixing when it comes to this attribute because they form strategic ties with those on the same side of the Revolution as they are, meaning those who share their loyalty attribute. The Revolution is one of the main conflicts in this series, and the tensions between the two sides are present even before the war begins. Because of this, nodes must choose whether they are loyal to Katniss or President Snow and then form strategic ties among their chosen group to ensure they survive, which is why there are a lot of dyads between nodes who share this attribute.

Nodal, Dyadic, and Triadic Closure Predictors

The final ergm I am running for this strategic ties network includes the edges the nodes have, the nodal attributes of loyalty, tribute status, and district, as well as dyadic predictors for each of these nodal attributes and the propensity for these nodes to form triads. I then exponentiate the coefficients to make them easier for me to analyze.

```
e4 <- ergm(strategy ~ edges +
             nodematch("Tribute") + nodematch("Loyalty") +
             absdiff("District") + nodefactor("Tribute") +
```

```
            nodefactor("Loyalty") + nodecov("District") + gwesp(decay = 0.25,fixed=T))
summary(e4)
```

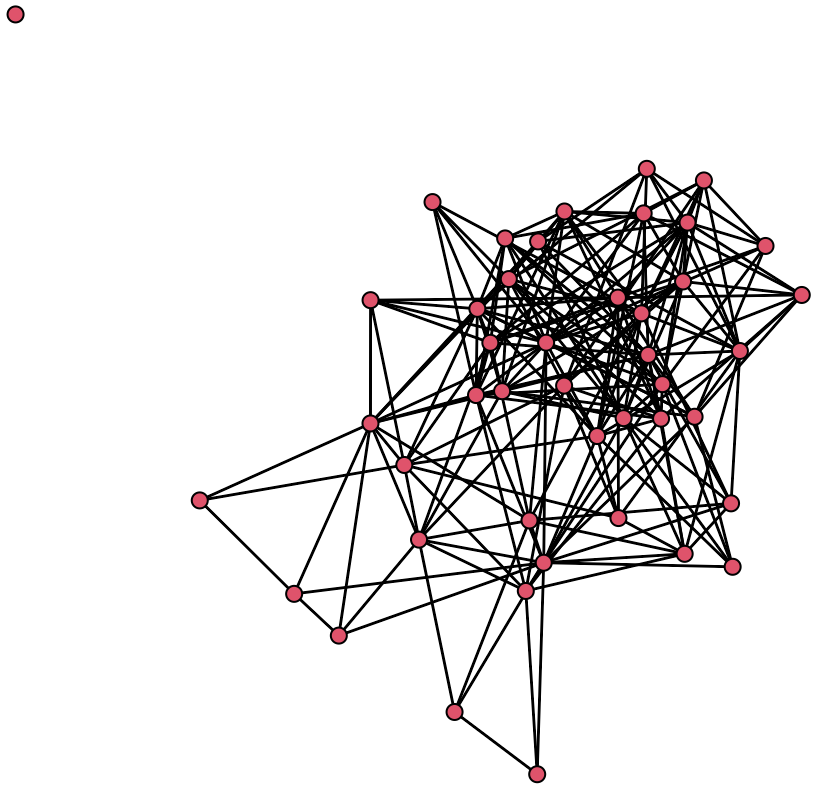
```
## Call:
## ergm(formula = strategy ~ edges + nodematch("Tribute") + nodematch("Loyalty") +
##     absdiff("District") + nodefactor("Tribute") + nodefactor("Loyalty") +
##     nodecov("District") + gwesp(decay = 0.25, fixed = T))
##
## Monte Carlo Maximum Likelihood Results:
##
##                         Estimate Std. Error MCMC % z value Pr(>|z|)
## edges                   -8.105730   1.194740      0  -6.785  < 1e-04 ***
## nodematch.Tribute        0.531189   0.144677      0   3.672 0.000241 ***
## nodematch.Loyalty        0.986472   0.173076      0   5.700  < 1e-04 ***
## absdiff.District         0.004244   0.019206      0   0.221 0.825127
## nodefactor.Tribute.yes   0.019391   0.079968      0   0.242 0.808410
## nodefactor.Loyalty.S    -0.295535   0.133307      0  -2.217 0.026626 *
## nodecov.District        -0.013881   0.012070      0  -1.150 0.250114
## gwesp.fixed.0.25         4.557994   0.870458      0   5.236  < 1e-04 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##      Null Deviance: 1311.4  on 946  degrees of freedom
##  Residual Deviance:  849.5  on 938  degrees of freedom
##
## AIC: 865.5  BIC: 904.3  (Smaller is better. MC Std. Err. = 0.1809)
```

```
exp(coef(e4))
```

```
##                   edges      nodematch.Tribute      nodematch.Loyalty
##           3.018049e-04           1.700953e+00           2.681757e+00
##       absdiff.District nodefactor.Tribute.yes   nodefactor.Loyalty.S
##           1.004253e+00           1.019580e+00           7.441331e-01
##       nodecov.District       gwesp.fixed.0.25
##           9.862149e-01           9.539192e+01
```

Now I will plot a simulated network structure based on the model I created above.

```
sim4 <- simulate(e4, nsim = 1, seed = 42)
op <- par(mar = c(0, 0, 0, 0))
plot(sim4)
```



Analysis

This model is the closest structurally to my actual strategic ties model visualized in the second section of this paper. The AIC value of this model is 865.5 and the BIC value is 904.3, showing that this model is better than all three of the previous models, as these values have significantly decreased. This model more accurately displays the structure of this strategic ties network because it factors in the edges within this network, the nodal attributes of a node's district, their loyalty in the revolution, their tribute status in the Hunger Games, dyadic predictors for each of these attributes, and the overall propensity for triadic closure.

The coefficient for edges in this model is 3.018049e-04, or 0.0003018049. The estimation of this coefficient also has a p-value of 0, meaning it is a very accurate estimation and it is unlikely to be due to chance or random error. This value significantly decreased from the previous models, signifying the density has gone down as the model became more accurate and included more factors.

The coefficient for the nodal attribute of loyalty "S" – meaning nodes who are loyal to President Snow in the Revolution – is 7.441331e-01, or 0.7441331. The p-value for this coefficient is 0.05, meaning it is a fairly accurate estimation and is likely not due to random chance or error. This increased from the previous models, which indicates that, as other attributes and predictors are added to the ergm and making it closer to the actual structure of the model, nodes associated with the "S" loyalty attribute have higher sociality and therefore more ties than they did in previous models.

The coefficient for the nodal attribute of district is 9.862149e-01, or 0.9862149. This value has remained relatively the same throughout all of the exponential random graph models I have created, showing that regardless of the other attributes and predictors included in a given model, nodes associated with the district attribute will always have the same relatively high sociality and number of ties. This resonates with my data and the Hunger Games series because district is something every node prioritizes, and it is the cornerstone of a character's identity within this universe.

The coefficient for the nodal attribute of tribute "yes" – meaning the nodes who were tributes in the Hunger Games– is 1.019580e+00. This value is very similar to the coefficient this attribute had in the previous model, meaning that when triadic closure is added to a model, it does not change the sociality, or number of ties,

of a node associated with the attribute "yes" for tribute status. This is likely because tribute status will always have a relatively high impact on a node's sociality because it is an important identifier within the series, much like district.

The coefficient for the attribute district as a dyadic predictor is 1.004253e+00. This value is virtually the same as the coefficient it had in the previous model, which was 1.0010037. Because of this, one can infer that the number of dyads created by nodes who share this attribute does not change when triadic closure is added as a factor in this ergm. Further, the amount of homophily with nodes who share this attribute remains at the same relatively high level, meaning that nodes are just as likely to form ties with other nodes who are from the same district as in the previous model.

The coefficient for the attribute tribute as a dyadic predictor is 1.700953e+00. The estimation of this coefficient also has a p-value of 0, meaning it is a very accurate estimation and it is unlikely to be due to chance or random error. This value slightly decreased from its coefficient in the previous model, where it was 1.8258621. These two values are still very similar, however, which signifies that even when triadic closure is included in this ergm, the attribute tribute still is expected to create the same amount of dyads among nodes of the same tribute status. The coefficient for this dyadic predictor is high, meaning this attribute creates more dyads than a node's district and therefore has the propensity to bring on more homophily within this network, showing how this attribute shapes the structure of the network.

The coefficient for the attribute loyalty as a dyadic predictor is 2.681757e+00. The estimation of this coefficient also has a p-value of 0, meaning it is a very accurate estimation and it is unlikely to be due to chance or random error. This value decreased from the previous model, where it was 3.0634401. This means that when triadic closure is factored into the ergm and the model gets closer to how it actually appears, the attribute loyalty brings on slightly fewer dyads of the same loyalty than in the previous model. However, this value is still very high, meaning there are more dyads created between nodes who share the same loyalty attribute than any other attribute in this network. This indicates that loyalty generates the most homophily in the strategic ties network, so nodes are more likely to cluster and form ties togther based on shared loyalty than any other attribute.

The coefficient for the amount of triadic closure in this network is 9.539192e+01, or 0.9539192. The estimation of this coefficient also has a p-value of 0, meaning it is a very accurate estimation and it is unlikely to be due to chance or random error. Because this coefficient is positive and significant, there is evidence that there is triadic closure in this strategic ties network. This means that if node "A" has a strong tie with nodes "B" and "C", then "B" and "C" may also have a strong tie within this network and create a triad.

Takeaways - Expontential Random Graph Models

After running these four ergms, I will return to my initial intent behind including these models in my data project. In the beginnig of this section, I stated what I hoped to discover using these models, which included identifying which nodal attributes indicate higher sociality and therefore more ties, which attribute brings on the most dyads between nodes and therefore more homophily, and how much triadic closure there is within my network through these various models.

Based on my models, I can determine that tribute status and district are the most indicative nodal predictors. These attributes have the highest coefficients across all of the models generated, meaning nodes associated with these attributes have higher sociality and form more ties within this network. A node's district is indicative of the number of ties it forms in this network because different districts are highlighted more throughout the series based on where the main characters are from and where the action is taking place. For example, most of the series takes place in either District 12, District 13, or the Capitol, so nodes from these districts have more ties because more characters are introduced from their districts and social circles due to their relevance to the story.

On the other hand, loyalty seems to bring on the most dyads that share this attribute, meaning this attribute generates the most homophily in this network structure. Loyalty generates homophily because this is a strategic ties network, and nodes want to strategically align themselves with nodes who share their values and loyalties. It would be nonsensical to form a strategic tie with someone on the opposing side of a war

unless it was absolutely necessary for survival, which is why nodes tend to only form ties with those who are loyal to the same side as they are.

The final takeaway I have from this section of my project is that triadic closure exists at some capacity within this strategic ties relationship, and including this in my model makes it closely resemble the actual structure of my strategic ties network.

V. Conclusion

In doing this project I have discovered many things, both surprising and unsurprising, about the Hunger Games universe. First, I realized the importance of considering how prominent a character is when discussing the number of ties they have in my relationship networks. Main characters like Katniss, Peeta, and Haymitch have a significant number of ties in all of these networks because they are featured the most in this series. Because of this, they are the most prominent actors in all of the networks and show the most degree, betweenness, and closeness centrality. Characters who get very little attention in this series, like Enobaria, Rue, and Thresh, do not have a lot of ties in these relationship networks because they are only shown in relationship to the main characters, so their separate friendship, strategic, and romantic network structures are not shown in the series. This meant that characters like these had very low prominence and degree, closeness, and betweenness centrality, but this values do not necessarily represent the lives of these characters due to their minimal representation in this series.

Second, I was very surprised by the lack of romantic ties in this series. As mentioned previously, romance is one of the first genres that comes to mind when thinking about this series, but it is not a common relationship between ties. The prevalence of romance within this series appears to be due to the series-long love triangle between main characters Katniss, Peeta, and Gale. Because these characters are the main focus of the series, their romantic endeavors also take center stage, causing romance to feel far more present in this series than it actually is. Strategic ties were the most common ties in this network, as every node I included had at least one strategic tie. This makes sense due to the nature of the series, where survival in conflict is the most important thing for every node, and, in order to survive, nodes need alliances to protect them. In terms of the attributes I decided to include, I expected district to be the most indicative of the structure of these networks because of how separated nodes from different districts are in this series. However, district was not a strong indicator of the structure because, while district signified sociality and number of ties more than other attributes, it did not create a lot of dyads between nodes from the same district. Homophily and the clustering of nodes was more a result of a node's loyalty than their district, which was surprising at first. However, after analyzing this fact, it seems very rational that nodes with the same loyalties would form ties together to keep their side of the conflict closer and strategically aligned. The biggest takeaway I have from this project is that the characters in Hunger Games heavily rely on each other for survival. Each node protects their ties and is willing to go to war if one of their ties is double crossed, which is a very unique feature to this series. The ties in some of these networks seemed insignificant at first, but even the weakest strategic ties would fight for one another, which is indicative of how important loyalty is in this series. I have really enjoyed getting to further explore the Hunger Games universe and broaden my knowledge on social network analysis, and I hope this project inspires and interest and love for both of these topics similar to my own.

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