

R Notebook for Network & belongingness Paper

By Neil Yetz, MPH

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Introduction

This Document was last updated on March 17, 2018. This document is associated with the Campus Connections Social Network Data. Please set the correct working directories in the setwd & load data section of this notebook. When run successfully, all network graphs, separated by semester and night with role attributes will be outputted and saved as a .RDS file into the MERGEALL folder of WTG. If you have any questions concerning this document, please send an email to Neil Yetz at neil.yetz@colostate.edu.

Clear Environment

```
rm(list = ls(all.names = TRUE))
```

Load Libraries

```
#install.packages("CTT")
#install.packages("GGally")
#install.packages("ggplot2")
#install.packages("lattice")
#install.packages("gridExtra")
#install.packages("igraph")
#install.packages("dplyr")
#install.packages("tidyr")
#install.packages("igraph")
#install.packages("statnet")
```

```
library(CTT)
library(GGally)
library(ggplot2)
library(lattice)
library(gridExtra)
library(reshape)
library(igraph)
library(tidyverse)
```

setwd & load data

```
setwd("T:/Research folders/CCWTG/Analyses/Data for Stats Dept/FINAL DATA")

#elmk <- read_csv("CC_edgelist.csv")
#saveRDS(elmk, "cc_edgelist.rds")
elmk <- readRDS("cc_edgelist.rds")
youth_att <- read_csv("Mentee_Attributes.csv")
staff_att <- read_csv("Staff_Attributes_Final.csv")
```

Format Edgelist

```
elmk <- elmk %>%
  filter(Receiver_Missing == 0,
         Sender_missing == 0,
         Sender_Final_ID != Receiver_Final_ID) %>%
  mutate(sn1 = ifelse((sn1 == 1 & sn2 == 0), NA, sn1), #marking NA for nominated, but weight = 0
         sn2 = ifelse(is.na(sn1), NA, sn2)) %>%
  select(-Receiver_Missing, -Sender_missing)
```

Format Attributes

```
youth_att <- youth_att %>%
  mutate(Final_ID = final_ID,
         role1 = Role,
         night1 = tolower(night),
         night2 = NA,
         role2 = NA,
         mentee = NA
        ) %>%
  select(Final_ID, semester, night1, night2, mfcond, role1, role2, room, gender, mentee, imnotes, date)

staff_att <- staff_att %>%
  mutate(date_dropped = NA,
         no_start = NA,
         Final_ID = FFinal_ID) %>%
  select(Final_ID, semester, night1, night2, mfcond, role1, role2, room, gender, mentee, imnotes, date)

staff_youth_att <- rbind(staff_att, youth_att)

staff_youth_att <- staff_youth_att %>%
  #lowercase all
  mutate(role1 = tolower(role1),
         role2 = tolower(role2),
         night1 = tolower(night1),
         night2 = tolower(night2),
         #Set role colors
         role_col = ifelse(role1 == "mentee", "orange", NA),
         role_col = ifelse(role1 == "mentor", "green", role_col),
         role_col = ifelse(role1 == "mentor coach", "dodgerblue", role_col),
         role_col = ifelse(role1 == "lead mentor coach", "red", role_col),
         role_col = ifelse(role1 == "instructor", "grey50", role_col),

         role_col2 = ifelse(role2 == "mentee", "orange", NA),
         role_col2 = ifelse(role2 == "mentor", "green", role_col2),
         role_col2 = ifelse(role2 == "mentor coach", "dodgerblue", role_col2),
         role_col2 = ifelse(role2 == "lead mentor coach", "red", role_col2),
         role_col2 = ifelse(role2 == "instructor", "grey50", role_col2)
        )
```

Create Useful Functions

```
#use this function to create plots Adjust here if necessary.

my_sn_g <- function(g, title = "", vertex.label = NA, vertex.size = 10, edge.color = "black", edge.arrow
  plot(g,
    vertex.label = NA,
    vertex.size = 10,
    edge.color = 'black',
    edge.arrow.size = 0.05,
    layout = layout_nicely(g),
```

```

    main = title)
}

#function to make legend creation cleaner
#Create vectors of attributes colors & corresponding colors
my_leg <- function(att, colors) {
  legend("bottomright", legend=att , col = colors , bty = "o", pch=20 , pt.cex = 1, cex = 1, text.col=
}

```

Set Legend

```

#For Legend roles & corresponding colors
role <- c("mentee", "mentor", "mentor coach", "lead mentor coach", "instructor")
color <- c("orange", "green", "dodgerblue", "red", "grey50")

```

Create General Graphs

F15

```

temp <- elmk %>% filter(semester == "F15")

mon <- temp %>% filter(night == "monday")
tue <- temp %>% filter(night == "tuesday")
wed <- temp %>% filter(night == "wednesday")
thu <- temp %>% filter(night == "thursday")

sem <- list(mon = mon,
            tue = tue,
            wed = wed,
            thu = thu)

rm(mon);rm(tue);rm(wed);rm(thu)

```

Summary

```

sem$mon <- group_by(sem$mon, survnum)
sem$tue <- group_by(sem$tue, survnum)
sem$wed <- group_by(sem$wed, survnum)
sem$thu <- group_by(sem$thu, survnum)

summarize(sem$mon, day = "mon", n = length(unique(Sender_Final_ID)), tie_count = sum(sn1, na.rm = TRUE))

## # A tibble: 5 x 5
##   survnum day      n tie_count tie_prop
##   <int> <chr> <int>   <int>   <dbl>
## 1      1 mon     69      76   0.361
## 2      2 mon     65     441   2.09
## 3      3 mon     61     672   3.19
## 4      4 mon     58     834   3.96
## 5      5 mon     59     887   4.21

```

```

summarize(sem$tue, day = "tue", n = length(unique(Sender_Final_ID)), tie_count = sum(sn1, na.rm = TRUE)

## # A tibble: 5 x 5
##   survnum day      n tie_count tie_prop
##   <int> <chr> <int>     <int>     <dbl>
## 1      1 tue     62        73     0.387
## 2      2 tue     61       389     2.06
## 3      3 tue     60       623     3.31
## 4      4 tue     60       760     4.03
## 5      5 tue     61       871     4.62

summarize(sem$wed, day = "wed", n = length(unique(Sender_Final_ID)), tie_count = sum(sn1, na.rm = TRUE)

## # A tibble: 5 x 5
##   survnum day      n tie_count tie_prop
##   <int> <chr> <int>     <int>     <dbl>
## 1      1 wed     67       104     0.482
## 2      2 wed     64       482     2.23
## 3      3 wed     64       731     3.39
## 4      4 wed     64       859     3.98
## 5      5 wed     63      1004     4.65

summarize(sem$thu, day = "thu", n = length(unique(Sender_Final_ID)), tie_count = sum(sn1, na.rm = TRUE)

## # A tibble: 5 x 5
##   survnum day      n tie_count tie_prop
##   <int> <chr> <int>     <int>     <dbl>
## 1      1 thu     71       126     0.528
## 2      2 thu     71       568     2.38
## 3      3 thu     69       772     3.23
## 4      4 thu     67       830     3.48
## 5      5 thu     67       877     3.67

sem$mon <- ungroup(sem$mon)
sem$tue <- ungroup(sem$tue)
sem$wed <- ungroup(sem$wed)
sem$thu <- ungroup(sem$thu)

```

Monday

```

#Set to right days
temp_night <- temp %>% filter(night == "monday")
temp_att <- staff_youth_att %>% mutate(night = "monday")

#Surv_1
surv_1 <- temp_night %>%
  filter(survnum == 1) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%

#Getting isolates
isolates1 <- surv_1 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_1 <- surv_1 %>%

```

```

    select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 2
surv_2 <- temp_night %>%
  filter(survnum == 2) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates2 <- surv_2 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_2 <- surv_2 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 3
surv_3 <- temp_night %>%
  filter(survnum == 3) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates3 <- surv_3 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_3 <- surv_3 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 4
surv_4 <- temp_night %>%
  filter(survnum == 4) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates4 <- surv_4 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_4 <- surv_4 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 5
surv_5 <- temp_night %>%
  filter(survnum == 5) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates5 <- surv_5 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%

```

```

filter(isolate < 1) %>%
select(Sender_Final_ID)
surv_5 <- surv_5 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

day <- list(sur1 = surv_1,
            sur2 = surv_2,
            sur3 = surv_3,
            sur4 = surv_4,
            sur5 = surv_5,
            iso1 = isolates1,
            iso2 = isolates2,
            iso3 = isolates3,
            iso4 = isolates4,
            iso5 = isolates5)

rm(surv_1);rm(surv_2);rm(surv_3);rm(surv_4);rm(surv_5)
rm(isolates1);rm(isolates2);rm(isolates3);rm(isolates4);rm(isolates5)
rm(temp_night)

```

General Graphs

#Convert to Matrices

```

sur1 <- as.matrix(day$sur1)
sur2 <- as.matrix(day$sur2)
sur3 <- as.matrix(day$sur3)
sur4 <- as.matrix(day$sur4)
sur5 <- as.matrix(day$sur5)

```

Convert matrix to an igraph object

```

g1 <- graph.edgelist(sur1, directed = TRUE) + vertices(day$iso1$Sender_Final_ID) #Graph edgelist + Add
g2 <- graph.edgelist(sur2, directed = TRUE) + vertices(day$iso2$Sender_Final_ID) #Graph edgelist + Add
g3 <- graph.edgelist(sur3, directed = TRUE) + vertices(day$iso3$Sender_Final_ID) #Graph edgelist + Add
g4 <- graph.edgelist(sur4, directed = TRUE) + vertices(day$iso4$Sender_Final_ID) #Graph edgelist + Add
g5 <- graph.edgelist(sur5, directed = TRUE) + vertices(day$iso5$Sender_Final_ID) #Graph edgelist + Add

```

#Capture Roles, Nights & Colors

```

temp_att <- temp_att %>%
  mutate(
    role1 = ifelse(!(is.na(role2))) & (night2 == night), role2, role1),
    night1 = ifelse(!(is.na(night2))) & (night2 == night), night2, night1),
    role_col = ifelse(!(is.na(role_col2))) & (night2 == night), role_col2, role_col)
  )

```

#Add staff Role Attribute

```

V(g1)$role <- temp_att$role1[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$role <- temp_att$role1[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$role <- temp_att$role1[match(V(g3)$name, temp_att$Final_ID)]

```

```

V(g4)$role <- temp_att$role1[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$role <- temp_att$role1[match(V(g5)$name, temp_att$Final_ID)]

#Add role colors

V(g1)$color <- temp_att$role_col[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$color <- temp_att$role_col[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$color <- temp_att$role_col[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$color <- temp_att$role_col[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$color <- temp_att$role_col[match(V(g5)$name, temp_att$Final_ID)]

#Set graphs to list
graphs <- list(g1 = g1, g2 = g2, g3 = g3, g4 = g4, g5 = g5)

rm(g1); rm(g2); rm(g3); rm(g4); rm(g5)
rm(sur1); rm(sur2); rm(sur3); rm(sur4); rm(sur5)
rm(temp_att)

```

Create Monday List

```

monday <- list(edgelist = day, graphs = graphs)
rm(day); rm(graphs)

```

Tuesday

```

temp_night <- temp %>% filter(night == "tuesday")
temp_att <- staff_youth_att %>% mutate(night = "tuesday")

#Surv_1
surv_1 <- temp_night %>%
  filter(survnum == 1) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%

#Getting isolates
isolates1 <- surv_1 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_1 <- surv_1 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_2
surv_2 <- temp_night %>%
  filter(survnum == 2) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%

#Getting isolates
isolates2 <- surv_2 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_2 <- surv_2 %>%

```



```

    select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 3
surv_3 <- temp_night %>%
  filter(survnum == 3) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates3 <- surv_3 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_3 <- surv_3 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 4
surv_4 <- temp_night %>%
  filter(survnum == 4) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates4 <- surv_4 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_4 <- surv_4 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 5
surv_5 <- temp_night %>%
  filter(survnum == 5) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates5 <- surv_5 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_5 <- surv_5 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

day <- list(sur1 = surv_1,
            sur2 = surv_2,
            sur3 = surv_3,
            sur4 = surv_4,
            sur5 = surv_5,
            iso1 = isolates1,
            iso2 = isolates2,
            iso3 = isolates3,
            iso4 = isolates4,

```

```

iso5 = isolates5)

rm(surv_1);rm(surv_2);rm(surv_3);rm(surv_4);rm(surv_5)
rm(isolates1);rm(isolates2);rm(isolates3);rm(isolates4);rm(isolates5)
rm(temp_night)

```

General Graphs

#Convert to Matrices

```

sur1 <- as.matrix(day$sur1)
sur2 <- as.matrix(day$sur2)
sur3 <- as.matrix(day$sur3)
sur4 <- as.matrix(day$sur4)
sur5 <- as.matrix(day$sur5)

```

Convert matrix to an igraph object

```

g1 <- graph.edgelist(sur1, directed = TRUE) + vertices(day$iso1$Sender_Final_ID) #Graph edgelist + Add
g2 <- graph.edgelist(sur2, directed = TRUE) + vertices(day$iso2$Sender_Final_ID) #Graph edgelist + Add
g3 <- graph.edgelist(sur3, directed = TRUE) + vertices(day$iso3$Sender_Final_ID) #Graph edgelist + Add
g4 <- graph.edgelist(sur4, directed = TRUE) + vertices(day$iso4$Sender_Final_ID) #Graph edgelist + Add
g5 <- graph.edgelist(sur5, directed = TRUE) + vertices(day$iso5$Sender_Final_ID) #Graph edgelist + Add

```

#Capture Roles, Nights & Colors

```

temp_att <- temp_att %>%
  mutate(
    role1 = ifelse(!is.na(role2)) & (night2 == night), role2, role1),
    night1 = ifelse(!is.na(night2)) & (night2 == night), night2, night1),
    role_col = ifelse(!is.na(role_col2)) & (night2 == night), role_col2, role_col)
  )

```

#Add staff Role Attribute

```

V(g1)$role <- temp_att$role1[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$role <- temp_att$role1[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$role <- temp_att$role1[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$role <- temp_att$role1[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$role <- temp_att$role1[match(V(g5)$name, temp_att$Final_ID)]

```

#Add role colors

```

V(g1)$color <- temp_att$role_col[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$color <- temp_att$role_col[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$color <- temp_att$role_col[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$color <- temp_att$role_col[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$color <- temp_att$role_col[match(V(g5)$name, temp_att$Final_ID)]

```

#Set graphs to list

```

graphs <- list(g1 = g1, g2 = g2, g3 = g3, g4 = g4, g5 = g5)

```

```
rm(g1); rm(g2); rm(g3); rm(g4); rm(g5)
rm(sur1); rm(sur2); rm(sur3); rm(sur4); rm(sur5)
rm(temp_att)
```

Create List

```
tuesday <- list(edgelists = day, graphs = graphs)
rm(day); rm(graphs)
```

Wednesday

```
temp_night <- temp %>% filter(night == "wednesday")
temp_att <- staff_youth_att %>% mutate(night = "wednesday")

#Surv_1
surv_1 <- temp_night %>%
  filter(survnum == 1) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates1 <- surv_1 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_1 <- surv_1 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_2
surv_2 <- temp_night %>%
  filter(survnum == 2) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates2 <- surv_2 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_2 <- surv_2 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_3
surv_3 <- temp_night %>%
  filter(survnum == 3) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates3 <- surv_3 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_3 <- surv_3 %>%
```

```

    select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 4
surv_4 <- temp_night %>%
  filter(survnum == 4) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates4 <- surv_4 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_4 <- surv_4 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 5
surv_5 <- temp_night %>%
  filter(survnum == 5) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates5 <- surv_5 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_5 <- surv_5 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

day <- list(sur1 = surv_1,
            sur2 = surv_2,
            sur3 = surv_3,
            sur4 = surv_4,
            sur5 = surv_5,
            iso1 = isolates1,
            iso2 = isolates2,
            iso3 = isolates3,
            iso4 = isolates4,
            iso5 = isolates5)

rm(surv_1);rm(surv_2);rm(surv_3);rm(surv_4);rm(surv_5)
rm(isolates1);rm(isolates2);rm(isolates3);rm(isolates4);rm(isolates5)
rm(temp_night)

```

General Graphs

#Convert to Matrices

```

sur1 <- as.matrix(day$sur1)
sur2 <- as.matrix(day$sur2)
sur3 <- as.matrix(day$sur3)
sur4 <- as.matrix(day$sur4)
sur5 <- as.matrix(day$sur5)

```

```
# Convert matrix to an igraph object
```

```
g1 <- graph.edgelist(sur1, directed = TRUE) + vertices(day$iso1$Sender_Final_ID) #Graph edgelist + Add  
g2 <- graph.edgelist(sur2, directed = TRUE) + vertices(day$iso2$Sender_Final_ID) #Graph edgelist + Add  
g3 <- graph.edgelist(sur3, directed = TRUE) + vertices(day$iso3$Sender_Final_ID) #Graph edgelist + Add  
g4 <- graph.edgelist(sur4, directed = TRUE) + vertices(day$iso4$Sender_Final_ID) #Graph edgelist + Add  
g5 <- graph.edgelist(sur5, directed = TRUE) + vertices(day$iso5$Sender_Final_ID) #Graph edgelist + Add
```

```
#Capture Roles, Nights & Colors
```

```
temp_att <- temp_att %>%  
  mutate(  
    role1 = ifelse(!(is.na(role2))) & (night2 == night), role2, role1),  
    night1 = ifelse(!(is.na(night2))) & (night2 == night), night2, night1),  
    role_col = ifelse(!(is.na(role_col2))) & (night2 == night), role_col2, role_col)  
  )
```

```
#Add staff Role Attribute
```

```
V(g1)$role <- temp_att$role1[match(V(g1)$name, temp_att$Final_ID)]  
V(g2)$role <- temp_att$role1[match(V(g2)$name, temp_att$Final_ID)]  
V(g3)$role <- temp_att$role1[match(V(g3)$name, temp_att$Final_ID)]  
V(g4)$role <- temp_att$role1[match(V(g4)$name, temp_att$Final_ID)]  
V(g5)$role <- temp_att$role1[match(V(g5)$name, temp_att$Final_ID)]
```

```
#Add role colors
```

```
V(g1)$color <- temp_att$role_col[match(V(g1)$name, temp_att$Final_ID)]  
V(g2)$color <- temp_att$role_col[match(V(g2)$name, temp_att$Final_ID)]  
V(g3)$color <- temp_att$role_col[match(V(g3)$name, temp_att$Final_ID)]  
V(g4)$color <- temp_att$role_col[match(V(g4)$name, temp_att$Final_ID)]  
V(g5)$color <- temp_att$role_col[match(V(g5)$name, temp_att$Final_ID)]
```

```
#Set graphs to list
```

```
graphs <- list(g1 = g1, g2 = g2, g3 = g3, g4 = g4, g5 = g5)
```

```
rm(g1); rm(g2); rm(g3); rm(g4); rm(g5)  
rm(sur1); rm(sur2); rm(sur3); rm(sur4); rm(sur5)  
rm(temp_att)
```

Create List

```
wednesday <- list(edgelist = day, graphs = graphs)  
rm(day); rm(graphs)
```

Thursday

```
temp_night <- temp %>% filter(night == "thursday")  
temp_att <- staff_youth_att %>% mutate(night = "thursday")
```

```
#Surv_1
```

```

surv_1 <- temp_night %>%
  filter(survnum == 1) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates1 <- surv_1 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_1 <- surv_1 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 2
surv_2 <- temp_night %>%
  filter(survnum == 2) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates2 <- surv_2 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_2 <- surv_2 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 3
surv_3 <- temp_night %>%
  filter(survnum == 3) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates3 <- surv_3 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_3 <- surv_3 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 4
surv_4 <- temp_night %>%
  filter(survnum == 4) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates4 <- surv_4 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_4 <- surv_4 %>%

```

```

    select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 5
surv_5 <- temp_night %>%
  filter(survnum == 5) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates5 <- surv_5 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_5 <- surv_5 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

day <- list(sur1 = surv_1,
            sur2 = surv_2,
            sur3 = surv_3,
            sur4 = surv_4,
            sur5 = surv_5,
            iso1 = isolates1,
            iso2 = isolates2,
            iso3 = isolates3,
            iso4 = isolates4,
            iso5 = isolates5)

rm(surv_1);rm(surv_2);rm(surv_3);rm(surv_4);rm(surv_5)
rm(isolates1);rm(isolates2);rm(isolates3);rm(isolates4);rm(isolates5)
rm(temp_night)

```

General Graphs

#Convert to Matrices

```

sur1 <- as.matrix(day$sur1)
sur2 <- as.matrix(day$sur2)
sur3 <- as.matrix(day$sur3)
sur4 <- as.matrix(day$sur4)
sur5 <- as.matrix(day$sur5)

```

Convert matrix to an igraph object

```

g1 <- graph.edgelist(sur1, directed = TRUE) + vertices(day$iso1$Sender_Final_ID) #Graph edgelist + Add
g2 <- graph.edgelist(sur2, directed = TRUE) + vertices(day$iso2$Sender_Final_ID) #Graph edgelist + Add
g3 <- graph.edgelist(sur3, directed = TRUE) + vertices(day$iso3$Sender_Final_ID) #Graph edgelist + Add
g4 <- graph.edgelist(sur4, directed = TRUE) + vertices(day$iso4$Sender_Final_ID) #Graph edgelist + Add
g5 <- graph.edgelist(sur5, directed = TRUE) + vertices(day$iso5$Sender_Final_ID) #Graph edgelist + Add

```

#Capture Roles, Nights & Colors

```

temp_att <- temp_att %>%

```

```

mutate(
  role1      = ifelse(!(is.na(role2)))      & (night2 == night), role2,      role1),
  night1     = ifelse(!(is.na(night2)))    & (night2 == night), night2,     night1),
  role_col   = ifelse(!(is.na(role_col2)))  & (night2 == night), role_col2,  role_col)
)

#Add staff Role Attribute

V(g1)$role <- temp_att$role1[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$role <- temp_att$role1[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$role <- temp_att$role1[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$role <- temp_att$role1[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$role <- temp_att$role1[match(V(g5)$name, temp_att$Final_ID)]

#Add role colors

V(g1)$color <- temp_att$role_col[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$color <- temp_att$role_col[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$color <- temp_att$role_col[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$color <- temp_att$role_col[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$color <- temp_att$role_col[match(V(g5)$name, temp_att$Final_ID)]

#Set graphs to list
graphs <- list(g1 = g1, g2 = g2, g3 = g3, g4 = g4, g5 = g5)

rm(g1); rm(g2); rm(g3); rm(g4); rm(g5)
rm(sur1); rm(sur2); rm(sur3); rm(sur4); rm(sur5)
rm(temp_att)

```

Create List

```

thursday <- list(edgelists = day, graphs = graphs)
rm(day); rm(graphs)

```

Plot Graphs

```

#Set chart image
par(mfrow=c(4,5))

#Monday Graphs

my_sn_g(monday$graphs$g1, title = "Monday - Week 1") ; my_leg(att = role, colors = color) #Soc
my_sn_g(monday$graphs$g2, title = "Monday - Week 3") ; my_leg(att = role, colors = color) #Soc
my_sn_g(monday$graphs$g3, title = "Monday - Week 6") ; my_leg(att = role, colors = color) #Soc
my_sn_g(monday$graphs$g4, title = "Monday - Week 9") ; my_leg(att = role, colors = color) #Soc
my_sn_g(monday$graphs$g5, title = "Monday - Week 11") ; my_leg(att = role, colors = color) #Soc

#Tuesday Graphs

my_sn_g(tuesday$graphs$g1, title = "Tuesday - Week 1") ; my_leg(att = role, colors = color) #Soc
my_sn_g(tuesday$graphs$g2, title = "Tuesday - Week 3") ; my_leg(att = role, colors = color) #Soc
my_sn_g(tuesday$graphs$g3, title = "Tuesday - Week 6") ; my_leg(att = role, colors = color) #Soc

```



```

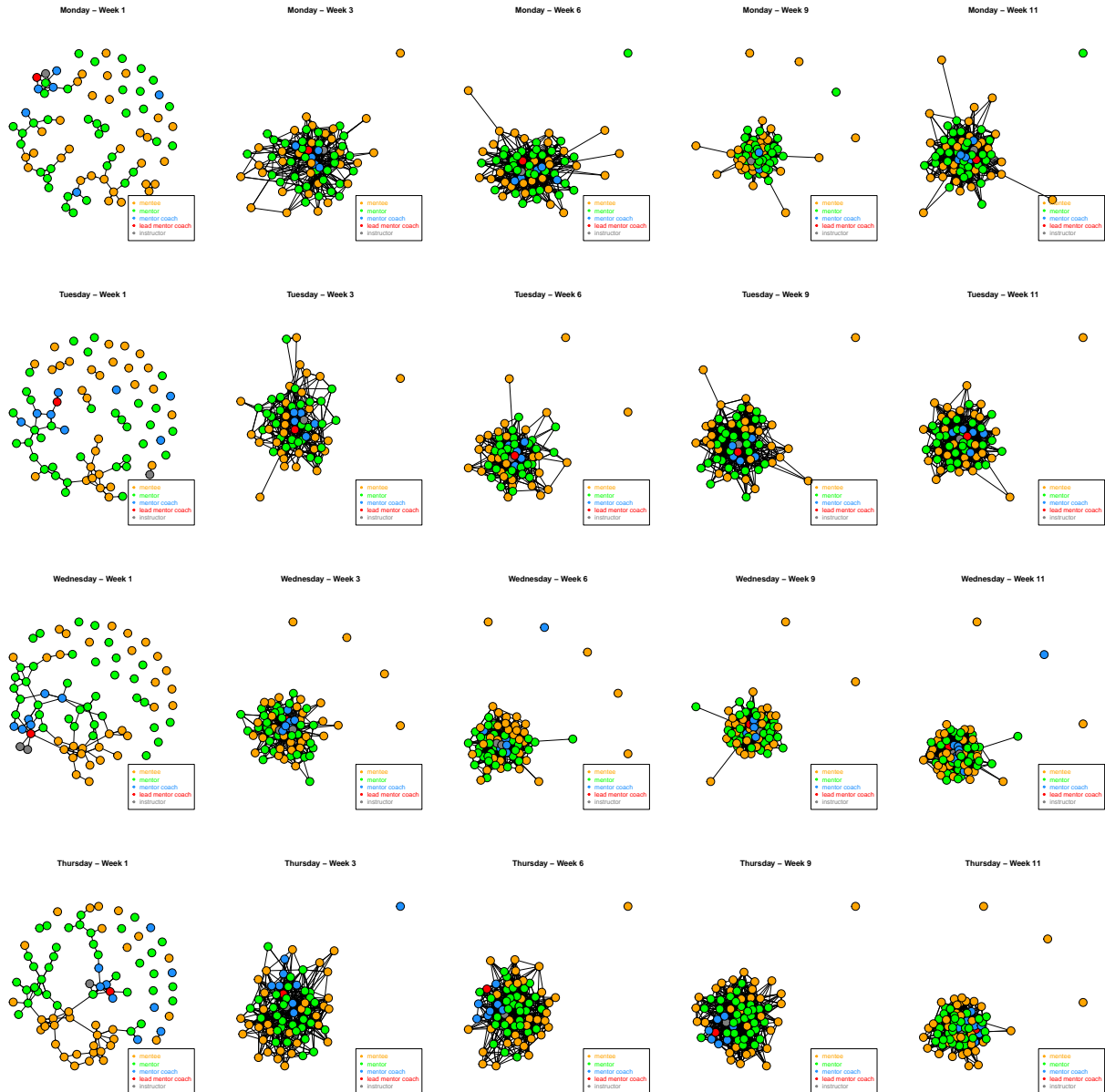
my_sn_g(tuesday$graphs$g4, title = "Tuesday - Week 9") ; my_leg(att = role, colors = color) #So
my_sn_g(tuesday$graphs$g5, title = "Tuesday - Week 11") ; my_leg(att = role, colors = color) #So

#Wednesday Graphs

my_sn_g(wednesday$graphs$g1, title = "Wednesday - Week 1") ; my_leg(att = role, colors = color) #So
my_sn_g(wednesday$graphs$g2, title = "Wednesday - Week 3") ; my_leg(att = role, colors = color) #So
my_sn_g(wednesday$graphs$g3, title = "Wednesday - Week 6") ; my_leg(att = role, colors = color) #So
my_sn_g(wednesday$graphs$g4, title = "Wednesday - Week 9") ; my_leg(att = role, colors = color) #So
my_sn_g(wednesday$graphs$g5, title = "Wednesday - Week 11") ; my_leg(att = role, colors = color) #So

my_sn_g(thursday$graphs$g1, title = "Thursday - Week 1") ; my_leg(att = role, colors = color) #So
my_sn_g(thursday$graphs$g2, title = "Thursday - Week 3") ; my_leg(att = role, colors = color) #So
my_sn_g(thursday$graphs$g3, title = "Thursday - Week 6") ; my_leg(att = role, colors = color) #So
my_sn_g(thursday$graphs$g4, title = "Thursday - Week 9") ; my_leg(att = role, colors = color) #So
my_sn_g(thursday$graphs$g5, title = "Thursday - Week 11") ; my_leg(att = role, colors = color) #So

```



```
#Plot With purrr::walk()
#walk(.x = monday$graphs, .f = my_sn_g, title = "Monday");my_leg(role, color)
#walk(.x = tuesday$graphs, .f = my_sn_g, title = "Tuesday");my_leg(role, color)
#walk(.x = wednesday$graphs, .f = my_sn_g, title = "Wednesday");my_leg(role, color)
#walk(.x = thursday$graphs, .f = my_sn_g, title = "Thursday");my_leg(role, color)
```

Create Semester List

```
F15 <- list(monday = monday, tuesday = tuesday, wednesday = wednesday, thursday = thursday)
rm(monday);rm(tuesday);rm(wednesday);rm(thursday)
rm(temp)
```

S16

```
temp <- elmk %>% filter(semester == "S16")

mon <- temp %>% filter(night == "monday")
tue <- temp %>% filter(night == "tuesday")
wed <- temp %>% filter(night == "wednesday")
thu <- temp %>% filter(night == "thursday")

sem <- list(mon = mon,
            tue = tue,
            wed = wed,
            thu = thu)

rm(mon);rm(tue);rm(wed);rm(thu)
```

Summary

```
sem$mon <- group_by(sem$mon, survnum)
sem$tue <- group_by(sem$tue, survnum)
sem$wed <- group_by(sem$wed, survnum)
sem$thu <- group_by(sem$thu, survnum)

summarize(sem$mon, day = "mon", n = length(unique(Sender_Final_ID)), tie_count = sum(sn1, na.rm = TRUE))

## # A tibble: 5 x 5
##   survnum day      n tie_count tie_prop
##   <int> <chr> <int>   <int>   <dbl>
## 1      1 mon     75      86    0.342
## 2      2 mon     71     454    1.80
## 3      3 mon     66     652    2.59
## 4      4 mon     66     799    3.18
## 5      5 mon     64     789    3.14

summarize(sem$tue, day = "tue", n = length(unique(Sender_Final_ID)), tie_count = sum(sn1, na.rm = TRUE))

## # A tibble: 5 x 5
##   survnum day      n tie_count tie_prop
##   <int> <chr> <int>   <int>   <dbl>
## 1      1 tue     69      87    0.364
## 2      2 tue     68     419    1.75
## 3      3 tue     64     679    2.84
## 4      4 tue     65     927    3.88
## 5      5 tue     63    1062    4.45

summarize(sem$wed, day = "wed", n = length(unique(Sender_Final_ID)), tie_count = sum(sn1, na.rm = TRUE))

## # A tibble: 5 x 5
##   survnum day      n tie_count tie_prop
##   <int> <chr> <int>   <int>   <dbl>
## 1      1 wed     75     110    0.432
## 2      2 wed     73     404    1.59
## 3      3 wed     66     674    2.65
## 4      4 wed     67     854    3.35
## 5      5 wed     67     917    3.60
```

```
summarize(sem$thu, day = "thu", n = length(unique(Sender_Final_ID)), tie_count = sum(sn1, na.rm = TRUE))
```

```
## # A tibble: 5 x 5
##   survnum day      n tie_count tie_prop
##   <int> <chr> <int>   <int>   <dbl>
## 1      1 1 thu    72     136   0.546
## 2      2 2 thu    71     545   2.19
## 3      3 3 thu    70     827   3.32
## 4      4 4 thu    69     924   3.71
## 5      5 5 thu    69    1035   4.15
```

```
sem$mon <- ungroup(sem$mon)
sem$tue <- ungroup(sem$tue)
sem$wed <- ungroup(sem$wed)
sem$thu <- ungroup(sem$thu)
```

Monday

```
temp_night <- temp %>% filter(night == "monday")
temp_att <- staff_youth_att %>% mutate(night = "monday")

#Surv_1
surv_1 <- temp_night %>%
  filter(survnum == 1) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%

#Getting isolates
isolates1 <- surv_1 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_1 <- surv_1 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_2
surv_2 <- temp_night %>%
  filter(survnum == 2) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%

#Getting isolates
isolates2 <- surv_2 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_2 <- surv_2 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_3
surv_3 <- temp_night %>%
  filter(survnum == 3) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%

#Getting isolates
isolates3 <- surv_3 %>%
```

```

mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
group_by(Sender_Final_ID) %>%
summarize(isolate = sum(sn1)) %>%
filter(isolate < 1) %>%
select(Sender_Final_ID)
surv_3 <- surv_3 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 4
surv_4 <- temp_night %>%
  filter(survnum == 4) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates4 <- surv_4 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_4 <- surv_4 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 5
surv_5 <- temp_night %>%
  filter(survnum == 5) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates5 <- surv_5 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_5 <- surv_5 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

day <- list(sur1 = surv_1,
            sur2 = surv_2,
            sur3 = surv_3,
            sur4 = surv_4,
            sur5 = surv_5,
            iso1 = isolates1,
            iso2 = isolates2,
            iso3 = isolates3,
            iso4 = isolates4,
            iso5 = isolates5)

rm(surv_1);rm(surv_2);rm(surv_3);rm(surv_4);rm(surv_5)
rm(isolates1);rm(isolates2);rm(isolates3);rm(isolates4);rm(isolates5)
rm(temp_night)

```

General Graphs

```
#Convert to Matrices
```

```
sur1 <- as.matrix(day$sur1)
sur2 <- as.matrix(day$sur2)
sur3 <- as.matrix(day$sur3)
sur4 <- as.matrix(day$sur4)
sur5 <- as.matrix(day$sur5)
```

```
# Convert matrix to an igraph object
```

```
g1 <- graph.edgelist(sur1, directed = TRUE) + vertices(day$iso1$Sender_Final_ID) #Graph edgelist + Add
g2 <- graph.edgelist(sur2, directed = TRUE) + vertices(day$iso2$Sender_Final_ID) #Graph edgelist + Add
g3 <- graph.edgelist(sur3, directed = TRUE) + vertices(day$iso3$Sender_Final_ID) #Graph edgelist + Add
g4 <- graph.edgelist(sur4, directed = TRUE) + vertices(day$iso4$Sender_Final_ID) #Graph edgelist + Add
g5 <- graph.edgelist(sur5, directed = TRUE) + vertices(day$iso5$Sender_Final_ID) #Graph edgelist + Add
```

```
#Capture Roles, Nights & Colors
```

```
temp_att <- temp_att %>%
  mutate(
    role1 = ifelse(!(is.na(role2))) & (night2 == night), role2, role1),
    night1 = ifelse(!(is.na(night2))) & (night2 == night), night2, night1),
    role_col = ifelse(!(is.na(role_col2))) & (night2 == night), role_col2, role_col)
  )
```

```
#Add staff Role Attribute
```

```
V(g1)$role <- temp_att$role1[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$role <- temp_att$role1[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$role <- temp_att$role1[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$role <- temp_att$role1[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$role <- temp_att$role1[match(V(g5)$name, temp_att$Final_ID)]
```

```
#Add role colors
```

```
V(g1)$color <- temp_att$role_col[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$color <- temp_att$role_col[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$color <- temp_att$role_col[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$color <- temp_att$role_col[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$color <- temp_att$role_col[match(V(g5)$name, temp_att$Final_ID)]
```

```
#Set graphs to list
```

```
graphs <- list(g1 = g1, g2 = g2, g3 = g3, g4 = g4, g5 = g5)
```

```
rm(g1); rm(g2); rm(g3); rm(g4); rm(g5)
rm(sur1); rm(sur2); rm(sur3); rm(sur4); rm(sur5)
rm(temp_att)
```

Create List

```
monday <- list(edgelists = day, graphs = graphs)
rm(day);rm(graphs)
```

Tuesday

```
temp_night <- temp %>% filter(night == "tuesday")
temp_att <- staff_youth_att %>% mutate(night = "tuesday")

#Surv_1
surv_1 <- temp_night %>%
  filter(survnum == 1) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates1 <- surv_1 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_1 <- surv_1 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_2
surv_2 <- temp_night %>%
  filter(survnum == 2) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates2 <- surv_2 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_2 <- surv_2 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_3
surv_3 <- temp_night %>%
  filter(survnum == 3) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates3 <- surv_3 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_3 <- surv_3 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_4
surv_4 <- temp_night %>%
  filter(survnum == 4) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
```

```

#Getting isolates
isolates4 <- surv_4 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_4 <- surv_4 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 5
surv_5 <- temp_night %>%
  filter(survnum == 5) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates5 <- surv_5 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_5 <- surv_5 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

day <- list(sur1 = surv_1,
            sur2 = surv_2,
            sur3 = surv_3,
            sur4 = surv_4,
            sur5 = surv_5,
            iso1 = isolates1,
            iso2 = isolates2,
            iso3 = isolates3,
            iso4 = isolates4,
            iso5 = isolates5)

rm(surv_1);rm(surv_2);rm(surv_3);rm(surv_4);rm(surv_5)
rm(isolates1);rm(isolates2);rm(isolates3);rm(isolates4);rm(isolates5)
rm(temp_night)

```

General Graphs

#Convert to Matrices

```

sur1 <- as.matrix(day$sur1)
sur2 <- as.matrix(day$sur2)
sur3 <- as.matrix(day$sur3)
sur4 <- as.matrix(day$sur4)
sur5 <- as.matrix(day$sur5)

```

Convert matrix to an igraph object

```

g1 <- graph.edgelist(sur1, directed = TRUE) + vertices(day$iso1$Sender_Final_ID) #Graph edgelist + Add
g2 <- graph.edgelist(sur2, directed = TRUE) + vertices(day$iso2$Sender_Final_ID) #Graph edgelist + Add

```



```

g3 <- graph.edgelist(sur3, directed = TRUE) + vertices(day$iso3$Sender_Final_ID) #Graph edgelist + Add
g4 <- graph.edgelist(sur4, directed = TRUE) + vertices(day$iso4$Sender_Final_ID) #Graph edgelist + Add
g5 <- graph.edgelist(sur5, directed = TRUE) + vertices(day$iso5$Sender_Final_ID) #Graph edgelist + Add

#Capture Roles, Nights & Colors

temp_att <- temp_att %>%
  mutate(
    role1 = ifelse(!(is.na(role2))) & (night2 == night), role2, role1),
    night1 = ifelse(!(is.na(night2))) & (night2 == night), night2, night1),
    role_col = ifelse(!(is.na(role_col2))) & (night2 == night), role_col2, role_col)
  )

#Add staff Role Attribute

V(g1)$role <- temp_att$role1[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$role <- temp_att$role1[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$role <- temp_att$role1[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$role <- temp_att$role1[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$role <- temp_att$role1[match(V(g5)$name, temp_att$Final_ID)]

#Add role colors

V(g1)$color <- temp_att$role_col[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$color <- temp_att$role_col[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$color <- temp_att$role_col[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$color <- temp_att$role_col[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$color <- temp_att$role_col[match(V(g5)$name, temp_att$Final_ID)]

#Set graphs to list
graphs <- list(g1 = g1, g2 = g2, g3 = g3, g4 = g4, g5 = g5)

rm(g1); rm(g2); rm(g3); rm(g4); rm(g5)
rm(sur1); rm(sur2); rm(sur3); rm(sur4); rm(sur5)
rm(temp_att)

```

Create List

```

tuesday <- list(edgelist = day, graphs = graphs)
rm(day); rm(graphs)

```

Wednesday

```

temp_night <- temp %>% filter(night == "wednesday")
temp_att <- staff_youth_att %>% mutate(night = "wednesday")

#Surv_1
surv_1 <- temp_night %>%
  filter(survnum == 1) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates1 <- surv_1 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%

```

```

group_by(Sender_Final_ID) %>%
summarize(isolate = sum(sn1)) %>%
filter(isolate < 1) %>%
select(Sender_Final_ID)
surv_1 <- surv_1 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 2
surv_2 <- temp_night %>%
  filter(survnum == 2) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates2 <- surv_2 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_2 <- surv_2 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 3
surv_3 <- temp_night %>%
  filter(survnum == 3) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates3 <- surv_3 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_3 <- surv_3 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 4
surv_4 <- temp_night %>%
  filter(survnum == 4) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates4 <- surv_4 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_4 <- surv_4 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 5
surv_5 <- temp_night %>%
  filter(survnum == 5) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%

```

```

#Getting isolates
isolates5 <- surv_5 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_5 <- surv_5 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

day <- list(surv1 = surv_1,
            surv2 = surv_2,
            surv3 = surv_3,
            surv4 = surv_4,
            surv5 = surv_5,
            iso1 = isolates1,
            iso2 = isolates2,
            iso3 = isolates3,
            iso4 = isolates4,
            iso5 = isolates5)

rm(surv_1);rm(surv_2);rm(surv_3);rm(surv_4);rm(surv_5)
rm(isolates1);rm(isolates2);rm(isolates3);rm(isolates4);rm(isolates5)
rm(temp_night)

```

General Graphs

#Convert to Matrices

```

sur1 <- as.matrix(day$sur1)
sur2 <- as.matrix(day$sur2)
sur3 <- as.matrix(day$sur3)
sur4 <- as.matrix(day$sur4)
sur5 <- as.matrix(day$sur5)

```

Convert matrix to an igraph object

```

g1 <- graph.edgelist(sur1, directed = TRUE) + vertices(day$iso1$Sender_Final_ID) #Graph edgelist + Add
g2 <- graph.edgelist(sur2, directed = TRUE) + vertices(day$iso2$Sender_Final_ID) #Graph edgelist + Add
g3 <- graph.edgelist(sur3, directed = TRUE) + vertices(day$iso3$Sender_Final_ID) #Graph edgelist + Add
g4 <- graph.edgelist(sur4, directed = TRUE) + vertices(day$iso4$Sender_Final_ID) #Graph edgelist + Add
g5 <- graph.edgelist(sur5, directed = TRUE) + vertices(day$iso5$Sender_Final_ID) #Graph edgelist + Add

```

#Capture Roles, Nights & Colors

```

temp_att <- temp_att %>%
  mutate(
    role1 = ifelse(!(is.na(role2))) & (night2 == night), role2, role1),
    night1 = ifelse(!(is.na(night2))) & (night2 == night), night2, night1),
    role_col = ifelse(!(is.na(role_col2))) & (night2 == night), role_col2, role_col)

```

```
#Add staff Role Attribute
```

```
V(g1)$role <- temp_att$role1[match(V(g1)$name, temp_att$Final_ID)]  
V(g2)$role <- temp_att$role1[match(V(g2)$name, temp_att$Final_ID)]  
V(g3)$role <- temp_att$role1[match(V(g3)$name, temp_att$Final_ID)]  
V(g4)$role <- temp_att$role1[match(V(g4)$name, temp_att$Final_ID)]  
V(g5)$role <- temp_att$role1[match(V(g5)$name, temp_att$Final_ID)]
```

```
#Add role colors
```

```
V(g1)$color <- temp_att$role_col[match(V(g1)$name, temp_att$Final_ID)]  
V(g2)$color <- temp_att$role_col[match(V(g2)$name, temp_att$Final_ID)]  
V(g3)$color <- temp_att$role_col[match(V(g3)$name, temp_att$Final_ID)]  
V(g4)$color <- temp_att$role_col[match(V(g4)$name, temp_att$Final_ID)]  
V(g5)$color <- temp_att$role_col[match(V(g5)$name, temp_att$Final_ID)]
```

```
#Set graphs to list
```

```
graphs <- list(g1 = g1, g2 = g2, g3 = g3, g4 = g4, g5 = g5)
```

```
rm(g1); rm(g2); rm(g3); rm(g4); rm(g5)  
rm(sur1); rm(sur2); rm(sur3); rm(sur4); rm(sur5)  
rm(temp_att)
```

Create List

```
wednesday <- list(edgelists = day, graphs = graphs)  
rm(day); rm(graphs)
```

Thursday

```
temp_night <- temp %>% filter(night == "thursday")  
temp_att <- staff_youth_att %>% mutate(night = "thursday")  
  
#Surv_1  
surv_1 <- temp_night %>%  
  filter(survnum == 1) %>%  
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%  
#Getting isolates  
isolates1 <- surv_1 %>%  
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%  
  group_by(Sender_Final_ID) %>%  
  summarize(isolate = sum(sn1)) %>%  
  filter(isolate < 1) %>%  
  select(Sender_Final_ID)  
surv_1 <- surv_1 %>%  
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))  
  
#Surv_2  
surv_2 <- temp_night %>%  
  filter(survnum == 2) %>%  
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%  
#Getting isolates  
isolates2 <- surv_2 %>%  
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
```

```

group_by(Sender_Final_ID) %>%
summarize(isolate = sum(sn1)) %>%
filter(isolate < 1) %>%
select(Sender_Final_ID)
surv_2 <- surv_2 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 3
surv_3 <- temp_night %>%
  filter(survnum == 3) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates3 <- surv_3 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_3 <- surv_3 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 4
surv_4 <- temp_night %>%
  filter(survnum == 4) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates4 <- surv_4 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_4 <- surv_4 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 5
surv_5 <- temp_night %>%
  filter(survnum == 5) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates5 <- surv_5 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_5 <- surv_5 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

day <- list(surv1 = surv_1,
            surv2 = surv_2,
            surv3 = surv_3,
            surv4 = surv_4,

```

```

sur5 = surv_5,
iso1 = isolates1,
iso2 = isolates2,
iso3 = isolates3,
iso4 = isolates4,
iso5 = isolates5)

rm(surv_1);rm(surv_2);rm(surv_3);rm(surv_4);rm(surv_5)
rm(isolates1);rm(isolates2);rm(isolates3);rm(isolates4);rm(isolates5)
rm(temp_night)

```

General Graphs

#Convert to Matrices

```

sur1 <- as.matrix(day$sur1)
sur2 <- as.matrix(day$sur2)
sur3 <- as.matrix(day$sur3)
sur4 <- as.matrix(day$sur4)
sur5 <- as.matrix(day$sur5)

```

Convert matrix to an igraph object

```

g1 <- graph.edgelist(sur1, directed = TRUE) + vertices(day$iso1$Sender_Final_ID) #Graph edgelist + Add
g2 <- graph.edgelist(sur2, directed = TRUE) + vertices(day$iso2$Sender_Final_ID) #Graph edgelist + Add
g3 <- graph.edgelist(sur3, directed = TRUE) + vertices(day$iso3$Sender_Final_ID) #Graph edgelist + Add
g4 <- graph.edgelist(sur4, directed = TRUE) + vertices(day$iso4$Sender_Final_ID) #Graph edgelist + Add
g5 <- graph.edgelist(sur5, directed = TRUE) + vertices(day$iso5$Sender_Final_ID) #Graph edgelist + Add

```

#Capture Roles, Nights & Colors

```

temp_att <- temp_att %>%
  mutate(
    role1 = ifelse(!(is.na(role2))) & (night2 == night), role2, role1),
    night1 = ifelse(!(is.na(night2))) & (night2 == night), night2, night1),
    role_col = ifelse(!(is.na(role_col2))) & (night2 == night), role_col2, role_col)
  )

```

#Add staff Role Attribute

```

V(g1)$role <- temp_att$role1[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$role <- temp_att$role1[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$role <- temp_att$role1[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$role <- temp_att$role1[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$role <- temp_att$role1[match(V(g5)$name, temp_att$Final_ID)]

```

#Add role colors

```

V(g1)$color <- temp_att$role_col[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$color <- temp_att$role_col[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$color <- temp_att$role_col[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$color <- temp_att$role_col[match(V(g4)$name, temp_att$Final_ID)]

```

```
V(g5)$color <- temp_att$role_col[match(V(g5)$name, temp_att$Final_ID)]
```

```
#Set graphs to list
```

```
graphs <- list(g1 = g1, g2 = g2, g3 = g3, g4 = g4, g5 = g5)
```

```
rm(g1); rm(g2); rm(g3); rm(g4); rm(g5)
rm(sur1); rm(sur2); rm(sur3); rm(sur4); rm(sur5)
rm(temp_att)
```

Create List

```
thursday <- list(edgelist = day, graphs = graphs)
rm(day); rm(graphs)
```

Plot Graphs

```
#Set chart image
```

```
par(mfrow=c(4,5))
```

```
#Monday Graphs
```

```
my_sn_g(monday$graphs$g1, title = "Monday - Week 1") ; my_leg(att = role, colors = color) #So
my_sn_g(monday$graphs$g2, title = "Monday - Week 3") ; my_leg(att = role, colors = color) #So
my_sn_g(monday$graphs$g3, title = "Monday - Week 6") ; my_leg(att = role, colors = color) #So
my_sn_g(monday$graphs$g4, title = "Monday - Week 9") ; my_leg(att = role, colors = color) #So
my_sn_g(monday$graphs$g5, title = "Monday - Week 11") ; my_leg(att = role, colors = color) #So
```

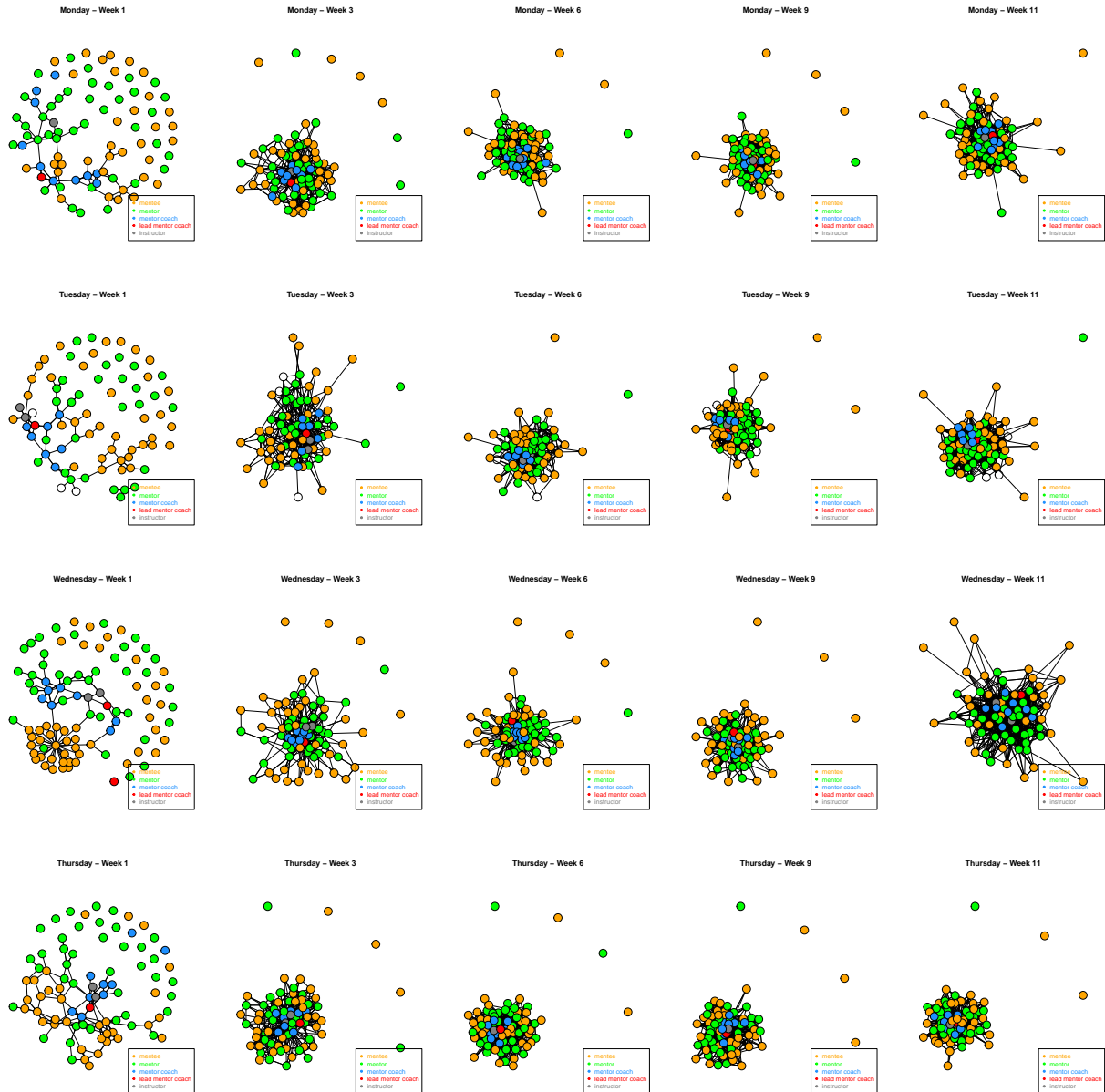
```
#Tuesday Graphs
```

```
my_sn_g(tuesday$graphs$g1, title = "Tuesday - Week 1") ; my_leg(att = role, colors = color) #So
my_sn_g(tuesday$graphs$g2, title = "Tuesday - Week 3") ; my_leg(att = role, colors = color) #So
my_sn_g(tuesday$graphs$g3, title = "Tuesday - Week 6") ; my_leg(att = role, colors = color) #So
my_sn_g(tuesday$graphs$g4, title = "Tuesday - Week 9") ; my_leg(att = role, colors = color) #So
my_sn_g(tuesday$graphs$g5, title = "Tuesday - Week 11") ; my_leg(att = role, colors = color) #So
```

```
#Wednesday Graphs
```

```
my_sn_g(wednesday$graphs$g1, title = "Wednesday - Week 1") ; my_leg(att = role, colors = color) #So
my_sn_g(wednesday$graphs$g2, title = "Wednesday - Week 3") ; my_leg(att = role, colors = color) #So
my_sn_g(wednesday$graphs$g3, title = "Wednesday - Week 6") ; my_leg(att = role, colors = color) #So
my_sn_g(wednesday$graphs$g4, title = "Wednesday - Week 9") ; my_leg(att = role, colors = color) #So
my_sn_g(wednesday$graphs$g5, title = "Wednesday - Week 11") ; my_leg(att = role, colors = color) #So
```

```
my_sn_g(thursday$graphs$g1, title = "Thursday - Week 1") ; my_leg(att = role, colors = color) #So
my_sn_g(thursday$graphs$g2, title = "Thursday - Week 3") ; my_leg(att = role, colors = color) #So
my_sn_g(thursday$graphs$g3, title = "Thursday - Week 6") ; my_leg(att = role, colors = color) #So
my_sn_g(thursday$graphs$g4, title = "Thursday - Week 9") ; my_leg(att = role, colors = color) #So
my_sn_g(thursday$graphs$g5, title = "Thursday - Week 11") ; my_leg(att = role, colors = color) #So
```



```
#Plot With purrr::walk()
#walk(.x = monday$graphs, .f = my_sn_g, title = "Monday");my_leg(role, color)
#walk(.x = tuesday$graphs, .f = my_sn_g, title = "Tuesday");my_leg(role, color)
#walk(.x = wednesday$graphs, .f = my_sn_g, title = "Wednesday");my_leg(role, color)
#walk(.x = thursday$graphs, .f = my_sn_g, title = "Thursday");my_leg(role, color)
```

Create Semester List

```
S16 <- list(monday = monday, tuesday = tuesday, wednesday = wednesday, thursday = thursday)
rm(monday);rm(tuesday);rm(wednesday);rm(thursday)
rm(temp)
```


F16

```
temp <- elmk %>% filter(semester == "F16")

mon <- temp %>% filter(night == "monday")
tue <- temp %>% filter(night == "tuesday")
wed <- temp %>% filter(night == "wednesday")
thu <- temp %>% filter(night == "thursday")

sem <- list(mon = mon,
            tue = tue,
            wed = wed,
            thu = thu)

rm(mon);rm(tue);rm(wed);rm(thu)
```

Summary

```
sem$mon <- group_by(sem$mon, survnum)
sem$tue <- group_by(sem$tue, survnum)
sem$wed <- group_by(sem$wed, survnum)
sem$thu <- group_by(sem$thu, survnum)

summarize(sem$mon, day = "mon", n = length(unique(Sender_Final_ID)), tie_count = sum(sn1, na.rm = TRUE))

## # A tibble: 5 x 5
##   survnum day      n tie_count tie_prop
##   <int> <chr> <int>   <int>   <dbl>
## 1      1 mon     63      73    0.383
## 2      2 mon     60     482    2.53
## 3      3 mon     60     705    3.70
## 4      4 mon     58     794    4.16
## 5      5 mon     58     842    4.41

summarize(sem$tue, day = "tue", n = length(unique(Sender_Final_ID)), tie_count = sum(sn1, na.rm = TRUE))

## # A tibble: 5 x 5
##   survnum day      n tie_count tie_prop
##   <int> <chr> <int>   <int>   <dbl>
## 1      1 tue     64      76    0.394
## 2      2 tue     61     319    1.65
## 3      3 tue     61     623    3.23
## 4      4 tue     60     804    4.17
## 5      5 tue     60     912    4.73

summarize(sem$wed, day = "wed", n = length(unique(Sender_Final_ID)), tie_count = sum(sn1, na.rm = TRUE))

## # A tibble: 5 x 5
##   survnum day      n tie_count tie_prop
##   <int> <chr> <int>   <int>   <dbl>
## 1      1 wed     66      93    0.466
## 2      2 wed     64     382    1.91
## 3      3 wed     62     632    3.17
## 4      4 wed     62     808    4.05
## 5      5 wed     60     716    3.59
```

```
summarize(sem$thu, day = "thu", n = length(unique(Sender_Final_ID)), tie_count = sum(sn1, na.rm = TRUE))
```

```
## # A tibble: 5 x 5
##   survnum day      n tie_count tie_prop
##   <int> <chr> <int>   <int>   <dbl>
## 1     1 1 thu    64     96   0.474
## 2     2 2 thu    62    535   2.64
## 3     3 3 thu    62    814   4.02
## 4     4 4 thu    61    909   4.49
## 5     5 5 thu    58    902   4.45
```

```
sem$mon <- ungroup(sem$mon)
sem$tue <- ungroup(sem$tue)
sem$wed <- ungroup(sem$wed)
sem$thu <- ungroup(sem$thu)
```

Monday

```
temp_night <- temp %>% filter(night == "monday")
temp_att <- staff_youth_att %>% mutate(night = "monday")

#Surv_1
surv_1 <- temp_night %>%
  filter(survnum == 1) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%

#Getting isolates
isolates1 <- surv_1 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_1 <- surv_1 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_2
surv_2 <- temp_night %>%
  filter(survnum == 2) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%

#Getting isolates
isolates2 <- surv_2 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_2 <- surv_2 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_3
surv_3 <- temp_night %>%
  filter(survnum == 3) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%

#Getting isolates
isolates3 <- surv_3 %>%
```

```

mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
group_by(Sender_Final_ID) %>%
summarize(isolate = sum(sn1)) %>%
filter(isolate < 1) %>%
select(Sender_Final_ID)
surv_3 <- surv_3 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 4
surv_4 <- temp_night %>%
  filter(survnum == 4) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #%>%
#Getting isolates
isolates4 <- surv_4 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_4 <- surv_4 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 5
surv_5 <- temp_night %>%
  filter(survnum == 5) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #%>%
#Getting isolates
isolates5 <- surv_5 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_5 <- surv_5 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

day <- list(sur1 = surv_1,
            sur2 = surv_2,
            sur3 = surv_3,
            sur4 = surv_4,
            sur5 = surv_5,
            iso1 = isolates1,
            iso2 = isolates2,
            iso3 = isolates3,
            iso4 = isolates4,
            iso5 = isolates5)

rm(surv_1);rm(surv_2);rm(surv_3);rm(surv_4);rm(surv_5)
rm(isolates1);rm(isolates2);rm(isolates3);rm(isolates4);rm(isolates5)
rm(temp_night)

```

General Graphs

```
#Convert to Matrices
```

```
sur1 <- as.matrix(day$sur1)
sur2 <- as.matrix(day$sur2)
sur3 <- as.matrix(day$sur3)
sur4 <- as.matrix(day$sur4)
sur5 <- as.matrix(day$sur5)
```

```
# Convert matrix to an igraph object
```

```
g1 <- graph.edgelist(sur1, directed = TRUE) + vertices(day$iso1$Sender_Final_ID) #Graph edgelist + Add
g2 <- graph.edgelist(sur2, directed = TRUE) + vertices(day$iso2$Sender_Final_ID) #Graph edgelist + Add
g3 <- graph.edgelist(sur3, directed = TRUE) + vertices(day$iso3$Sender_Final_ID) #Graph edgelist + Add
g4 <- graph.edgelist(sur4, directed = TRUE) + vertices(day$iso4$Sender_Final_ID) #Graph edgelist + Add
g5 <- graph.edgelist(sur5, directed = TRUE) + vertices(day$iso5$Sender_Final_ID) #Graph edgelist + Add
```

```
#Capture Roles, Nights & Colors
```

```
temp_att <- temp_att %>%
  mutate(
    role1 = ifelse(!(is.na(role2))) & (night2 == night), role2, role1),
    night1 = ifelse(!(is.na(night2))) & (night2 == night), night2, night1),
    role_col = ifelse(!(is.na(role_col2))) & (night2 == night), role_col2, role_col)
  )
```

```
#Add staff Role Attribute
```

```
V(g1)$role <- temp_att$role1[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$role <- temp_att$role1[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$role <- temp_att$role1[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$role <- temp_att$role1[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$role <- temp_att$role1[match(V(g5)$name, temp_att$Final_ID)]
```

```
#Add role colors
```

```
V(g1)$color <- temp_att$role_col[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$color <- temp_att$role_col[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$color <- temp_att$role_col[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$color <- temp_att$role_col[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$color <- temp_att$role_col[match(V(g5)$name, temp_att$Final_ID)]
```

```
#Set graphs to list
```

```
graphs <- list(g1 = g1, g2 = g2, g3 = g3, g4 = g4, g5 = g5)
```

```
rm(g1); rm(g2); rm(g3); rm(g4); rm(g5)
rm(sur1); rm(sur2); rm(sur3); rm(sur4); rm(sur5)
rm(temp_att)
```

Create List

```
monday <- list(edgelist = day, graphs = graphs)
rm(day);rm(graphs)
```

Tuesday

```
temp_night <- temp %>% filter(night == "tuesday")
temp_att <- staff_youth_att %>% mutate(night = "tuesday")

#Surv_1
surv_1 <- temp_night %>%
  filter(survnum == 1) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates1 <- surv_1 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_1 <- surv_1 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_2
surv_2 <- temp_night %>%
  filter(survnum == 2) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates2 <- surv_2 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_2 <- surv_2 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_3
surv_3 <- temp_night %>%
  filter(survnum == 3) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates3 <- surv_3 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_3 <- surv_3 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_4
surv_4 <- temp_night %>%
  filter(survnum == 4) %>%
```

```

    mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates4 <- surv_4 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_4 <- surv_4 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 5
surv_5 <- temp_night %>%
  filter(survnum == 5) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates5 <- surv_5 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_5 <- surv_5 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

day <- list(sur1 = surv_1,
            sur2 = surv_2,
            sur3 = surv_3,
            sur4 = surv_4,
            sur5 = surv_5,
            iso1 = isolates1,
            iso2 = isolates2,
            iso3 = isolates3,
            iso4 = isolates4,
            iso5 = isolates5)

rm(surv_1);rm(surv_2);rm(surv_3);rm(surv_4);rm(surv_5)
rm(isolates1);rm(isolates2);rm(isolates3);rm(isolates4);rm(isolates5)
rm(temp_night)

```

General Graphs

#Convert to Matrices

```

sur1 <- as.matrix(day$sur1)
sur2 <- as.matrix(day$sur2)
sur3 <- as.matrix(day$sur3)
sur4 <- as.matrix(day$sur4)
sur5 <- as.matrix(day$sur5)

```

Convert matrix to an igraph object

```

g1 <- graph.edgelist(sur1, directed = TRUE) + vertices(day$iso1$Sender_Final_ID) #Graph edgelist + Add

```

```

g2 <- graph.edgelist(sur2, directed = TRUE) + vertices(day$iso2$Sender_Final_ID) #Graph edgelist + Add
g3 <- graph.edgelist(sur3, directed = TRUE) + vertices(day$iso3$Sender_Final_ID) #Graph edgelist + Add
g4 <- graph.edgelist(sur4, directed = TRUE) + vertices(day$iso4$Sender_Final_ID) #Graph edgelist + Add
g5 <- graph.edgelist(sur5, directed = TRUE) + vertices(day$iso5$Sender_Final_ID) #Graph edgelist + Add

#Capture Roles, Nights & Colors

temp_att <- temp_att %>%
  mutate(
    role1 = ifelse(!(is.na(role2))) & (night2 == night), role2, role1),
    night1 = ifelse(!(is.na(night2))) & (night2 == night), night2, night1),
    role_col = ifelse(!(is.na(role_col2))) & (night2 == night), role_col2, role_col)
  )

#Add staff Role Attribute

V(g1)$role <- temp_att$role1[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$role <- temp_att$role1[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$role <- temp_att$role1[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$role <- temp_att$role1[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$role <- temp_att$role1[match(V(g5)$name, temp_att$Final_ID)]

#Add role colors

V(g1)$color <- temp_att$role_col[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$color <- temp_att$role_col[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$color <- temp_att$role_col[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$color <- temp_att$role_col[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$color <- temp_att$role_col[match(V(g5)$name, temp_att$Final_ID)]

#Set graphs to list
graphs <- list(g1 = g1, g2 = g2, g3 = g3, g4 = g4, g5 = g5)

rm(g1); rm(g2); rm(g3); rm(g4); rm(g5)
rm(sur1); rm(sur2); rm(sur3); rm(sur4); rm(sur5)
rm(temp_att)

```

Create List

```

tuesday <- list(edgelist = day, graphs = graphs)
rm(day); rm(graphs)

```

Wednesday

```

temp_night <- temp %>% filter(night == "wednesday")
temp_att <- staff_youth_att %>% mutate(night = "wednesday")

#Surv_1
surv_1 <- temp_night %>%
  filter(survnum == 1) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates1 <- surv_1 %>%

```

```

mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
group_by(Sender_Final_ID) %>%
summarize(isolate = sum(sn1)) %>%
filter(isolate < 1) %>%
select(Sender_Final_ID)
surv_1 <- surv_1 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 2
surv_2 <- temp_night %>%
  filter(survnum == 2) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates2 <- surv_2 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_2 <- surv_2 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 3
surv_3 <- temp_night %>%
  filter(survnum == 3) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates3 <- surv_3 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_3 <- surv_3 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 4
surv_4 <- temp_night %>%
  filter(survnum == 4) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates4 <- surv_4 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_4 <- surv_4 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 5
surv_5 <- temp_night %>%
  filter(survnum == 5) %>%

```



```

mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates5 <- surv_5 %>%
mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
group_by(Sender_Final_ID) %>%
summarize(isolate = sum(sn1)) %>%
filter(isolate < 1) %>%
select(Sender_Final_ID)
surv_5 <- surv_5 %>%
select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

day <- list(sur1 = surv_1,
            sur2 = surv_2,
            sur3 = surv_3,
            sur4 = surv_4,
            sur5 = surv_5,
            iso1 = isolates1,
            iso2 = isolates2,
            iso3 = isolates3,
            iso4 = isolates4,
            iso5 = isolates5)

rm(surv_1);rm(surv_2);rm(surv_3);rm(surv_4);rm(surv_5)
rm(isolates1);rm(isolates2);rm(isolates3);rm(isolates4);rm(isolates5)
rm(temp_night)

```

General Graphs

#Convert to Matrices

```

sur1 <- as.matrix(day$sur1)
sur2 <- as.matrix(day$sur2)
sur3 <- as.matrix(day$sur3)
sur4 <- as.matrix(day$sur4)
sur5 <- as.matrix(day$sur5)

```

Convert matrix to an igraph object

```

g1 <- graph.edgelist(sur1, directed = TRUE) + vertices(day$iso1$Sender_Final_ID) #Graph edgelist + Add
g2 <- graph.edgelist(sur2, directed = TRUE) + vertices(day$iso2$Sender_Final_ID) #Graph edgelist + Add
g3 <- graph.edgelist(sur3, directed = TRUE) + vertices(day$iso3$Sender_Final_ID) #Graph edgelist + Add
g4 <- graph.edgelist(sur4, directed = TRUE) + vertices(day$iso4$Sender_Final_ID) #Graph edgelist + Add
g5 <- graph.edgelist(sur5, directed = TRUE) + vertices(day$iso5$Sender_Final_ID) #Graph edgelist + Add

```

#Capture Roles, Nights & Colors

```

temp_att <- temp_att %>%
mutate(
  role1 = ifelse(!(is.na(role2))) & (night2 == night), role2, role1),
  night1 = ifelse(!(is.na(night2))) & (night2 == night), night2, night1),
  role_col = ifelse(!(is.na(role_col2))) & (night2 == night), role_col2, role_col)
)

```

#Add staff Role Attribute

```
V(g1)$role <- temp_att$role1[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$role <- temp_att$role1[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$role <- temp_att$role1[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$role <- temp_att$role1[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$role <- temp_att$role1[match(V(g5)$name, temp_att$Final_ID)]
```

#Add role colors

```
V(g1)$color <- temp_att$role_col[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$color <- temp_att$role_col[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$color <- temp_att$role_col[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$color <- temp_att$role_col[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$color <- temp_att$role_col[match(V(g5)$name, temp_att$Final_ID)]
```

#Set graphs to list

```
graphs <- list(g1 = g1, g2 = g2, g3 = g3, g4 = g4, g5 = g5)
```

```
rm(g1); rm(g2); rm(g3); rm(g4); rm(g5)
rm(sur1); rm(sur2); rm(sur3); rm(sur4); rm(sur5)
rm(temp_att)
```

Create List

```
wednesday <- list(edgelists = day, graphs = graphs)
rm(day); rm(graphs)
```

Thursday

```
temp_night <- temp %>% filter(night == "thursday")
temp_att <- staff_youth_att %>% mutate(night = "thursday")
```

#Surv_1

```
surv_1 <- temp_night %>%
  filter(survnum == 1) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
```

#Getting isolates

```
isolates1 <- surv_1 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_1 <- surv_1 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))
```

#Surv_2

```
surv_2 <- temp_night %>%
  filter(survnum == 2) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
```

#Getting isolates

```
isolates2 <- surv_2 %>%
```

```

mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
group_by(Sender_Final_ID) %>%
summarize(isolate = sum(sn1)) %>%
filter(isolate < 1) %>%
select(Sender_Final_ID)
surv_2 <- surv_2 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 3
surv_3 <- temp_night %>%
  filter(survnum == 3) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates3 <- surv_3 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_3 <- surv_3 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 4
surv_4 <- temp_night %>%
  filter(survnum == 4) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates4 <- surv_4 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_4 <- surv_4 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 5
surv_5 <- temp_night %>%
  filter(survnum == 5) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates5 <- surv_5 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_5 <- surv_5 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

day <- list(surv1 = surv_1,
            surv2 = surv_2,
            surv3 = surv_3,

```

```

sur4 = surv_4,
sur5 = surv_5,
iso1 = isolates1,
iso2 = isolates2,
iso3 = isolates3,
iso4 = isolates4,
iso5 = isolates5)

rm(surv_1);rm(surv_2);rm(surv_3);rm(surv_4);rm(surv_5)
rm(isolates1);rm(isolates2);rm(isolates3);rm(isolates4);rm(isolates5)
rm(temp_night)

```

General Graphs

#Convert to Matrices

```

sur1 <- as.matrix(day$sur1)
sur2 <- as.matrix(day$sur2)
sur3 <- as.matrix(day$sur3)
sur4 <- as.matrix(day$sur4)
sur5 <- as.matrix(day$sur5)

```

Convert matrix to an igraph object

```

g1 <- graph.edgelist(sur1, directed = TRUE) + vertices(day$iso1$Sender_Final_ID) #Graph edgelist + Add
g2 <- graph.edgelist(sur2, directed = TRUE) + vertices(day$iso2$Sender_Final_ID) #Graph edgelist + Add
g3 <- graph.edgelist(sur3, directed = TRUE) + vertices(day$iso3$Sender_Final_ID) #Graph edgelist + Add
g4 <- graph.edgelist(sur4, directed = TRUE) + vertices(day$iso4$Sender_Final_ID) #Graph edgelist + Add
g5 <- graph.edgelist(sur5, directed = TRUE) + vertices(day$iso5$Sender_Final_ID) #Graph edgelist + Add

```

#Capture Roles, Nights & Colors

```

temp_att <- temp_att %>%
  mutate(
    role1 = ifelse(!(is.na(role2))) & (night2 == night), role2, role1),
    night1 = ifelse(!(is.na(night2))) & (night2 == night), night2, night1),
    role_col = ifelse(!(is.na(role_col2))) & (night2 == night), role_col2, role_col)
  )

```

#Add staff Role Attribute

```

V(g1)$role <- temp_att$role1[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$role <- temp_att$role1[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$role <- temp_att$role1[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$role <- temp_att$role1[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$role <- temp_att$role1[match(V(g5)$name, temp_att$Final_ID)]

```

#Add role colors

```

V(g1)$color <- temp_att$role_col[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$color <- temp_att$role_col[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$color <- temp_att$role_col[match(V(g3)$name, temp_att$Final_ID)]

```

```
V(g4)$color <- temp_att$role_col[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$color <- temp_att$role_col[match(V(g5)$name, temp_att$Final_ID)]
```

#Set graphs to list

```
graphs <- list(g1 = g1, g2 = g2, g3 = g3, g4 = g4, g5 = g5)
```

```
rm(g1); rm(g2); rm(g3); rm(g4); rm(g5)
rm(sur1); rm(sur2); rm(sur3); rm(sur4); rm(sur5)
rm(temp_att)
```

Create List

```
thursday <- list(edgelist = day, graphs = graphs)
rm(day); rm(graphs)
```

Plot Graphs

#Set chart image

```
par(mfrow=c(4,5))
```

#Monday Graphs

my_sn_g(monday\$graphs\$g1,	title = "Monday - Week 1") ; my_leg(att = role, colors = color) #Soc
my_sn_g(monday\$graphs\$g2,	title = "Monday - Week 3") ; my_leg(att = role, colors = color) #Soc
my_sn_g(monday\$graphs\$g3,	title = "Monday - Week 6") ; my_leg(att = role, colors = color) #Soc
my_sn_g(monday\$graphs\$g4,	title = "Monday - Week 9") ; my_leg(att = role, colors = color) #Soc
my_sn_g(monday\$graphs\$g5,	title = "Monday - Week 11") ; my_leg(att = role, colors = color) #Soc

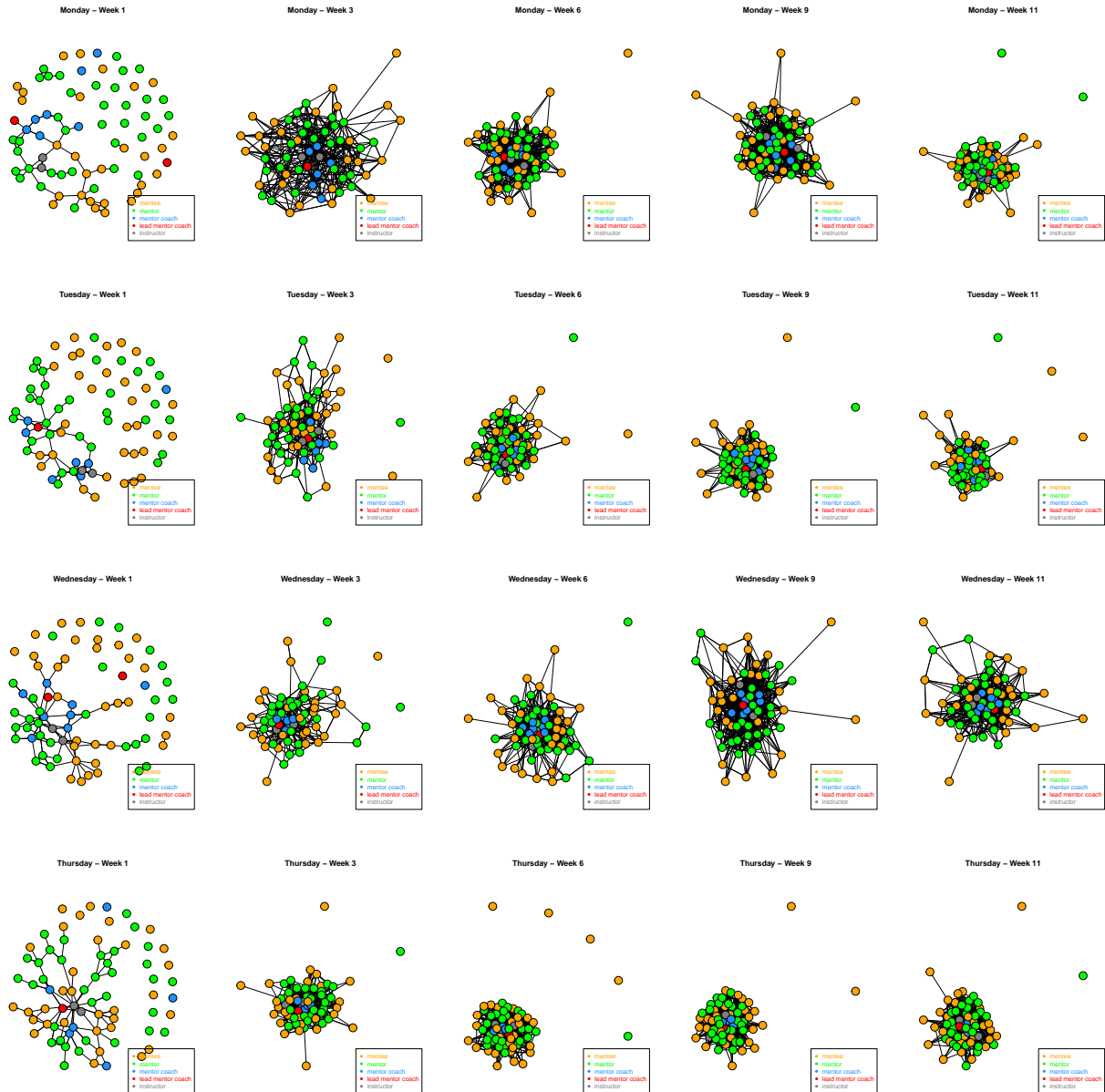
#Tuesday Graphs

my_sn_g(tuesday\$graphs\$g1,	title = "Tuesday - Week 1") ; my_leg(att = role, colors = color) #Soc
my_sn_g(tuesday\$graphs\$g2,	title = "Tuesday - Week 3") ; my_leg(att = role, colors = color) #Soc
my_sn_g(tuesday\$graphs\$g3,	title = "Tuesday - Week 6") ; my_leg(att = role, colors = color) #Soc
my_sn_g(tuesday\$graphs\$g4,	title = "Tuesday - Week 9") ; my_leg(att = role, colors = color) #Soc
my_sn_g(tuesday\$graphs\$g5,	title = "Tuesday - Week 11") ; my_leg(att = role, colors = color) #Soc

#Wednesday Graphs

my_sn_g(wednesday\$graphs\$g1,	title = "Wednesday - Week 1") ; my_leg(att = role, colors = color) #Soc
my_sn_g(wednesday\$graphs\$g2,	title = "Wednesday - Week 3") ; my_leg(att = role, colors = color) #Soc
my_sn_g(wednesday\$graphs\$g3,	title = "Wednesday - Week 6") ; my_leg(att = role, colors = color) #Soc
my_sn_g(wednesday\$graphs\$g4,	title = "Wednesday - Week 9") ; my_leg(att = role, colors = color) #Soc
my_sn_g(wednesday\$graphs\$g5,	title = "Wednesday - Week 11") ; my_leg(att = role, colors = color) #Soc

my_sn_g(thursday\$graphs\$g1,	title = "Thursday - Week 1") ; my_leg(att = role, colors = color) #Soc
my_sn_g(thursday\$graphs\$g2,	title = "Thursday - Week 3") ; my_leg(att = role, colors = color) #Soc
my_sn_g(thursday\$graphs\$g3,	title = "Thursday - Week 6") ; my_leg(att = role, colors = color) #Soc
my_sn_g(thursday\$graphs\$g4,	title = "Thursday - Week 9") ; my_leg(att = role, colors = color) #Soc
my_sn_g(thursday\$graphs\$g5,	title = "Thursday - Week 11") ; my_leg(att = role, colors = color) #Soc



```
#Plot With purrr::walk()
#walk(.x = monday$graphs, .f = my_sn_g, title = "Monday");my_leg(role, color)
#walk(.x = tuesday$graphs, .f = my_sn_g, title = "Tuesday");my_leg(role, color)
#walk(.x = wednesday$graphs, .f = my_sn_g, title = "Wednesday");my_leg(role, color)
#walk(.x = thursday$graphs, .f = my_sn_g, title = "Thursday");my_leg(role, color)
```

Create Semester List

```
F16 <- list(monday = monday, tuesday = tuesday, wednesday = wednesday, thursday = thursday)
rm(monday);rm(tuesday);rm(wednesday);rm(thursday)
rm(temp)
```

S17

```
temp <- elmk %>% filter(semester == "S17")

mon <- temp %>% filter(night == "monday")
tue <- temp %>% filter(night == "tuesday")
wed <- temp %>% filter(night == "wednesday")
thu <- temp %>% filter(night == "thursday")

sem <- list(mon = mon,
            tue = tue,
            wed = wed,
            thu = thu)

rm(mon);rm(tue);rm(wed);rm(thu)
```

Summary

```
sem$mon <- group_by(sem$mon, survnum)
sem$tue <- group_by(sem$tue, survnum)
sem$wed <- group_by(sem$wed, survnum)
sem$thu <- group_by(sem$thu, survnum)

summarize(sem$mon, day = "mon", n = length(unique(Sender_Final_ID)), tie_count = sum(sn1, na.rm = TRUE)
```

```
## # A tibble: 5 x 5
##   survnum day      n tie_count tie_prop
##   <int> <chr> <int>   <int>   <dbl>
## 1      1 mon     66     149    0.702
## 2      2 mon     65     451    2.12
## 3      3 mon     63     664    3.13
## 4      4 mon     62     797    3.75
## 5      5 mon     61     839    3.95
```

```
summarize(sem$tue, day = "tue", n = length(unique(Sender_Final_ID)), tie_count = sum(sn1, na.rm = TRUE)
```

```
## # A tibble: 5 x 5
##   survnum day      n tie_count tie_prop
##   <int> <chr> <int>   <int>   <dbl>
## 1      1 tue     65      86    0.409
## 2      2 tue     64     466    2.22
## 3      3 tue     63     768    3.66
## 4      4 tue     62     841    4.00
## 5      5 tue     62    1006    4.79
```

```
summarize(sem$wed, day = "wed", n = length(unique(Sender_Final_ID)), tie_count = sum(sn1, na.rm = TRUE)
```

```
## # A tibble: 5 x 5
##   survnum day      n tie_count tie_prop
##   <int> <chr> <int>   <int>   <dbl>
## 1      1 wed     64     139    0.685
## 2      2 wed     64     432    2.13
## 3      3 wed     62     648    3.19
## 4      4 wed     62     846    4.17
## 5      5 wed     62     932    4.59
```

```
summarize(sem$thu, day = "thu", n = length(unique(Sender_Final_ID)), tie_count = sum(sn1, na.rm = TRUE))
```

```
## # A tibble: 5 x 5
##   survnum day      n tie_count tie_prop
##   <int> <chr> <int>   <int>   <dbl>
## 1     1 1 thu    66     92    0.425
## 2     2 2 thu    65    440    2.03
## 3     3 3 thu    64    700    3.23
## 4     4 4 thu    63    867    4.01
## 5     5 5 thu    63    954    4.41
```

```
sem$mon <- ungroup(sem$mon)
sem$tue <- ungroup(sem$tue)
sem$wed <- ungroup(sem$wed)
sem$thu <- ungroup(sem$thu)
```

Monday

```
temp_night <- temp %>% filter(night == "monday")
temp_att <- staff_youth_att %>% mutate(night = "monday")

#Surv_1
surv_1 <- temp_night %>%
  filter(survnum == 1) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%

#Getting isolates
isolates1 <- surv_1 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_1 <- surv_1 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_2
surv_2 <- temp_night %>%
  filter(survnum == 2) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%

#Getting isolates
isolates2 <- surv_2 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_2 <- surv_2 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_3
surv_3 <- temp_night %>%
  filter(survnum == 3) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%

#Getting isolates
isolates3 <- surv_3 %>%
```



```

mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
group_by(Sender_Final_ID) %>%
summarize(isolate = sum(sn1)) %>%
filter(isolate < 1) %>%
select(Sender_Final_ID)
surv_3 <- surv_3 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 4
surv_4 <- temp_night %>%
  filter(survnum == 4) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #%>%
#Getting isolates
isolates4 <- surv_4 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_4 <- surv_4 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 5
surv_5 <- temp_night %>%
  filter(survnum == 5) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #%>%
#Getting isolates
isolates5 <- surv_5 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_5 <- surv_5 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

day <- list(sur1 = surv_1,
            sur2 = surv_2,
            sur3 = surv_3,
            sur4 = surv_4,
            sur5 = surv_5,
            iso1 = isolates1,
            iso2 = isolates2,
            iso3 = isolates3,
            iso4 = isolates4,
            iso5 = isolates5)

rm(surv_1);rm(surv_2);rm(surv_3);rm(surv_4);rm(surv_5)
rm(isolates1);rm(isolates2);rm(isolates3);rm(isolates4);rm(isolates5)
rm(temp_night)

```

General Graphs

```
#Convert to Matrices
```

```
sur1 <- as.matrix(day$sur1)
sur2 <- as.matrix(day$sur2)
sur3 <- as.matrix(day$sur3)
sur4 <- as.matrix(day$sur4)
sur5 <- as.matrix(day$sur5)
```

```
# Convert matrix to an igraph object
```

```
g1 <- graph.edgelist(sur1, directed = TRUE) + vertices(day$iso1$Sender_Final_ID) #Graph edgelist + Add
g2 <- graph.edgelist(sur2, directed = TRUE) + vertices(day$iso2$Sender_Final_ID) #Graph edgelist + Add
g3 <- graph.edgelist(sur3, directed = TRUE) + vertices(day$iso3$Sender_Final_ID) #Graph edgelist + Add
g4 <- graph.edgelist(sur4, directed = TRUE) + vertices(day$iso4$Sender_Final_ID) #Graph edgelist + Add
g5 <- graph.edgelist(sur5, directed = TRUE) + vertices(day$iso5$Sender_Final_ID) #Graph edgelist + Add
```

```
#Capture Roles, Nights & Colors
```

```
temp_att <- temp_att %>%
  mutate(
    role1 = ifelse(!(is.na(role2))) & (night2 == night), role2, role1),
    night1 = ifelse(!(is.na(night2))) & (night2 == night), night2, night1),
    role_col = ifelse(!(is.na(role_col2))) & (night2 == night), role_col2, role_col)
  )
```

```
#Add staff Role Attribute
```

```
V(g1)$role <- temp_att$role1[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$role <- temp_att$role1[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$role <- temp_att$role1[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$role <- temp_att$role1[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$role <- temp_att$role1[match(V(g5)$name, temp_att$Final_ID)]
```

```
#Add role colors
```

```
V(g1)$color <- temp_att$role_col[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$color <- temp_att$role_col[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$color <- temp_att$role_col[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$color <- temp_att$role_col[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$color <- temp_att$role_col[match(V(g5)$name, temp_att$Final_ID)]
```

```
#Set graphs to list
```

```
graphs <- list(g1 = g1, g2 = g2, g3 = g3, g4 = g4, g5 = g5)
```

```
rm(g1); rm(g2); rm(g3); rm(g4); rm(g5)
rm(sur1); rm(sur2); rm(sur3); rm(sur4); rm(sur5)
rm(temp_att)
```

Create List

```
monday <- list(edgelists = day, graphs = graphs)
rm(day);rm(graphs)
```

Tuesday

```
temp_night <- temp %>% filter(night == "tuesday")
temp_att <- staff_youth_att %>% mutate(night = "tuesday")

#Surv_1
surv_1 <- temp_night %>%
  filter(survnum == 1) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates1 <- surv_1 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_1 <- surv_1 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_2
surv_2 <- temp_night %>%
  filter(survnum == 2) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates2 <- surv_2 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_2 <- surv_2 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_3
surv_3 <- temp_night %>%
  filter(survnum == 3) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates3 <- surv_3 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_3 <- surv_3 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv_4
surv_4 <- temp_night %>%
  filter(survnum == 4) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
```

```

#Getting isolates
isolates4 <- surv_4 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_4 <- surv_4 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 5
surv_5 <- temp_night %>%
  filter(survnum == 5) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates5 <- surv_5 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_5 <- surv_5 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

day <- list(sur1 = surv_1,
            sur2 = surv_2,
            sur3 = surv_3,
            sur4 = surv_4,
            sur5 = surv_5,
            iso1 = isolates1,
            iso2 = isolates2,
            iso3 = isolates3,
            iso4 = isolates4,
            iso5 = isolates5)

rm(surv_1);rm(surv_2);rm(surv_3);rm(surv_4);rm(surv_5)
rm(isolates1);rm(isolates2);rm(isolates3);rm(isolates4);rm(isolates5)
rm(temp_night)

```

General Graphs

#Convert to Matrices

```

sur1 <- as.matrix(day$sur1)
sur2 <- as.matrix(day$sur2)
sur3 <- as.matrix(day$sur3)
sur4 <- as.matrix(day$sur4)
sur5 <- as.matrix(day$sur5)

```

Convert matrix to an igraph object

```

g1 <- graph.edgelist(sur1, directed = TRUE) + vertices(day$iso1$Sender_Final_ID) #Graph edgelist + Add
g2 <- graph.edgelist(sur2, directed = TRUE) + vertices(day$iso2$Sender_Final_ID) #Graph edgelist + Add

```

```

g3 <- graph.edgelist(sur3, directed = TRUE) + vertices(day$iso3$Sender_Final_ID) #Graph edgelist + Add
g4 <- graph.edgelist(sur4, directed = TRUE) + vertices(day$iso4$Sender_Final_ID) #Graph edgelist + Add
g5 <- graph.edgelist(sur5, directed = TRUE) + vertices(day$iso5$Sender_Final_ID) #Graph edgelist + Add

#Capture Roles, Nights & Colors

temp_att <- temp_att %>%
  mutate(
    role1 = ifelse(!(is.na(role2))) & (night2 == night), role2, role1),
    night1 = ifelse(!(is.na(night2))) & (night2 == night), night2, night1),
    role_col = ifelse(!(is.na(role_col2))) & (night2 == night), role_col2, role_col)
  )

#Add staff Role Attribute

V(g1)$role <- temp_att$role1[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$role <- temp_att$role1[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$role <- temp_att$role1[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$role <- temp_att$role1[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$role <- temp_att$role1[match(V(g5)$name, temp_att$Final_ID)]

#Add role colors

V(g1)$color <- temp_att$role_col[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$color <- temp_att$role_col[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$color <- temp_att$role_col[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$color <- temp_att$role_col[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$color <- temp_att$role_col[match(V(g5)$name, temp_att$Final_ID)]

#Set graphs to list
graphs <- list(g1 = g1, g2 = g2, g3 = g3, g4 = g4, g5 = g5)

rm(g1); rm(g2); rm(g3); rm(g4); rm(g5)
rm(sur1); rm(sur2); rm(sur3); rm(sur4); rm(sur5)
rm(temp_att)

```

Create List

```

tuesday <- list(edgelist = day, graphs = graphs)
rm(day); rm(graphs)

```

Wednesday

```

temp_night <- temp %>% filter(night == "wednesday")
temp_att <- staff_youth_att %>% mutate(night = "wednesday")

#Surv_1
surv_1 <- temp_night %>%
  filter(survnum == 1) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates1 <- surv_1 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%

```

```

group_by(Sender_Final_ID) %>%
summarize(isolate = sum(sn1)) %>%
filter(isolate < 1) %>%
select(Sender_Final_ID)
surv_1 <- surv_1 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 2
surv_2 <- temp_night %>%
  filter(survnum == 2) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates2 <- surv_2 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_2 <- surv_2 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 3
surv_3 <- temp_night %>%
  filter(survnum == 3) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates3 <- surv_3 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_3 <- surv_3 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 4
surv_4 <- temp_night %>%
  filter(survnum == 4) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates4 <- surv_4 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_4 <- surv_4 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 5
surv_5 <- temp_night %>%
  filter(survnum == 5) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%

```

```

#Getting isolates
isolates5 <- surv_5 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_5 <- surv_5 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

day <- list(surv1 = surv_1,
            sur2 = surv_2,
            sur3 = surv_3,
            sur4 = surv_4,
            sur5 = surv_5,
            iso1 = isolates1,
            iso2 = isolates2,
            iso3 = isolates3,
            iso4 = isolates4,
            iso5 = isolates5)

rm(surv_1);rm(surv_2);rm(surv_3);rm(surv_4);rm(surv_5)
rm(isolates1);rm(isolates2);rm(isolates3);rm(isolates4);rm(isolates5)
rm(temp_night)

```

General Graphs

#Convert to Matrices

```

sur1 <- as.matrix(day$sur1)
sur2 <- as.matrix(day$sur2)
sur3 <- as.matrix(day$sur3)
sur4 <- as.matrix(day$sur4)
sur5 <- as.matrix(day$sur5)

```

Convert matrix to an igraph object

```

g1 <- graph.edgelist(sur1, directed = TRUE) + vertices(day$iso1$Sender_Final_ID) #Graph edgelist + Add
g2 <- graph.edgelist(sur2, directed = TRUE) + vertices(day$iso2$Sender_Final_ID) #Graph edgelist + Add
g3 <- graph.edgelist(sur3, directed = TRUE) + vertices(day$iso3$Sender_Final_ID) #Graph edgelist + Add
g4 <- graph.edgelist(sur4, directed = TRUE) + vertices(day$iso4$Sender_Final_ID) #Graph edgelist + Add
g5 <- graph.edgelist(sur5, directed = TRUE) + vertices(day$iso5$Sender_Final_ID) #Graph edgelist + Add

```

#Capture Roles, Nights & Colors

```

temp_att <- temp_att %>%
  mutate(
    role1 = ifelse(!(is.na(role2))) & (night2 == night), role2, role1),
    night1 = ifelse(!(is.na(night2))) & (night2 == night), night2, night1),
    role_col = ifelse(!(is.na(role_col2))) & (night2 == night), role_col2, role_col)

```

```
#Add staff Role Attribute
```

```
V(g1)$role <- temp_att$role1[match(V(g1)$name, temp_att$Final_ID)]  
V(g2)$role <- temp_att$role1[match(V(g2)$name, temp_att$Final_ID)]  
V(g3)$role <- temp_att$role1[match(V(g3)$name, temp_att$Final_ID)]  
V(g4)$role <- temp_att$role1[match(V(g4)$name, temp_att$Final_ID)]  
V(g5)$role <- temp_att$role1[match(V(g5)$name, temp_att$Final_ID)]
```

```
#Add role colors
```

```
V(g1)$color <- temp_att$role_col[match(V(g1)$name, temp_att$Final_ID)]  
V(g2)$color <- temp_att$role_col[match(V(g2)$name, temp_att$Final_ID)]  
V(g3)$color <- temp_att$role_col[match(V(g3)$name, temp_att$Final_ID)]  
V(g4)$color <- temp_att$role_col[match(V(g4)$name, temp_att$Final_ID)]  
V(g5)$color <- temp_att$role_col[match(V(g5)$name, temp_att$Final_ID)]
```

```
#Set graphs to list
```

```
graphs <- list(g1 = g1, g2 = g2, g3 = g3, g4 = g4, g5 = g5)
```

```
rm(g1); rm(g2); rm(g3); rm(g4); rm(g5)  
rm(sur1); rm(sur2); rm(sur3); rm(sur4); rm(sur5)  
rm(temp_att)
```

Create List

```
wednesday <- list(edgelists = day, graphs = graphs)  
rm(day); rm(graphs)
```

Thursday

```
temp_night <- temp %>% filter(night == "thursday")  
temp_att <- staff_youth_att %>% mutate(night = "thursday")  
  
#Surv_1  
surv_1 <- temp_night %>%  
  filter(survnum == 1) %>%  
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%  
#Getting isolates  
isolates1 <- surv_1 %>%  
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%  
  group_by(Sender_Final_ID) %>%  
  summarize(isolate = sum(sn1)) %>%  
  filter(isolate < 1) %>%  
  select(Sender_Final_ID)  
surv_1 <- surv_1 %>%  
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))  
  
#Surv_2  
surv_2 <- temp_night %>%  
  filter(survnum == 2) %>%  
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%  
#Getting isolates  
isolates2 <- surv_2 %>%  
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
```



```

group_by(Sender_Final_ID) %>%
summarize(isolate = sum(sn1)) %>%
filter(isolate < 1) %>%
select(Sender_Final_ID)
surv_2 <- surv_2 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 3
surv_3 <- temp_night %>%
  filter(survnum == 3) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates3 <- surv_3 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_3 <- surv_3 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 4
surv_4 <- temp_night %>%
  filter(survnum == 4) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates4 <- surv_4 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_4 <- surv_4 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

#Surv 5
surv_5 <- temp_night %>%
  filter(survnum == 5) %>%
  mutate(Receiver_Final_ID = ifelse(is.na(sn1), NA, Receiver_Final_ID)) #>%
#Getting isolates
isolates5 <- surv_5 %>%
  mutate(sn1 = ifelse(is.na(sn1), 0, sn1)) %>%
  group_by(Sender_Final_ID) %>%
  summarize(isolate = sum(sn1)) %>%
  filter(isolate < 1) %>%
  select(Sender_Final_ID)
surv_5 <- surv_5 %>%
  select(Sender_Final_ID, Receiver_Final_ID) %>% filter(!(is.na(Receiver_Final_ID)))

day <- list(surv1 = surv_1,
            surv2 = surv_2,
            surv3 = surv_3,
            surv4 = surv_4,

```

```

    sur5 = surv_5,
    iso1 = isolates1,
    iso2 = isolates2,
    iso3 = isolates3,
    iso4 = isolates4,
    iso5 = isolates5)

rm(surv_1);rm(surv_2);rm(surv_3);rm(surv_4);rm(surv_5)
rm(isolates1);rm(isolates2);rm(isolates3);rm(isolates4);rm(isolates5)
rm(temp_night)

```

General Graphs

#Convert to Matrices

```

sur1 <- as.matrix(day$sur1)
sur2 <- as.matrix(day$sur2)
sur3 <- as.matrix(day$sur3)
sur4 <- as.matrix(day$sur4)
sur5 <- as.matrix(day$sur5)

```

Convert matrix to an igraph object

```

g1 <- graph.edgelist(sur1, directed = TRUE) + vertices(day$iso1$Sender_Final_ID) #Graph edgelist + Add
g2 <- graph.edgelist(sur2, directed = TRUE) + vertices(day$iso2$Sender_Final_ID) #Graph edgelist + Add
g3 <- graph.edgelist(sur3, directed = TRUE) + vertices(day$iso3$Sender_Final_ID) #Graph edgelist + Add
g4 <- graph.edgelist(sur4, directed = TRUE) + vertices(day$iso4$Sender_Final_ID) #Graph edgelist + Add
g5 <- graph.edgelist(sur5, directed = TRUE) + vertices(day$iso5$Sender_Final_ID) #Graph edgelist + Add

```

#Capture Roles, Nights & Colors

```

temp_att <- temp_att %>%
  mutate(
    role1 = ifelse(!(is.na(role2))) & (night2 == night), role2, role1),
    night1 = ifelse(!(is.na(night2))) & (night2 == night), night2, night1),
    role_col = ifelse(!(is.na(role_col2))) & (night2 == night), role_col2, role_col)
  )

```

#Add staff Role Attribute

```

V(g1)$role <- temp_att$role1[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$role <- temp_att$role1[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$role <- temp_att$role1[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$role <- temp_att$role1[match(V(g4)$name, temp_att$Final_ID)]
V(g5)$role <- temp_att$role1[match(V(g5)$name, temp_att$Final_ID)]

```

#Add role colors

```

V(g1)$color <- temp_att$role_col[match(V(g1)$name, temp_att$Final_ID)]
V(g2)$color <- temp_att$role_col[match(V(g2)$name, temp_att$Final_ID)]
V(g3)$color <- temp_att$role_col[match(V(g3)$name, temp_att$Final_ID)]
V(g4)$color <- temp_att$role_col[match(V(g4)$name, temp_att$Final_ID)]

```

```
V(g5)$color <- temp_att$role_col[match(V(g5)$name, temp_att$Final_ID)]
```

```
#Set graphs to list
```

```
graphs <- list(g1 = g1, g2 = g2, g3 = g3, g4 = g4, g5 = g5)
```

```
rm(g1); rm(g2); rm(g3); rm(g4); rm(g5)
rm(sur1); rm(sur2); rm(sur3); rm(sur4); rm(sur5)
rm(temp_att)
```

Create List

```
thursday <- list(edgelist = day, graphs = graphs)
rm(day); rm(graphs)
```

Plot Graphs

```
#Set chart image
```

```
par(mfrow=c(4,5))
```

```
#Monday Graphs
```

```
my_sn_g(monday$graphs$g1, title = "Monday - Week 1" ) ; my_leg(att = role, colors = color) #So
my_sn_g(monday$graphs$g2, title = "Monday - Week 3" ) ; my_leg(att = role, colors = color) #So
my_sn_g(monday$graphs$g3, title = "Monday - Week 6" ) ; my_leg(att = role, colors = color) #So
my_sn_g(monday$graphs$g4, title = "Monday - Week 9" ) ; my_leg(att = role, colors = color) #So
my_sn_g(monday$graphs$g5, title = "Monday - Week 11" ) ; my_leg(att = role, colors = color) #So
```

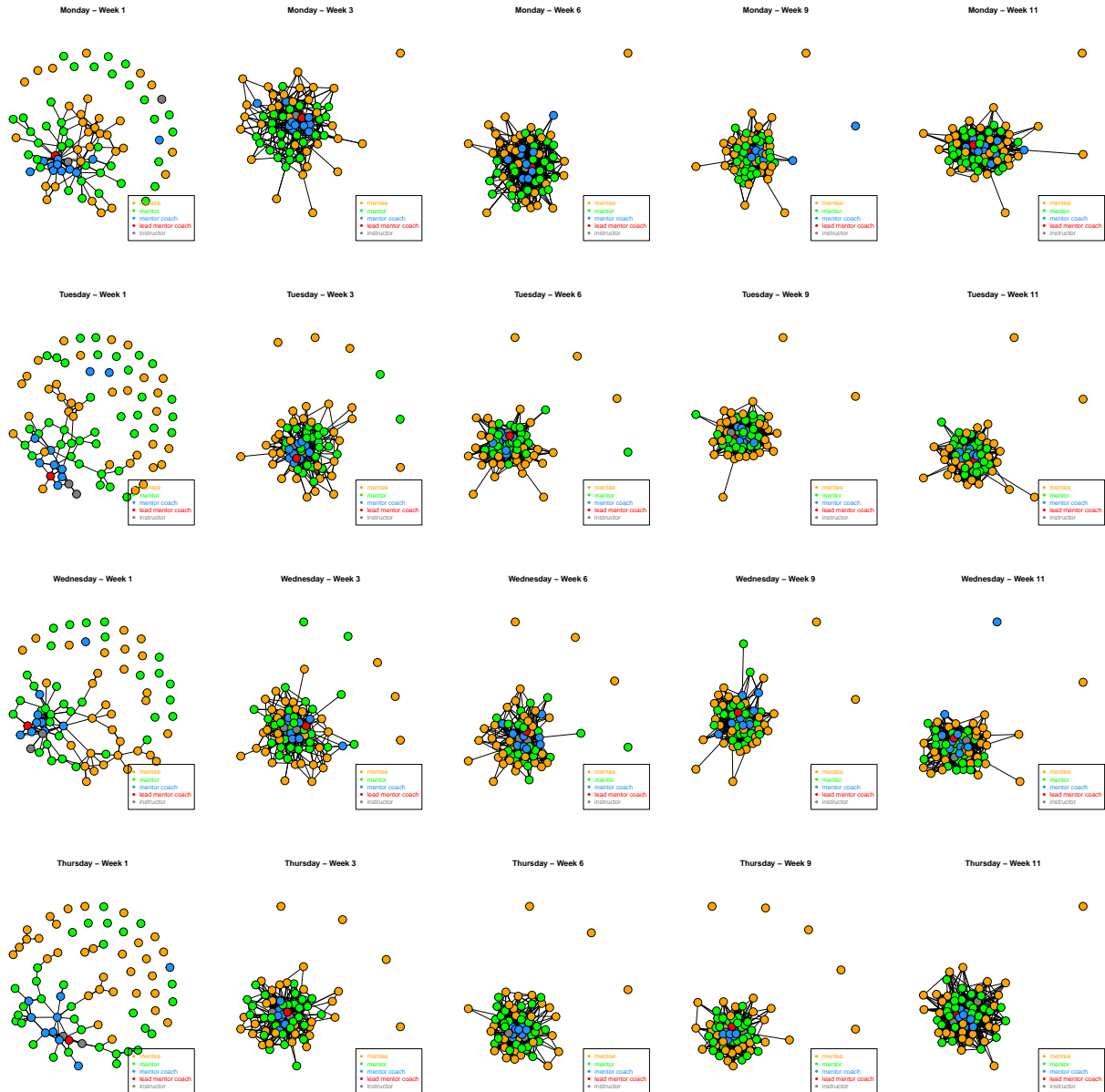
```
#Tuesday Graphs
```

```
my_sn_g(tuesday$graphs$g1, title = "Tuesday - Week 1" ) ; my_leg(att = role, colors = color) #So
my_sn_g(tuesday$graphs$g2, title = "Tuesday - Week 3" ) ; my_leg(att = role, colors = color) #So
my_sn_g(tuesday$graphs$g3, title = "Tuesday - Week 6" ) ; my_leg(att = role, colors = color) #So
my_sn_g(tuesday$graphs$g4, title = "Tuesday - Week 9" ) ; my_leg(att = role, colors = color) #So
my_sn_g(tuesday$graphs$g5, title = "Tuesday - Week 11" ) ; my_leg(att = role, colors = color) #So
```

```
#Wednesday Graphs
```

```
my_sn_g(wednesday$graphs$g1, title = "Wednesday - Week 1" ) ; my_leg(att = role, colors = color) #So
my_sn_g(wednesday$graphs$g2, title = "Wednesday - Week 3" ) ; my_leg(att = role, colors = color) #So
my_sn_g(wednesday$graphs$g3, title = "Wednesday - Week 6" ) ; my_leg(att = role, colors = color) #So
my_sn_g(wednesday$graphs$g4, title = "Wednesday - Week 9" ) ; my_leg(att = role, colors = color) #So
my_sn_g(wednesday$graphs$g5, title = "Wednesday - Week 11" ) ; my_leg(att = role, colors = color) #So
```

```
my_sn_g(thursday$graphs$g1, title = "Thursday - Week 1" ) ; my_leg(att = role, colors = color) #So
my_sn_g(thursday$graphs$g2, title = "Thursday - Week 3" ) ; my_leg(att = role, colors = color) #So
my_sn_g(thursday$graphs$g3, title = "Thursday - Week 6" ) ; my_leg(att = role, colors = color) #So
my_sn_g(thursday$graphs$g4, title = "Thursday - Week 9" ) ; my_leg(att = role, colors = color) #So
my_sn_g(thursday$graphs$g5, title = "Thursday - Week 11" ) ; my_leg(att = role, colors = color) #So
```



```
#Plot With purrr::walk()
#walk(.x = monday$graphs, .f = my_sn_g, title = "Monday");my_leg(role, color)
#walk(.x = tuesday$graphs, .f = my_sn_g, title = "Tuesday");my_leg(role, color)
#walk(.x = wednesday$graphs, .f = my_sn_g, title = "Wednesday");my_leg(role, color)
#walk(.x = thursday$graphs, .f = my_sn_g, title = "Thursday");my_leg(role, color)
```

Create Semester List

```
S17 <- list(monday = monday, tuesday = tuesday, wednesday = wednesday, thursday = thursday)
rm(monday);rm(tuesday);rm(wednesday);rm(thursday)
rm(temp)
```

Combine Semesters to list

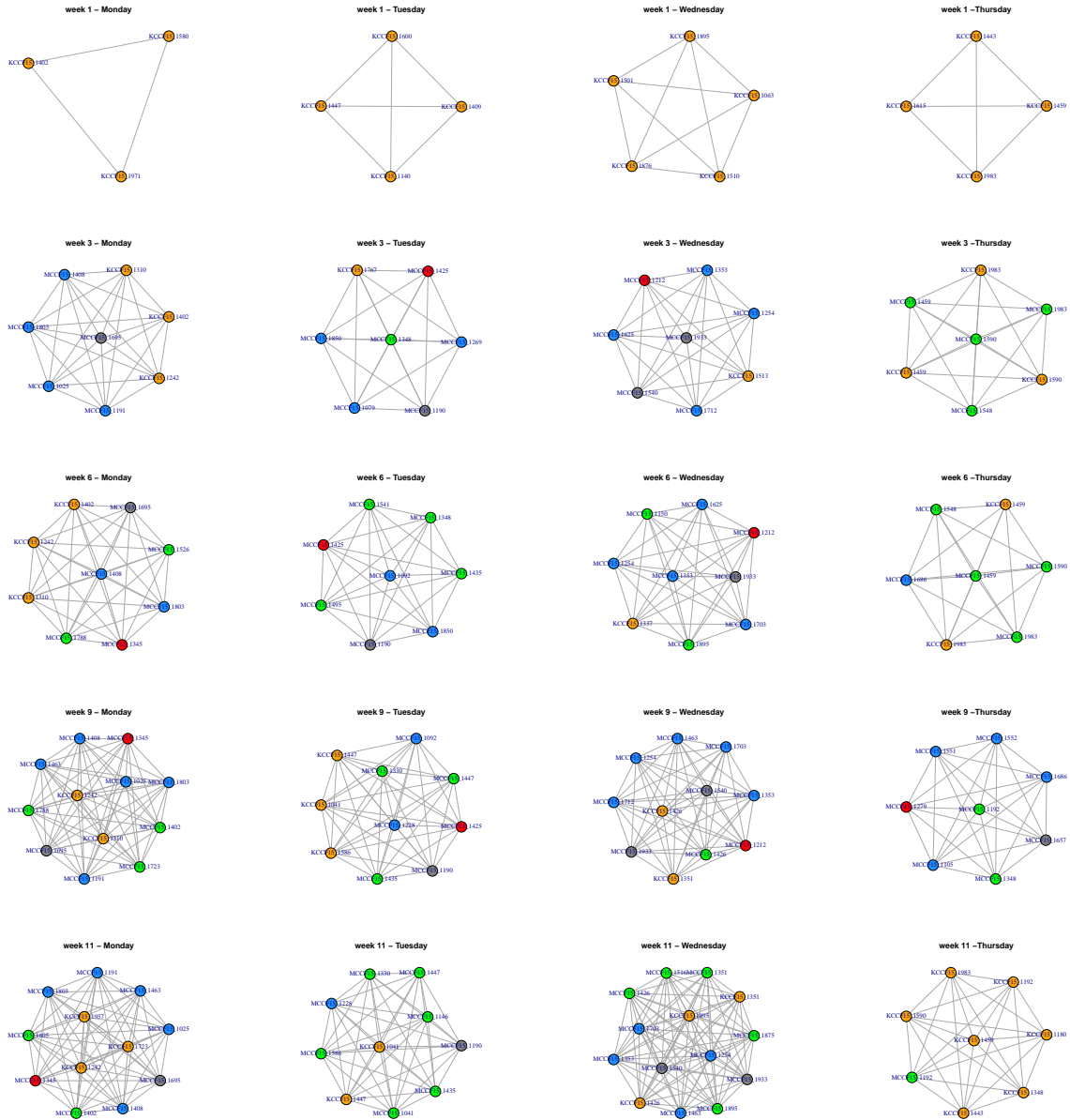
```
ALL <- list(F15 = F15, S16 = S16, F16 = F16, S17 = S17)
rm(F15);rm(S16);rm(F16);rm(S17)
```

Save All Networks to permanent RData File

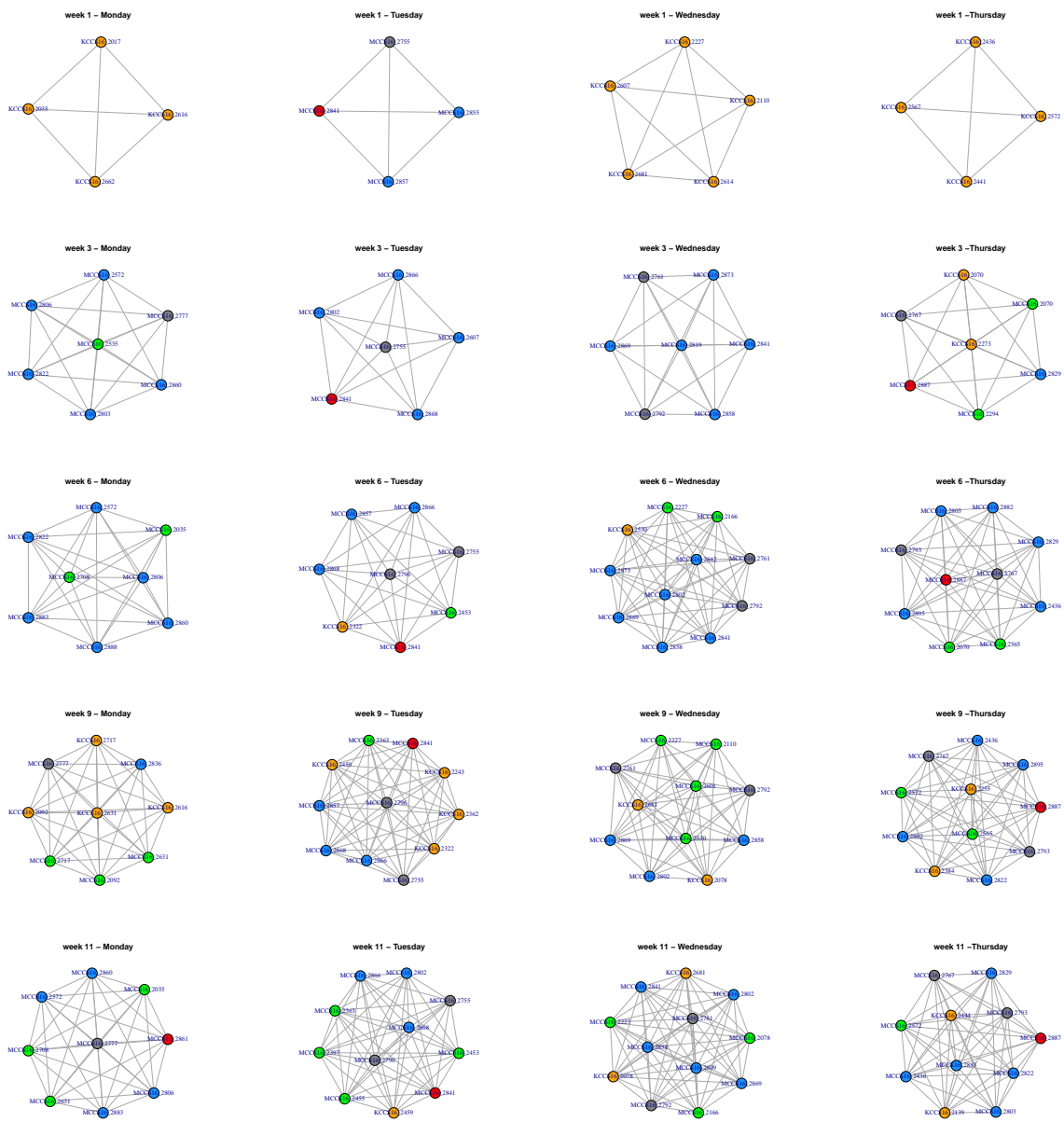
```
saveRDS(ALL, file="T:/Research folders/CCWTG/Data/MERGEALL/ALL_NETWORKS.RDS")
```

Examine Cliques

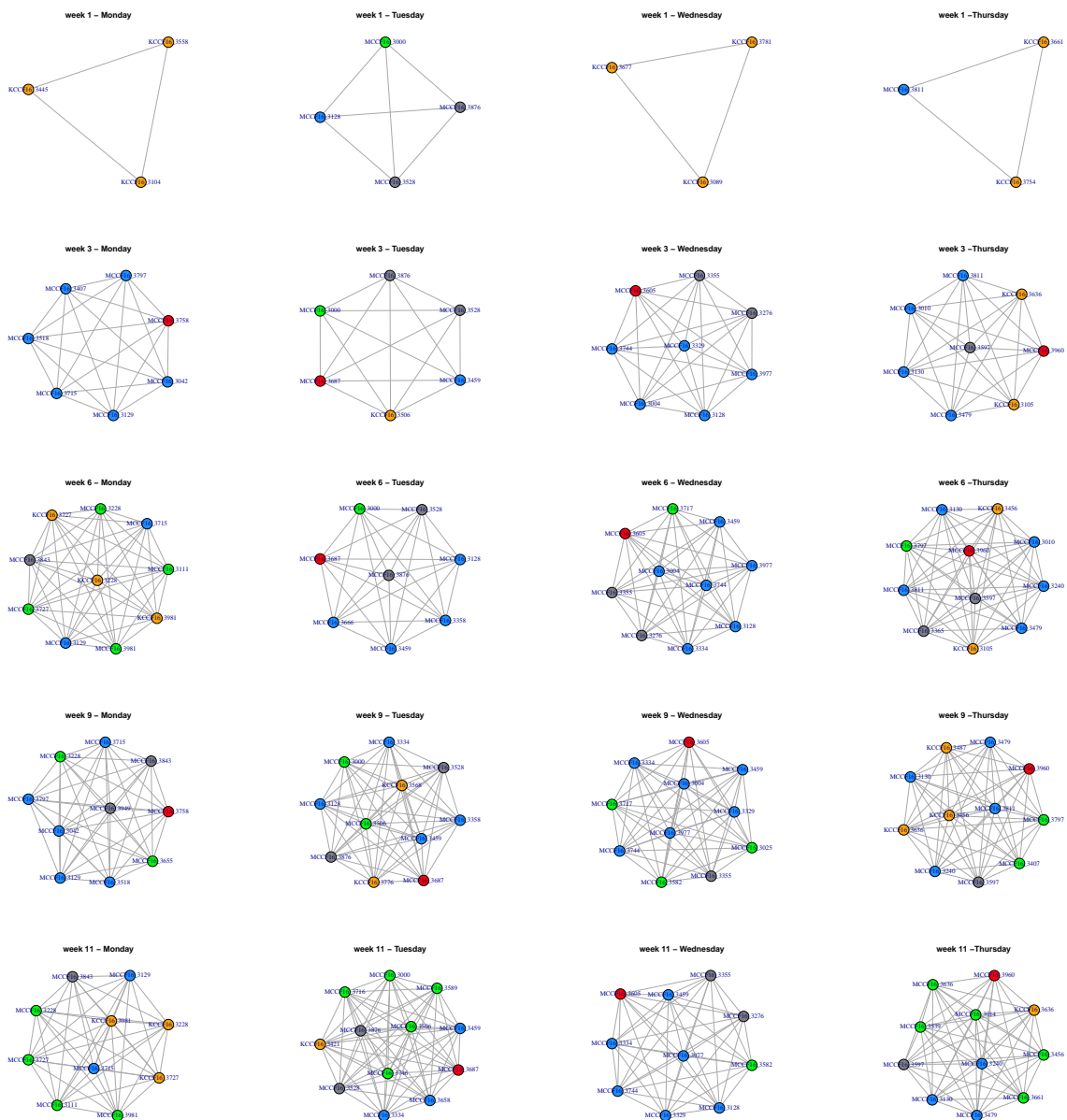
F15



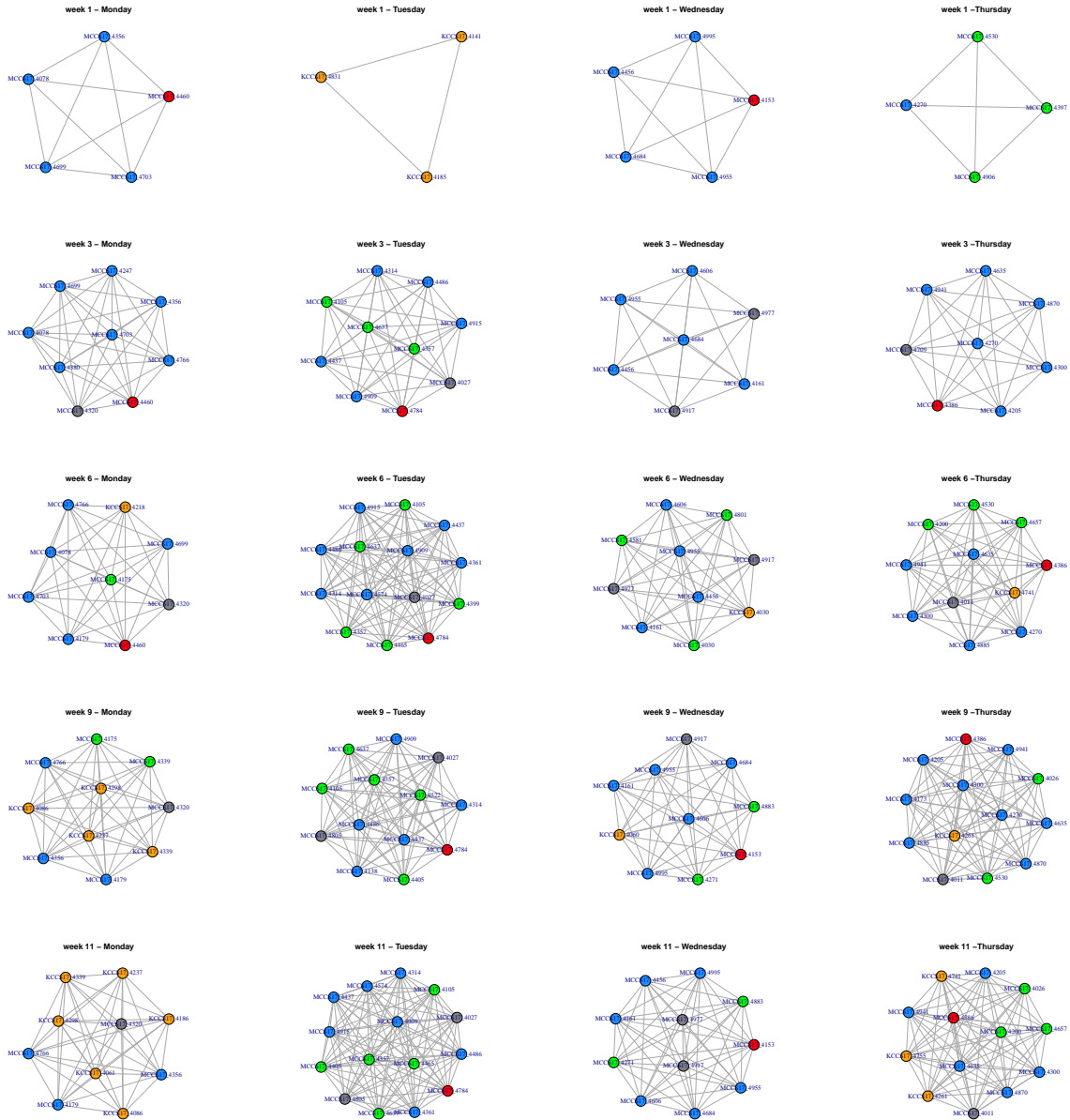
S16



F16



S17



##Combine Cliques

```
cliques <- list(F15 = F15, S16 = S16, F16 = F16, S17 = S17)
rm(F15);rm(S16);rm(F16);rm(S17)
```