Generate Network Plots

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```
# set working directory
setwd("/Users/charlescostanzo/College/Au 2023/Politsc 4998/URS Application/")
```

```
# load libraries
library(igraph) # for graphing
library(dplyr) # for %>% operator and mutate(), case_when() function
library(stringr) # for str_to_title() function
```

Note: need results = "asis" to print a new line after each plot

```
# create a vector containing all congress numbers
congress_number <- as.character(c(97:114))

# loop through all .graphml files and create a plot for each
for(i in seq_along(congress_number)){

  # read in the .graphml file for congress i (starting at 97)
  g <- read_graph(paste0("/Users/charlescostanzo/College/Au 2023/Politsc 4998/Data/graphml_zscore_self_1_1_5_
                  format = "graphml")

  # check vertex attribute names
  vertex_attr_names(g)
  # see https://voteview.com/articles/data_help_members for more info

  # create a data frame "vertex_labels" containing bioname, state_abbrev,
  # and district_code
  vertex_labels <- data.frame(vertex_attr(g)$bioname,
                              vertex_attr(g)$state_abbrev,
                              vertex_attr(g)$district_code)

  # rename "vertex_labels" columns to be more clear
  names(vertex_labels) <- c("Name", "District_State", "District_Number")

  # create a data frame "last_first" with two columns for last and first names
  last_first <- do.call("rbind",
                        regmatches(vertex_labels$Name,
                                   regexpr(", ", vertex_labels$Name),
                                   invert = TRUE) )
  last_first <- data.frame(last_first)

  # rename "last_first" columns to be more appropriate
  names(last_first) <- c("Last_Name", "First_Name")

  # add the "last_first" columns to "vertex_labels"
  vertex_labels <- cbind(vertex_labels, last_first)
```

```r
  # capitalize last names
  vertex_labels$Last_Name <- str_to_title(vertex_labels$Last_Name)

  # capitalize third character in "Mc" last names, e.g. Mccarthy --> McCarthy
  # capitalize other names on a case-by-case basis

  vertex_labels <- vertex_labels %>%
    mutate(Last_Name = case_when(
      grepl("Mc", vertex_labels$Last_Name) == TRUE ~ paste0(
        substr(vertex_labels$Last_Name,1, 2
               ),
        toupper(substr(vertex_labels$Last_Name, 3, 3)),
        substr(vertex_labels$Last_Name, 4,
               nchar(vertex_labels$Last_Name))),
      Last_Name == "Desjarlais" ~ "DesJarlais",
      Last_Name == "Delbene" ~ "DelBene",
      Last_Name == "Delauro" ~ "DeLauro",
      Last_Name == "Desantis" ~ "DeSantis",
      Last_Name == "Degette" ~ "DeGette",
      Last_Name == "Defazio" ~ "DeFazio",
      Last_Name == "Lamalfa" ~ "LaMalfa",
      TRUE ~ Last_Name
    ))

  # create a column 'vertex_label' that contains properly formatted vertex labels
  # for each member of Congress node
  vertex_labels$vertex_label <- paste0(vertex_labels$District_State,
                                       "-",
                                       round(as.numeric(
                                         vertex_labels$District_Number),
                                             0))

  # create a jpeg file for figure 1
  jpeg(paste0("/Users/charlescostanzo/College/Au 2023/Politsc 4998/URS Application/network plots/",
       congress_number[i],"_congress.jpeg"),
       width = 25,
       height = 15,
       units = 'in',
       res = 50)

    # use a multidimensional scaling layout, which is good for large, dense networks
  l <- layout_with_mds(g)

  # rescale coordinates to be within given bounds
  l <- norm_coords(l, ymin=-1, ymax=1, xmin=-1, xmax=1)

  # create graph
  plot(x = g, # graph to plot
# vertex.label = "", # remove vertex labels
       vertex.label = vertex_labels$vertex_label,
#previous adjustment of vertex label size
       vertex.label.cex = page_rank(g)$vector*100,
# set the size of vertex proportional to PageRank
       vertex.size = page_rank(g)$vector*500,
# set vertex colors for Republicans (party_code = 200) and Democrats (party_code = 100)
       vertex.color = ifelse(vertex_attr(g)$party_code == 100,
                             "#0AC6FF", "#F21B3F"),
       # vertex.label.font = 2, # bold vertex labels
```

```
        vertex.frame.width = 4, # made the black frame around vertexes thicker
        edge.arrow.size = .5, # adjust edge arrow size
        edge.width = .6, # adjust edge with
        edge.arrow.width = 0.5, # adjust edge arrow width
        layout = l, # set layout to layout created above
        asp = 0, # set aspect ratio to 0
        rescale = FALSE) # do not rescale

  # stop editing and output finished jpeg
  dev.off()
}
```

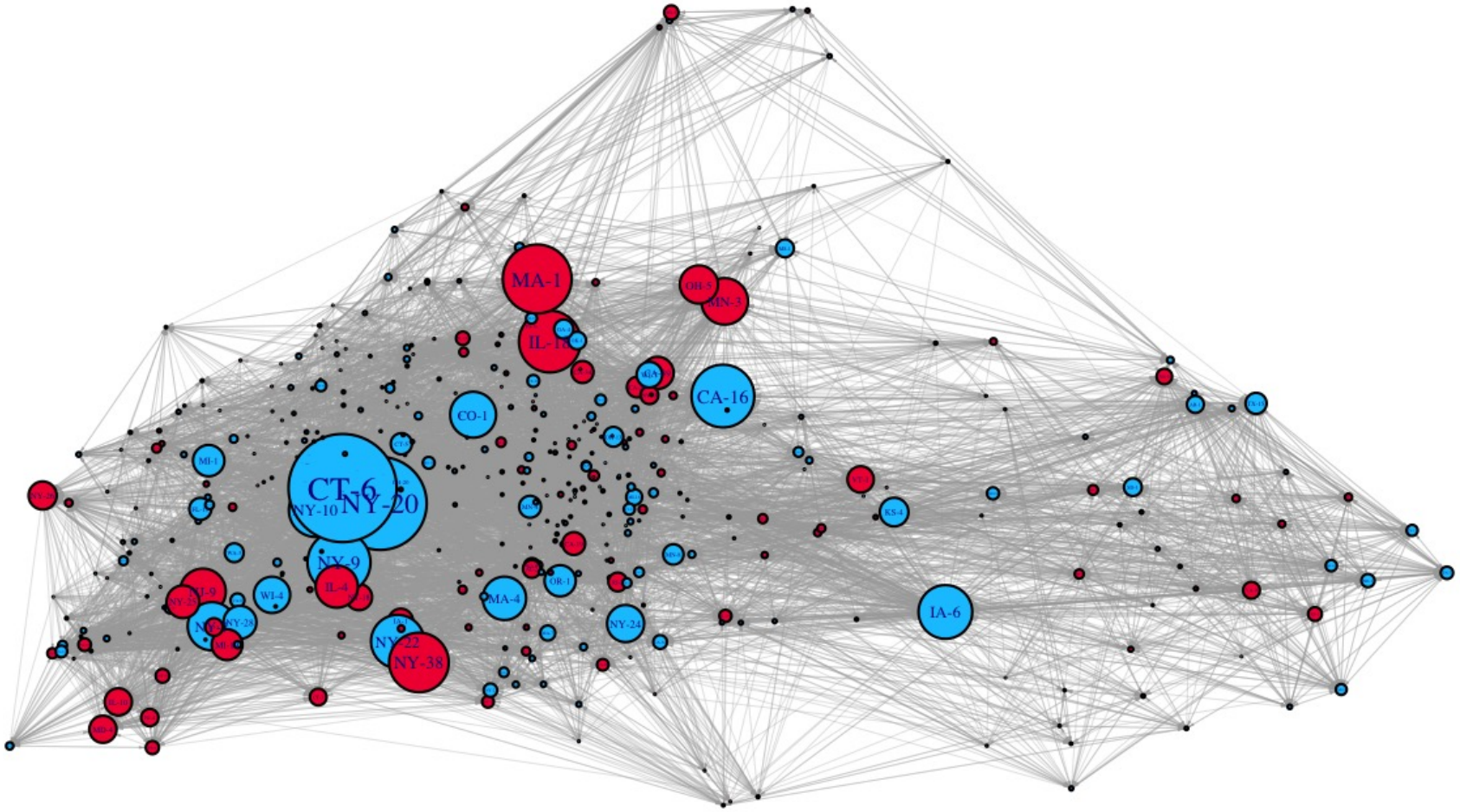

Figure 1: Speech Network of the 97^{th} Congress

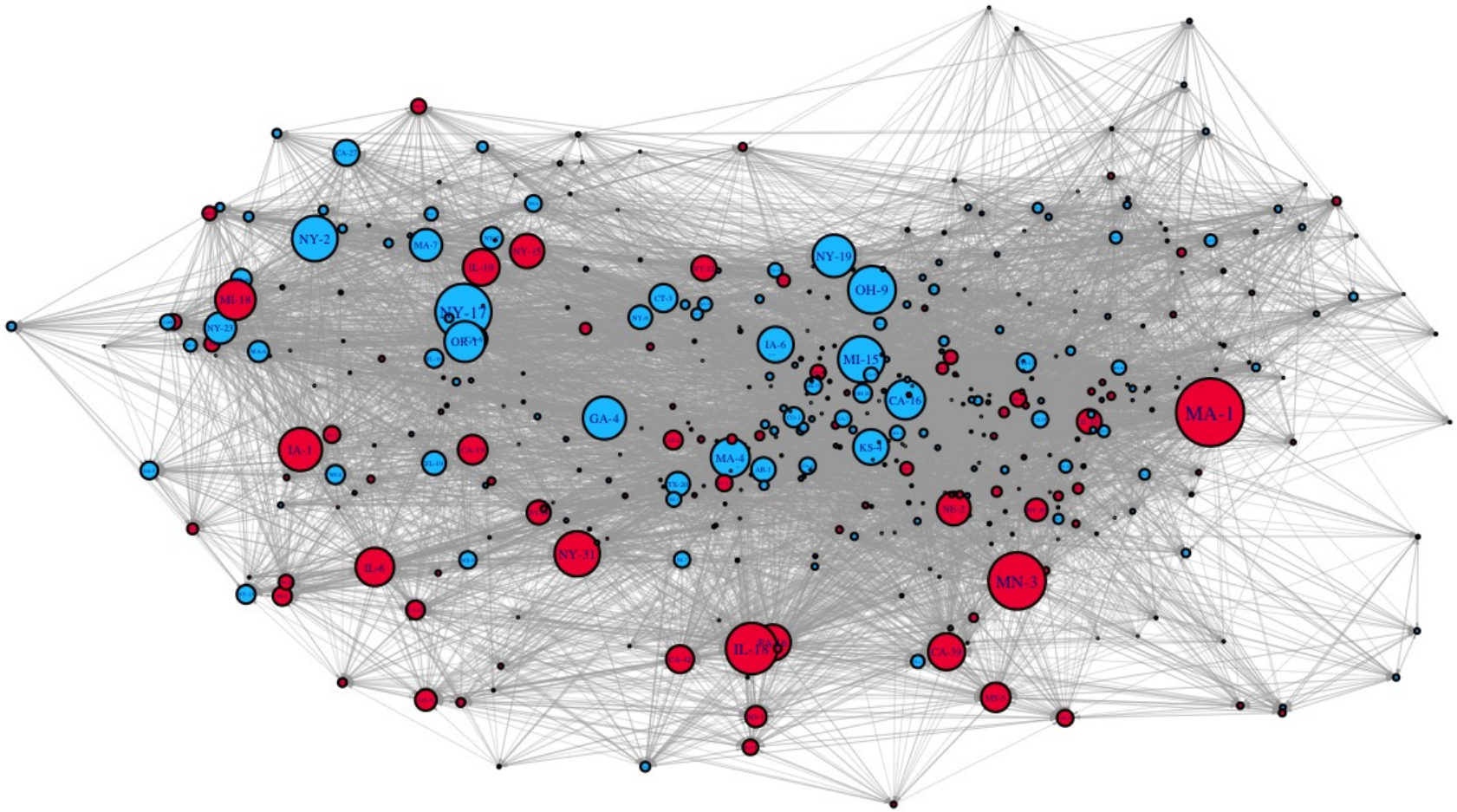

Figure 2: Speech Network of the 98$^{\text{th}}$ Congress

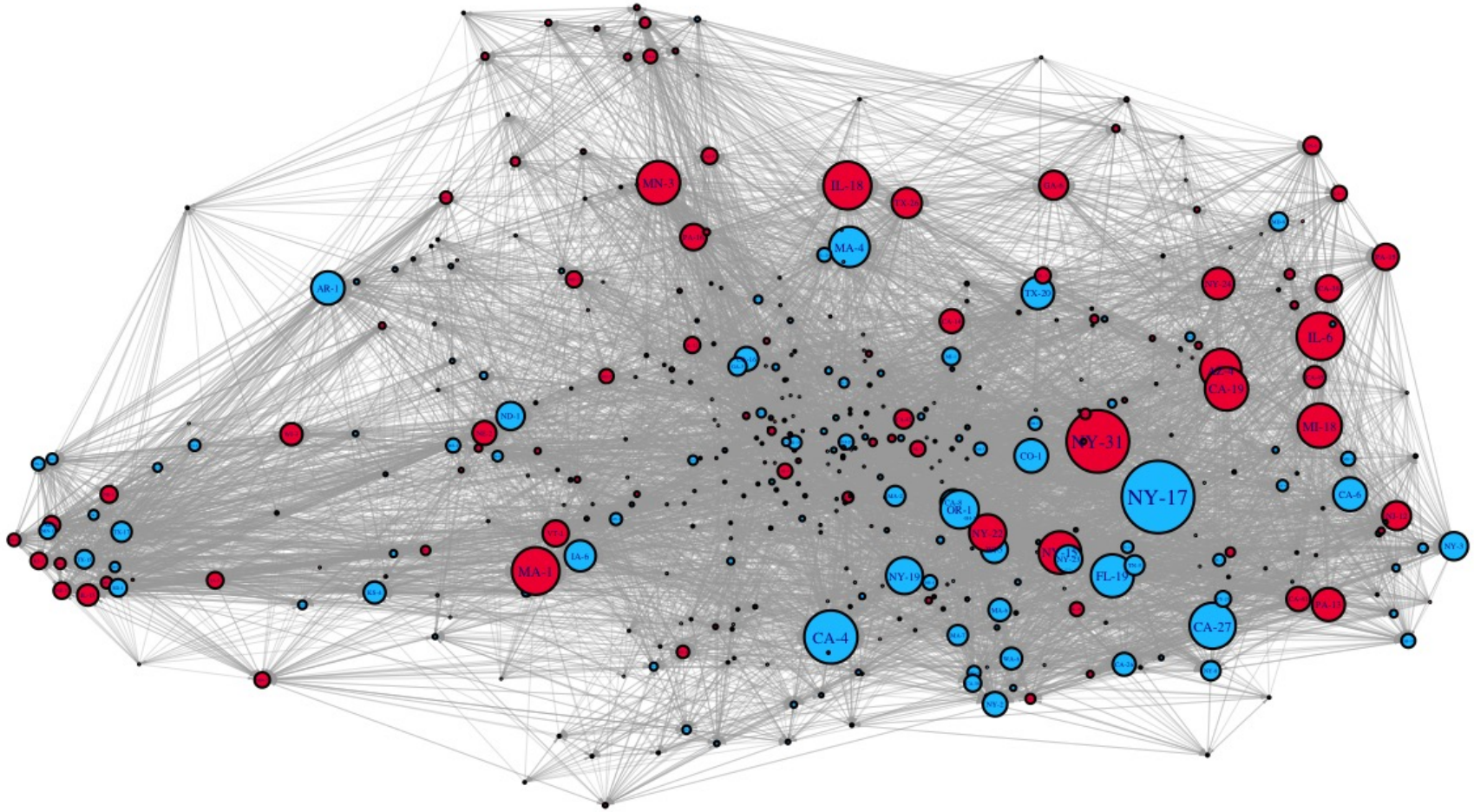

Figure 3: Speech Network of the 99$^{\text{th}}$ Congress

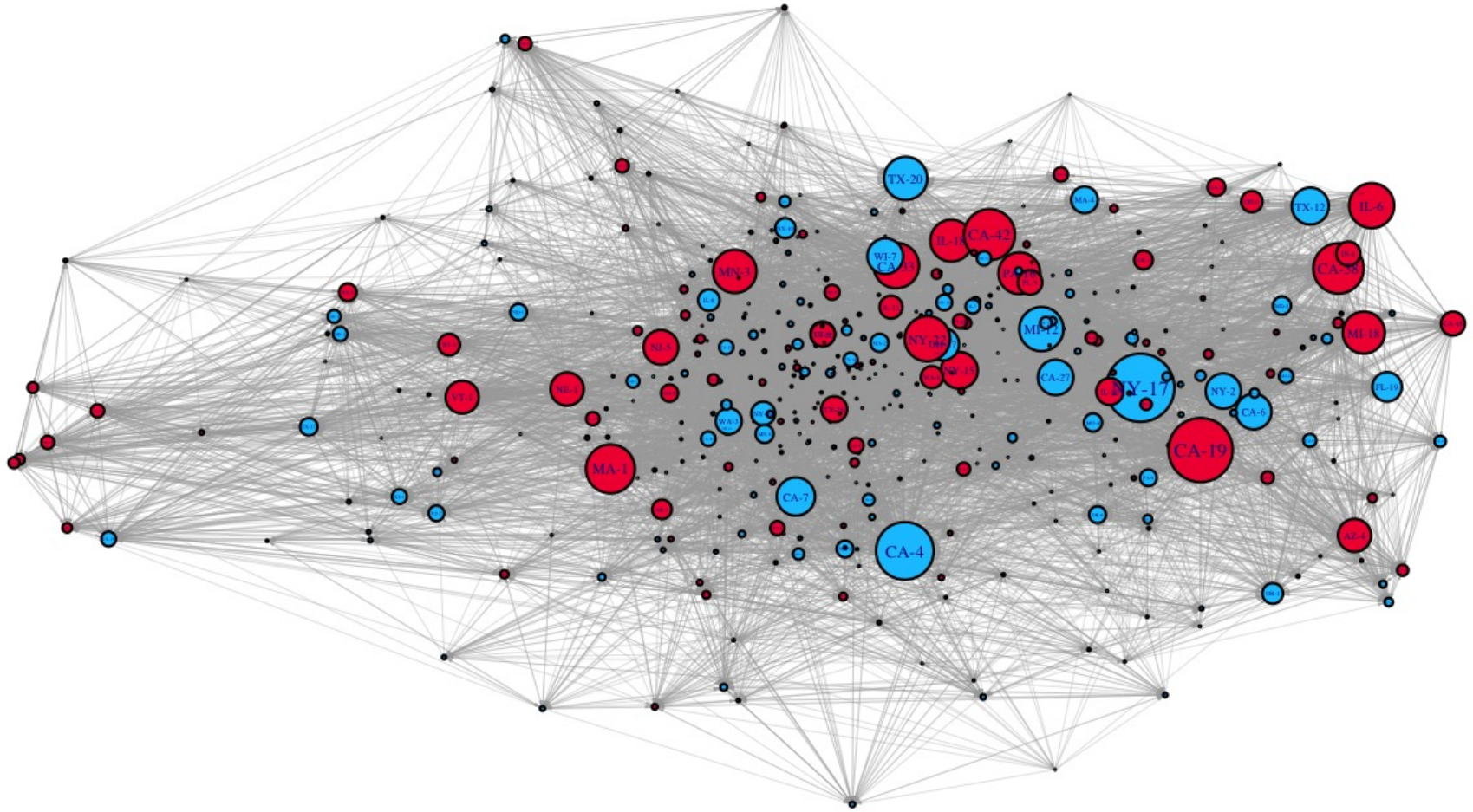

Figure 4: Speech Network of the 100^{th} Congress

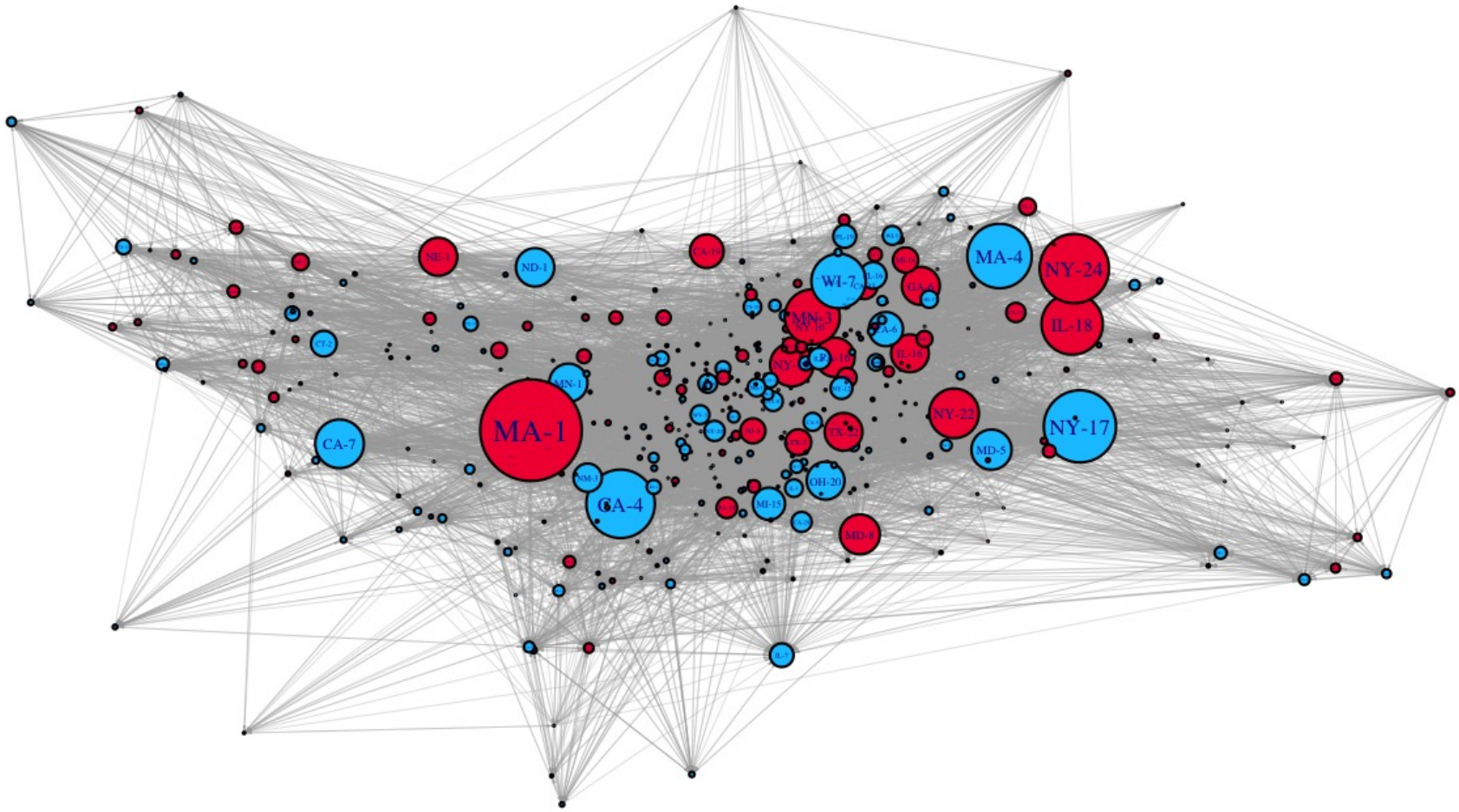

Figure 5: Speech Network of the 101st Congress

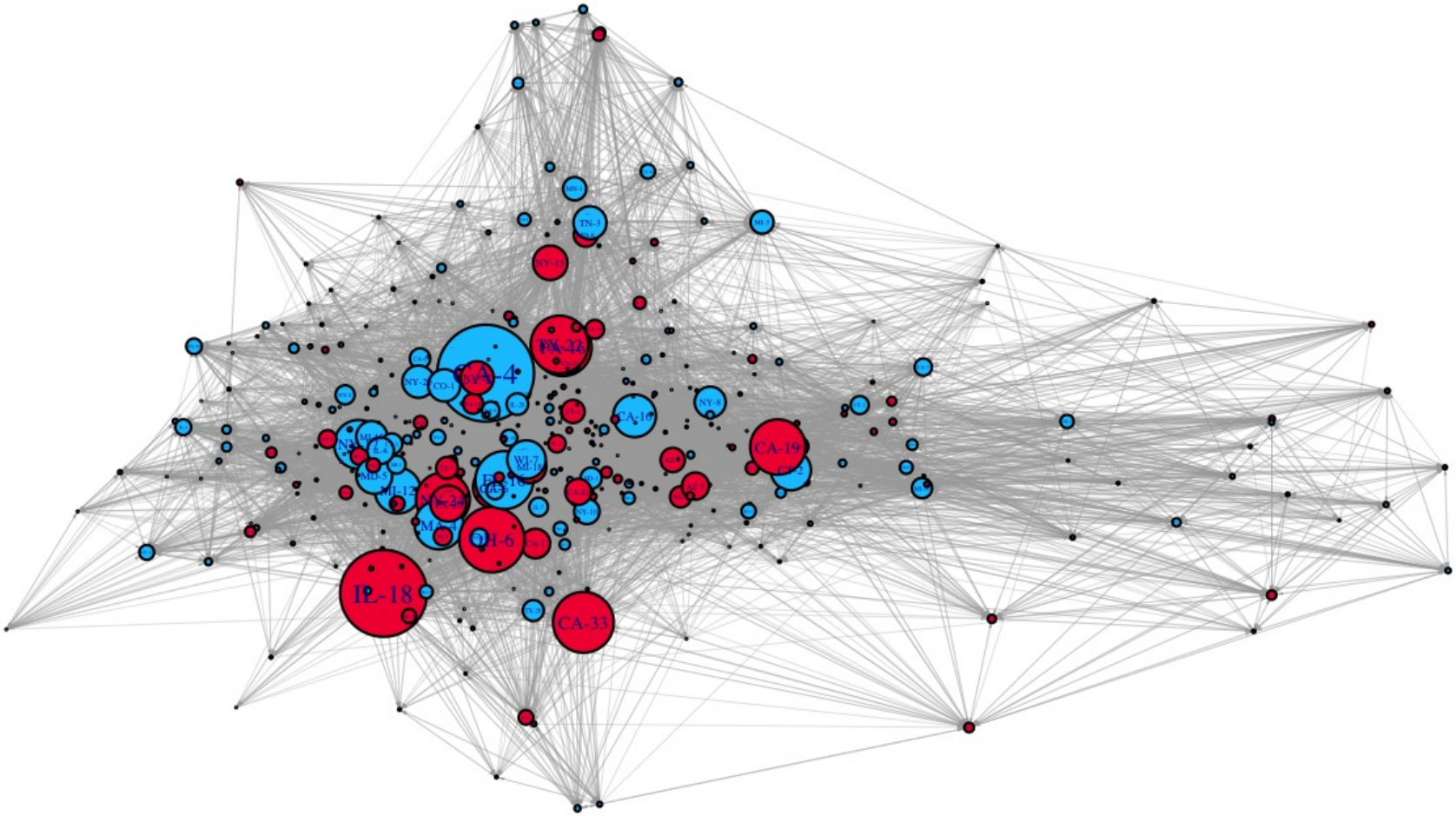

Figure 6: Speech Network of the 102nd Congress

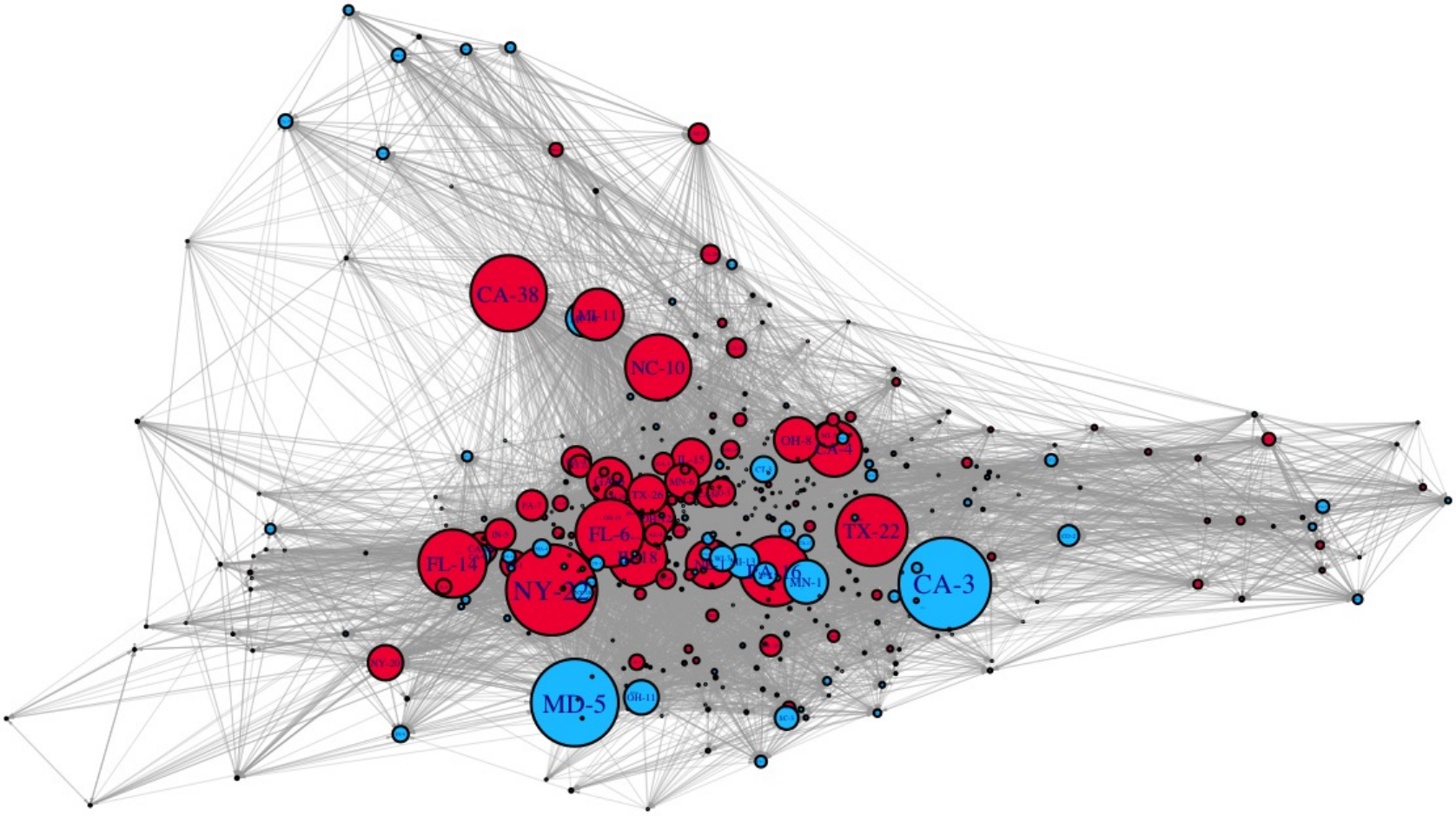

Figure 7: Speech Network of the 103rd Congress

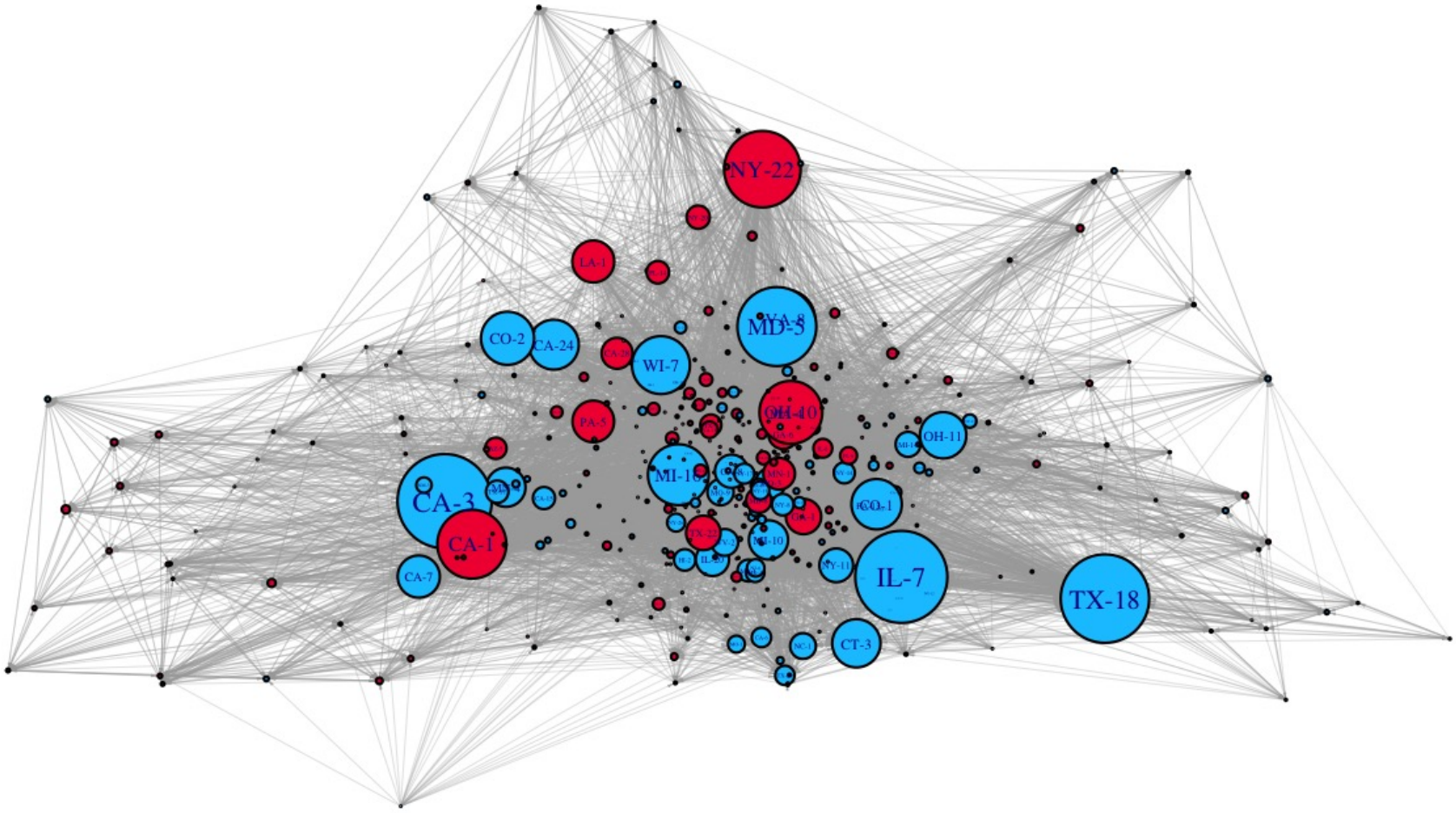

Figure 8: Speech Network of the 104$^{\text{th}}$ Congress

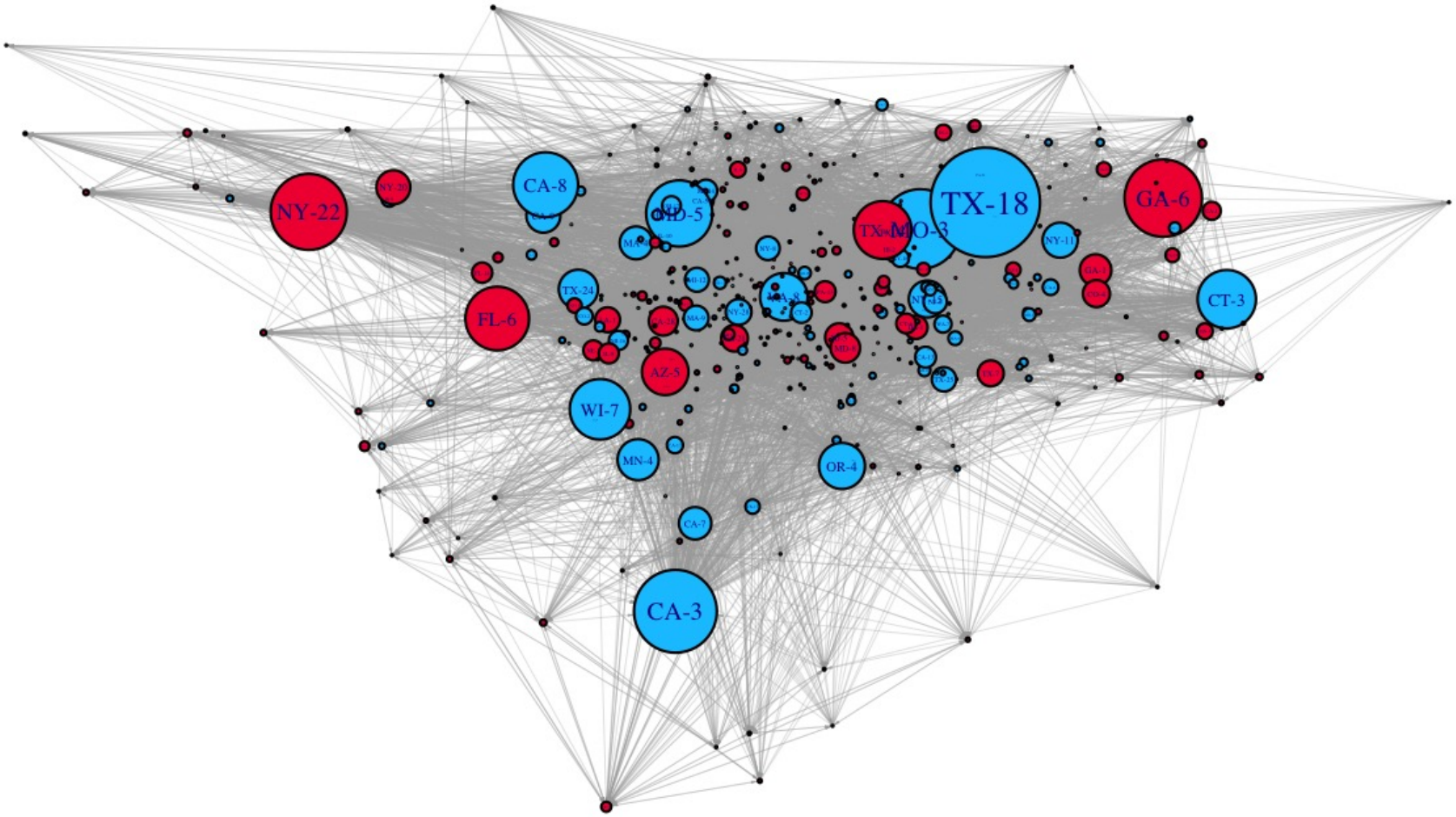

Figure 9: Speech Network of the 105$^{\text{th}}$ Congress

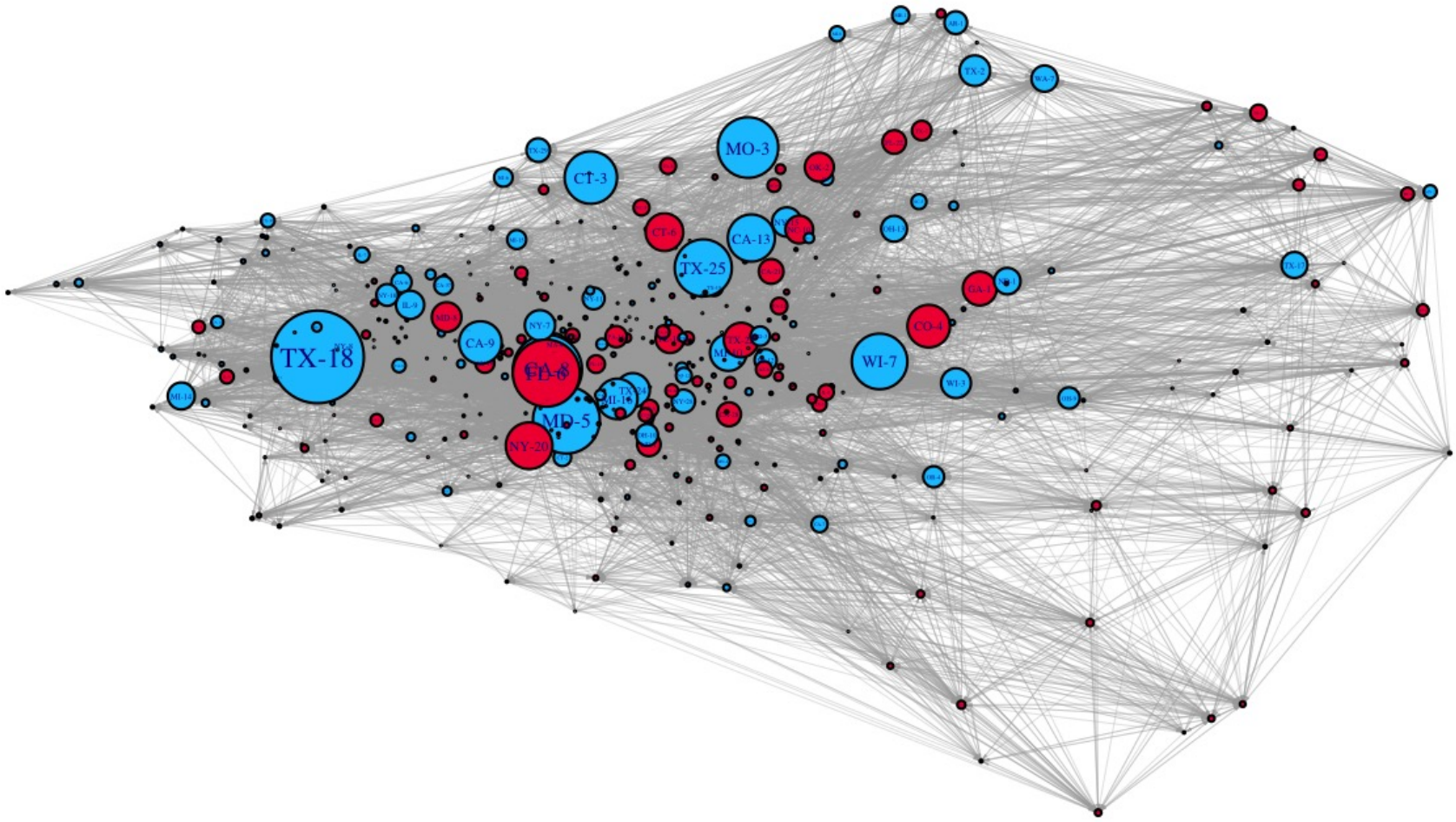

Figure 10: Speech Network of the 106$^{\text{th}}$ Congress

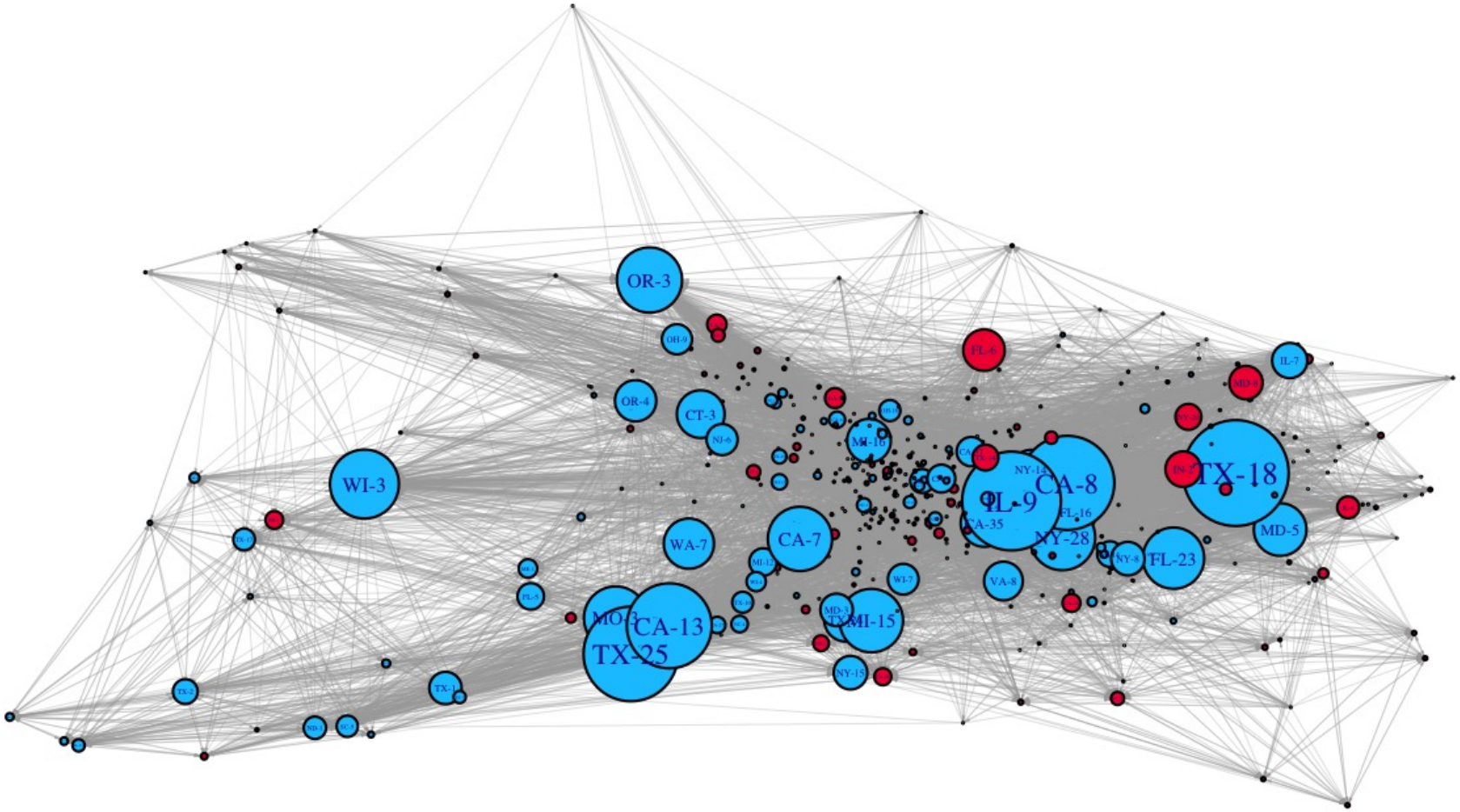

Figure 11: Speech Network of the 107$^{\text{th}}$ Congress

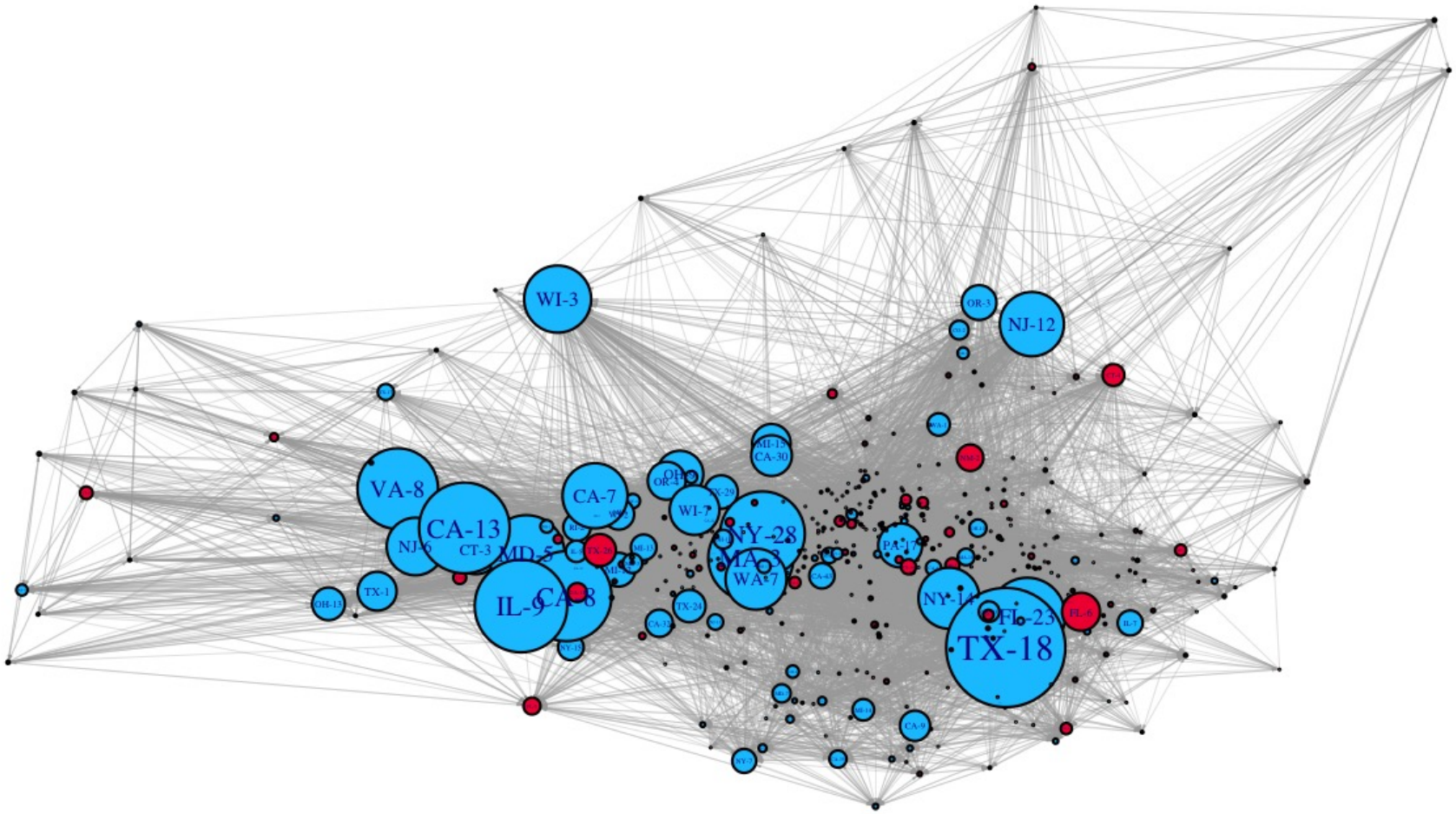

Figure 12: Speech Network of the 108$^{\text{th}}$ Congress

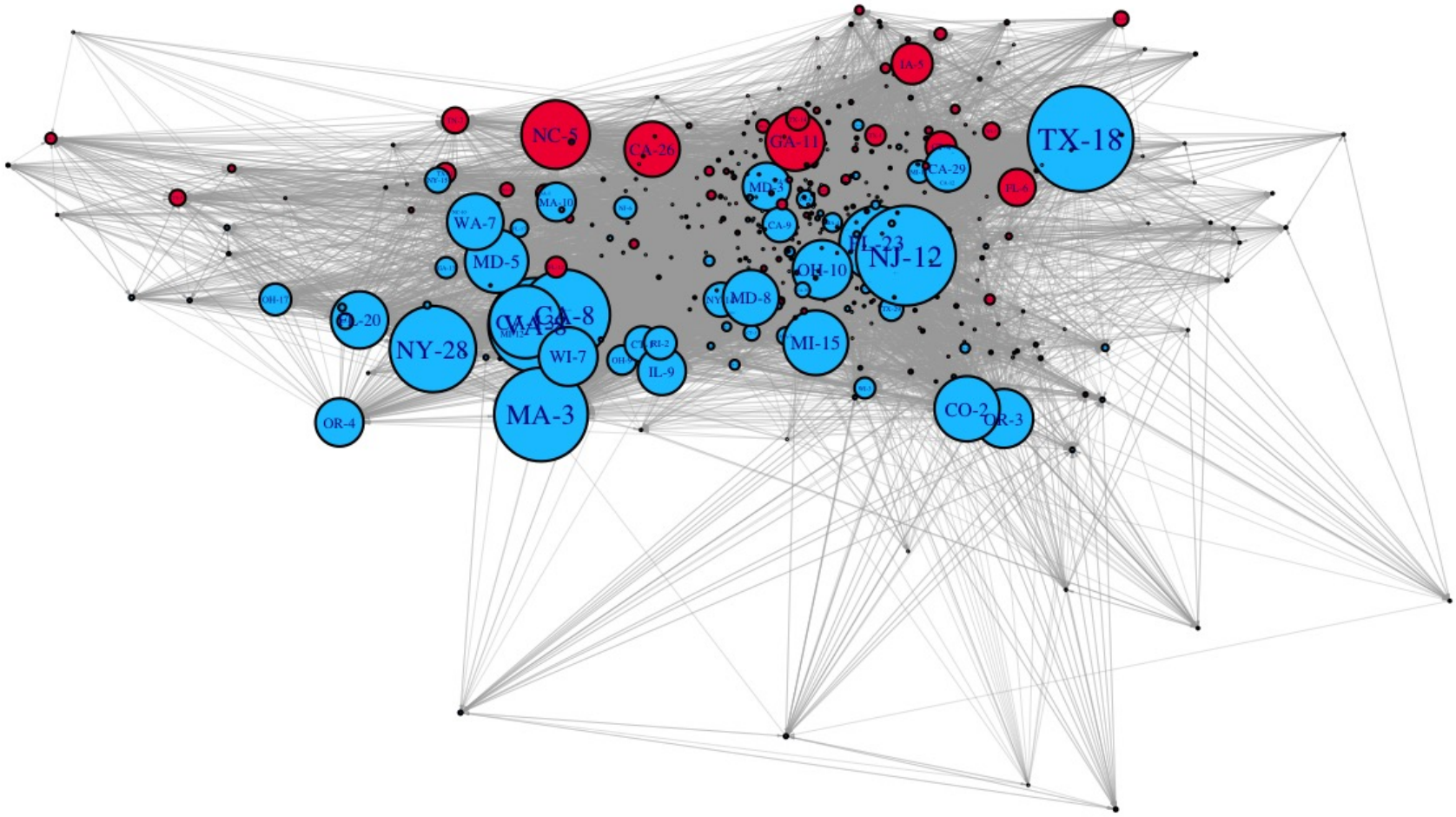

Figure 13: Speech Network of the 109$^{\text{th}}$ Congress

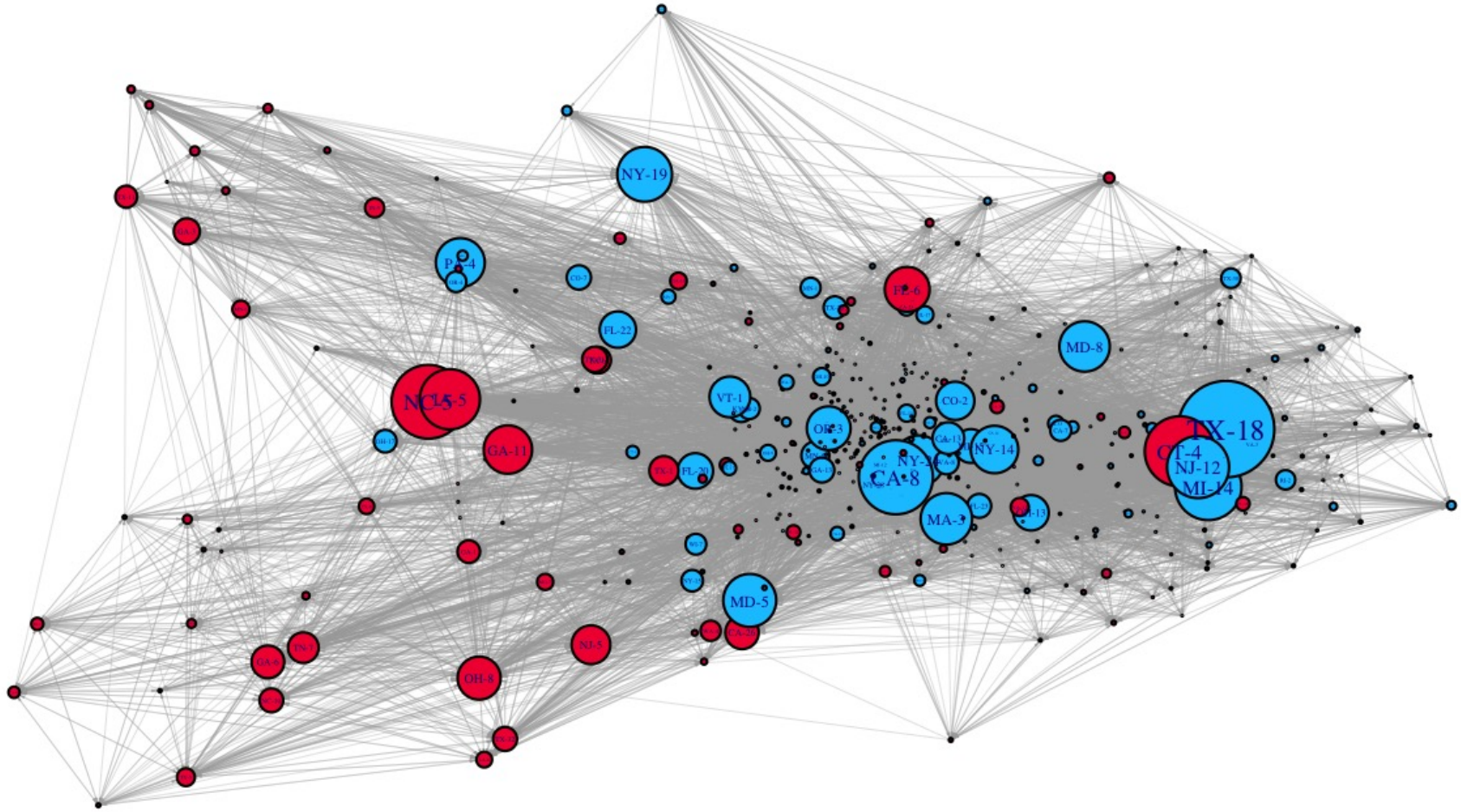

Figure 14: Speech Network of the 110$^{\text{th}}$ Congress

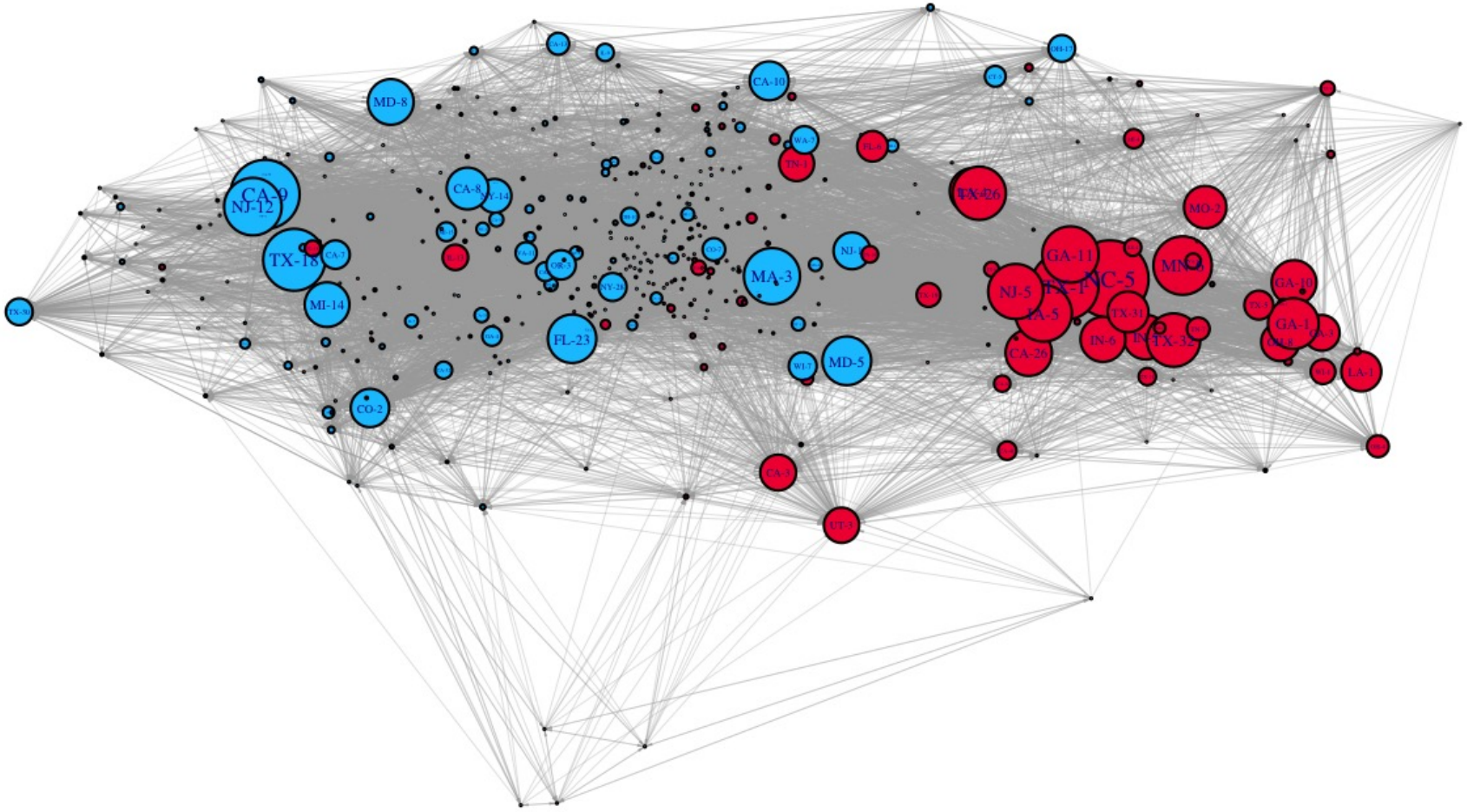

Figure 15: Speech Network of the 111$^{\text{th}}$ Congress

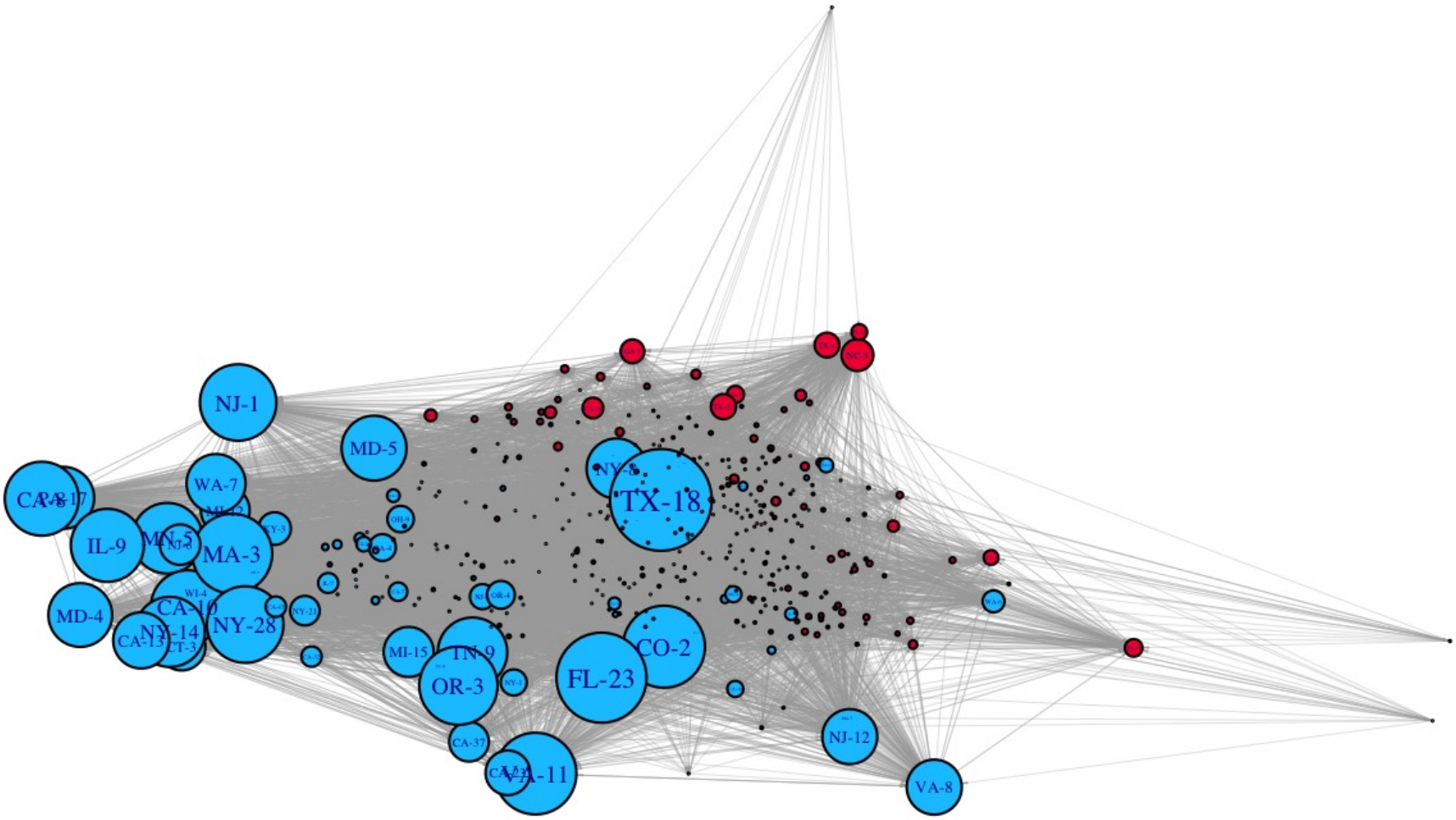

Figure 16: Speech Network of the 112$^{\text{th}}$ Congress

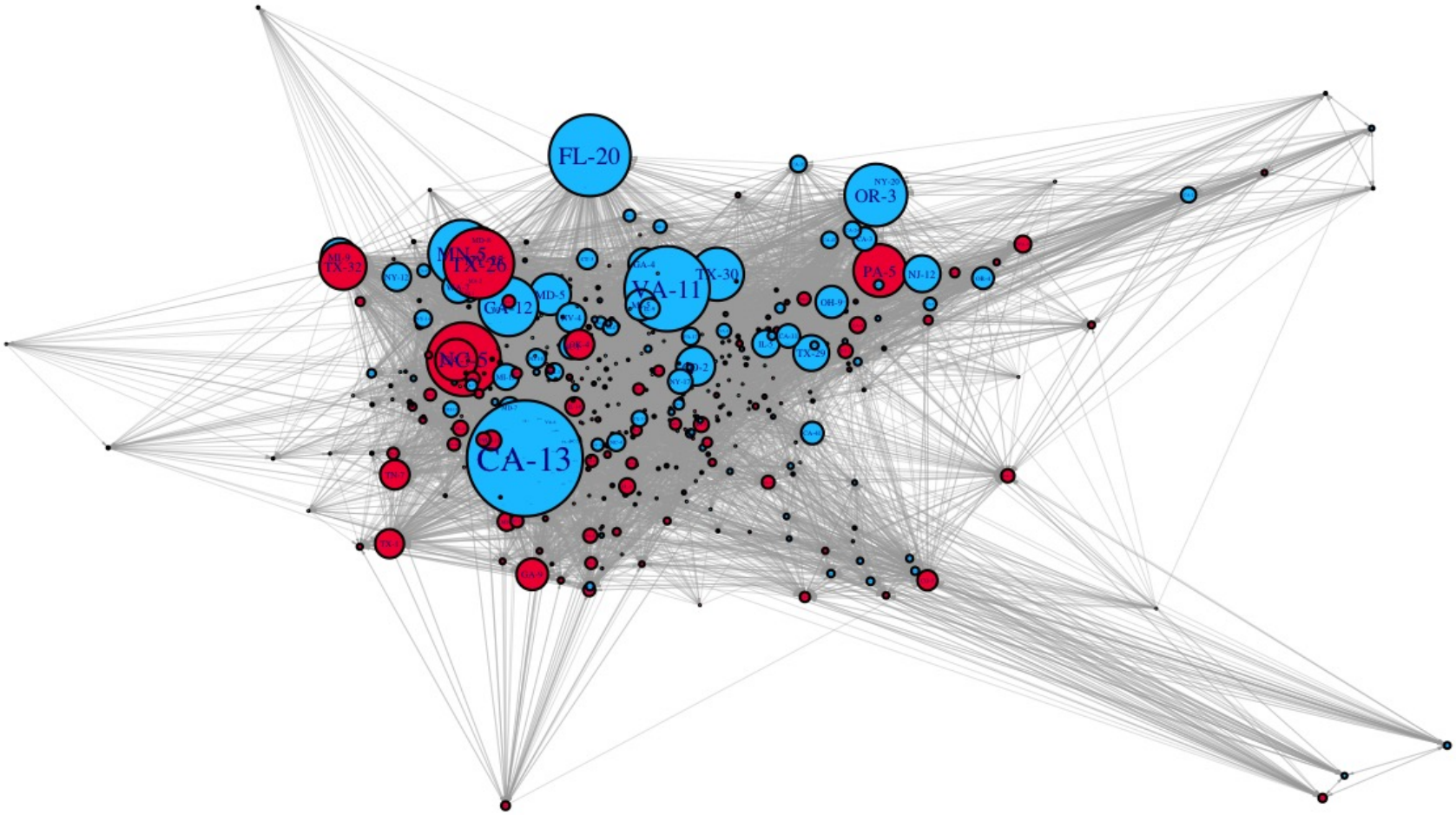

Figure 17: Speech Network of the 113$^{\text{th}}$ Congress

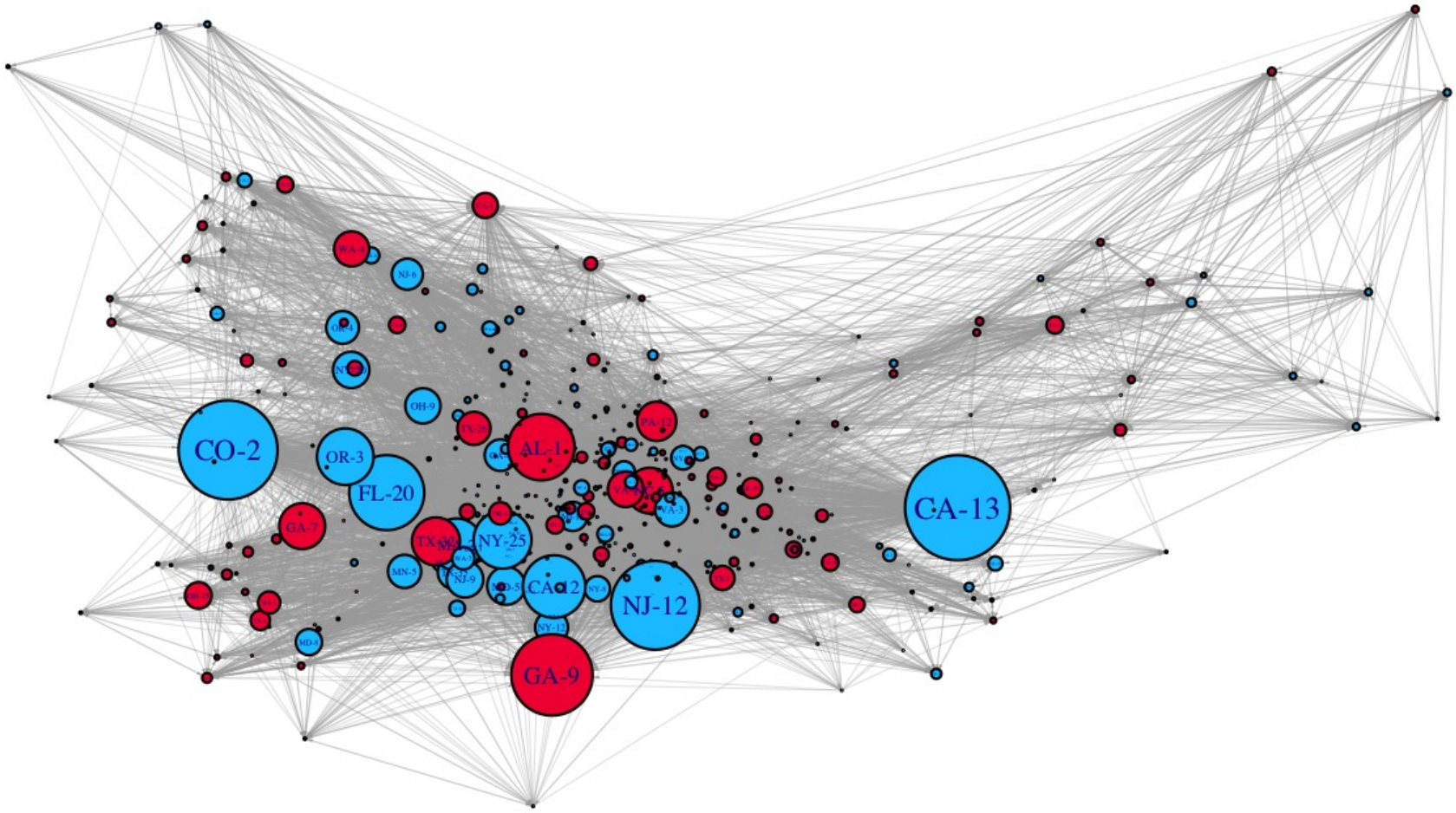

Figure 18: Speech Network of the 114$^{\text{th}}$ Congress