FB human mobility data visualization 2022 Jan -Mar

```
Yun Yueh (Sunny)
```

5/10/2022

```
library(tidyverse) ;library(plyr) ;library(readr); library(igraph);library(stringr);library(network)
library(diagram) ;library(plotrix);library("GGally")
invisible(lapply(c("ggplot2", "maps", "network", "sna"), base::library, character.only = TRUE))
```

```
mydir = "/Users/sunnyyueh/Desktop/論文/11622655397921190_2021-01-01_2021-03-01_csv"
myfiles = list.files(path=mydir, pattern="*.csv", full.names=TRUE)
```

dat_csv = ldply(myfiles, read_csv)

```
FB = dat_csv
FB$polygon1_name=str_to_title(FB$polygon1_name)
FB$polygon2_name=str_to_title(FB$polygon2_name)
Jan = FB[grep("2021-01", FB$ds),]
Feb = FB[grep("2021-02", FB$ds),]
Mar = FB[grep("2021-03", FB$ds),]
```

FB_edge=FB[c('polygon1_name','polygon2_name','metric_value')] Jan_edge=Jan[c('polygon1_name','polygon2_name','metric_value')] Feb_edge=Feb[c('polygon1_name','polygon2_name','metric_value')] Mar_edge=Mar[c('polygon1_name','polygon2_name','metric_value')] Jan_g<- graph.data.frame(Jan_edge,directed = F)</pre> Feb_g<- graph.data.frame(Feb_edge,directed = F)</pre> Mar_g<- graph.data.frame(Mar_edge,directed = F)</pre> FB_g<- graph.data.frame(FB_edge,directed = F)</pre>

FB_adj<- get.adjacency(FB_g,sparse = F)</pre> Jan_adj<- get.adjacency(Jan_g,sparse = F);heatmap(Jan_adj,Colv = NA, Rowv = NA,,main="Jan")</pre>

Jan

Bahrain Benin Montenegro The Bahamas Moldova Japan Qatar Honduras Dominican Republic Uruguay Slovakia Albania Portugal Netherlands Bangladesh San Marino Sweden Argentina Canada Mexico Hungary Togo South Korea Egypt Belgium Paraguay France Philippines Germany Brazil

Feb_adj<- get.adjacency(Feb_g,sparse = F);heatmap(Feb_adj,Colv = NA, Rowv = NA,main="Feb")</pre>

Feb Benin Malta Libya Albania Costa Rica Kuwait Uruguay Haiti Burkina Faso Bulgaria Argentina Tunisia Togo Paraguay Finland Guatemala Malaysia Peru Bhutan Hungary Saudi Arabia Sweden India Iraq Belgium Cambodia Poland Serbia Romania Germany Colombia

Mar

Mar_adj<- get.adjacency(Mar_g,sparse = F);heatmap(Mar_adj,Colv = NA, Rowv = NA,main="Mar")</pre>

Lithuania San Marino Costa Rica Mexico Puerto Rico Liechtenstein Nigeria Armenia Nepal Haiti Japan Sweden Honduras Cambodia Thailand United Kingdom Moldova Vietnam Luxembourg Bosnia And Herzegovina Turkey Germany Croatia Belgium Colombia Bolivia Jan_nw=network(Jan_adj,directed = TRUE)

Jan_nw=network(Jan_edge,directed = TRUE,multiple=TRUE) Jan_nw %v% "lat" <- as.numeric(Jan\$latitude1)</pre>

Jan_nw %v% "lon" <- as.numeric(Jan\$longitude1)</pre> Jan_nw %v% "Country"<-Jan\$polygon1_name

JAN

edges_for_plot=merge(x = Jan_edges, y = Jan[c("polygon1_name", "longitude1", "latitude1")], by.x="from",by.y='pol

Jan_edges <- get.data.frame(Jan_g)</pre>

ygon1_name',all.x=TRUE) edges_for_plot=edges_for_plot %>% distinct(from, to,metric_value, .keep_all = TRUE) edges_for_plot=merge(x = edges_for_plot, y = Jan[c("polygon2_name", "longitude2", "latitude2")], by.x="to",by.y='

polygon2_name',all.x=TRUE) edges_for_plot_Jan=edges_for_plot %>% distinct(from, to,metric_value, .keep_all = TRUE)

Feb_edges <- get.data.frame(Feb_g)</pre>

data("world.cities")

FEB

edges_for_plot=merge(x = Feb_edges, y = Jan[c("polygon1_name", "longitude1", "latitude1")], by.x="from",by.y='pol ygon1_name',all.x=TRUE) edges_for_plot=edges_for_plot %>% distinct(from, to,metric_value, .keep_all = TRUE) edges_for_plot=merge(x = edges_for_plot, y = Jan[c("polygon2_name", "longitude2", "latitude2")], by.x="to",by.y=' polygon2_name',all.x=TRUE) edges_for_plot_Feb=edges_for_plot %>% distinct(from, to,metric_value, .keep_all = TRUE) ## MAR

Mar_edges <- get.data.frame(Mar_g)</pre> edges_for_plot=merge(x = Mar_edges, y = Jan[c("polygon1_name", "longitude1", "latitude1")], by.x="from",by.y='pol ygon1_name',all.x=TRUE) edges_for_plot=edges_for_plot %>% distinct(from, to,metric_value, .keep_all = TRUE) edges_for_plot=merge(x = edges_for_plot, y = Jan[c("polygon2_name", "longitude2", "latitude2")], by.x="to",by.y=' polygon2_name',all.x=TRUE) edges_for_plot_Mar=edges_for_plot %>% distinct(from, to,metric_value, .keep_all = TRUE)

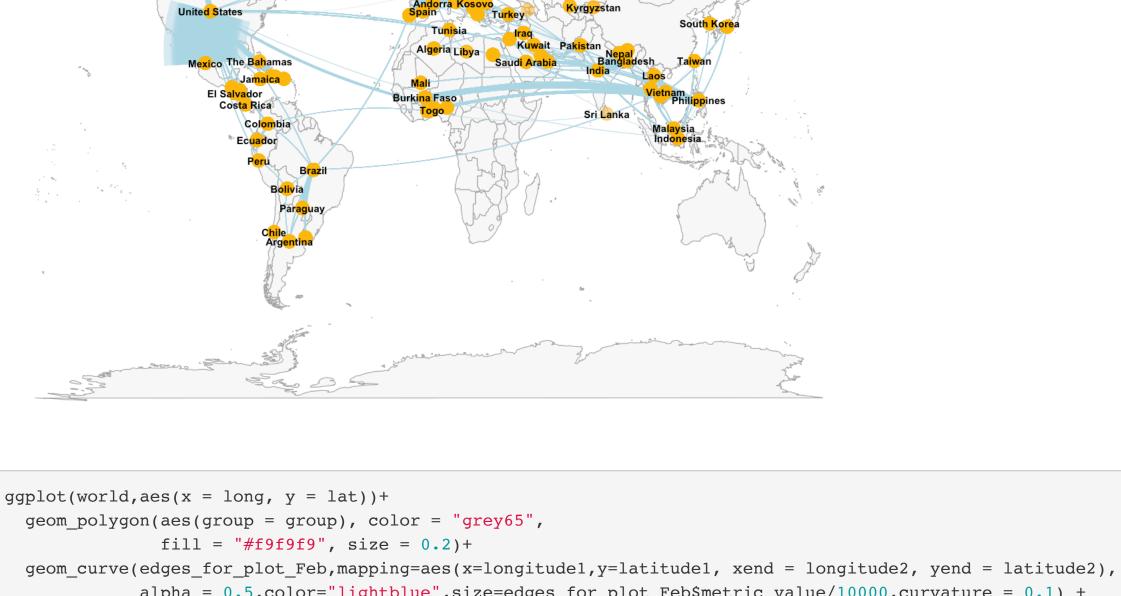
world <- fortify(maps::map("world", plot = FALSE, fill = TRUE))</pre>

maptheme <- theme(panel.grid = element_blank()) +</pre> theme(axis.text = element_blank()) + theme(axis.ticks = element_blank()) + theme(axis.title = element_blank()) + theme(legend.position = "bottom") + theme(panel.grid = element_blank()) + theme(panel.background = element_blank()) + theme(plot.margin = unit(c(0, 0, 0.5, 0), 'cm'))

ggplot(world, aes(x = long, y = lat))+geom_polygon(aes(group = group), color = "grey65", fill = "#f9f9f9", size = 0.2)+geom_curve(edges_for_plot_Jan,mapping=aes(x=longitude1,y=latitude1, xend = longitude2, yend = latitude2), alpha = 0.5,color="lightblue",size=edges_for_plot_Jan\$metric_value/10000,curvature = 0.1) + geom_point(Jan,mapping=aes(x=longitude1,y=latitude1),shape = 21, color='darkgoldenrod1',fill = 'darkgoldenrod1' , size=3, alpha=0.5)+geom_text(Jan,mapping=aes(x=longitude1,y=latitude1, label = polygon1_name), # draw text labels size = 2, color = "black",check_overlap = TRUE,fontface = "bold") + ggtitle("January 2020 human mobility") + theme(plot.title = element_text(size=14, face="bold"))+ maptheme

Warning: Removed 12 rows containing missing values (geom_curve).

January 2020 human mobility



```
alpha = 0.5,color="lightblue",size=edges_for_plot_Feb$metric_value/10000,curvature = 0.1) +
  geom_point(Feb, mapping=aes(x=longitude1, y=latitude1), shape = 21, color='darkgoldenrod1', fill = 'darkgoldenrod1'
 , size=3, alpha=0.5)+
  geom text(Feb, mapping=aes(x=longitude1, y=latitude1, label = polygon1 name),
                                                                                           # draw text labels
            size = 2, color = "black",check_overlap = TRUE,fontface = "bold") +
  ggtitle("Febuary 2020 human mobility") +
  theme(plot.title = element_text(size=14, face="bold"))+
  maptheme
## Warning: Removed 13 rows containing missing values (geom curve).
Febuary 2020 human mobility
```

geom_polygon(aes(group = group), color = "grey65", fill = "#f9f9f9", size = 0.2)+

```
ggplot(world, aes(x = long, y = lat))+
 geom_curve(edges_for_plot_Mar, mapping=aes(x=longitude1, y=latitude1, xend = longitude2, yend = latitude2),
            alpha = 0.5,color="lightblue",size=edges_for_plot_Mar$metric_value/10000,curvature = 0.1) +
 geom_point(Mar,mapping=aes(x=longitude1,y=latitude1),shape = 21, color='darkgoldenrod1',fill = 'darkgoldenrod1'
, size=3, alpha=0.5)+
  geom_text(Mar,mapping=aes(x=longitude1,y=latitude1, label = polygon1_name),
                                                                                        # draw text labels
            size = 2, color = "black",check_overlap = TRUE,fontface = "bold") +
 ggtitle("March 2020 human mobility") +
  theme(plot.title = element_text(size=14, face="bold"))+
  maptheme
```

March 2020 human mobility

Warning: Removed 2 rows containing missing values (geom_curve).

