FB human mobility data visualization 2022 Jan - Mar

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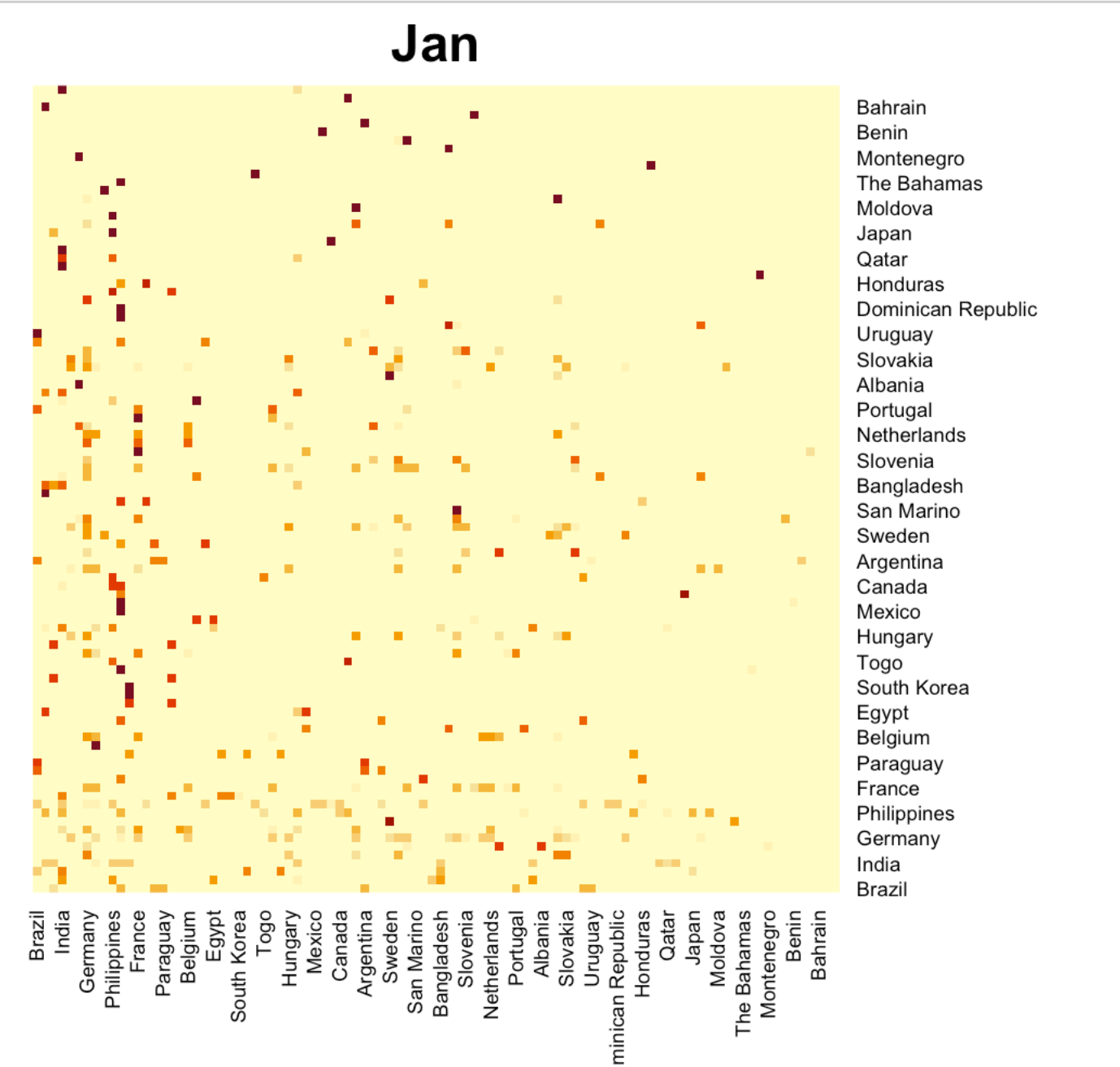
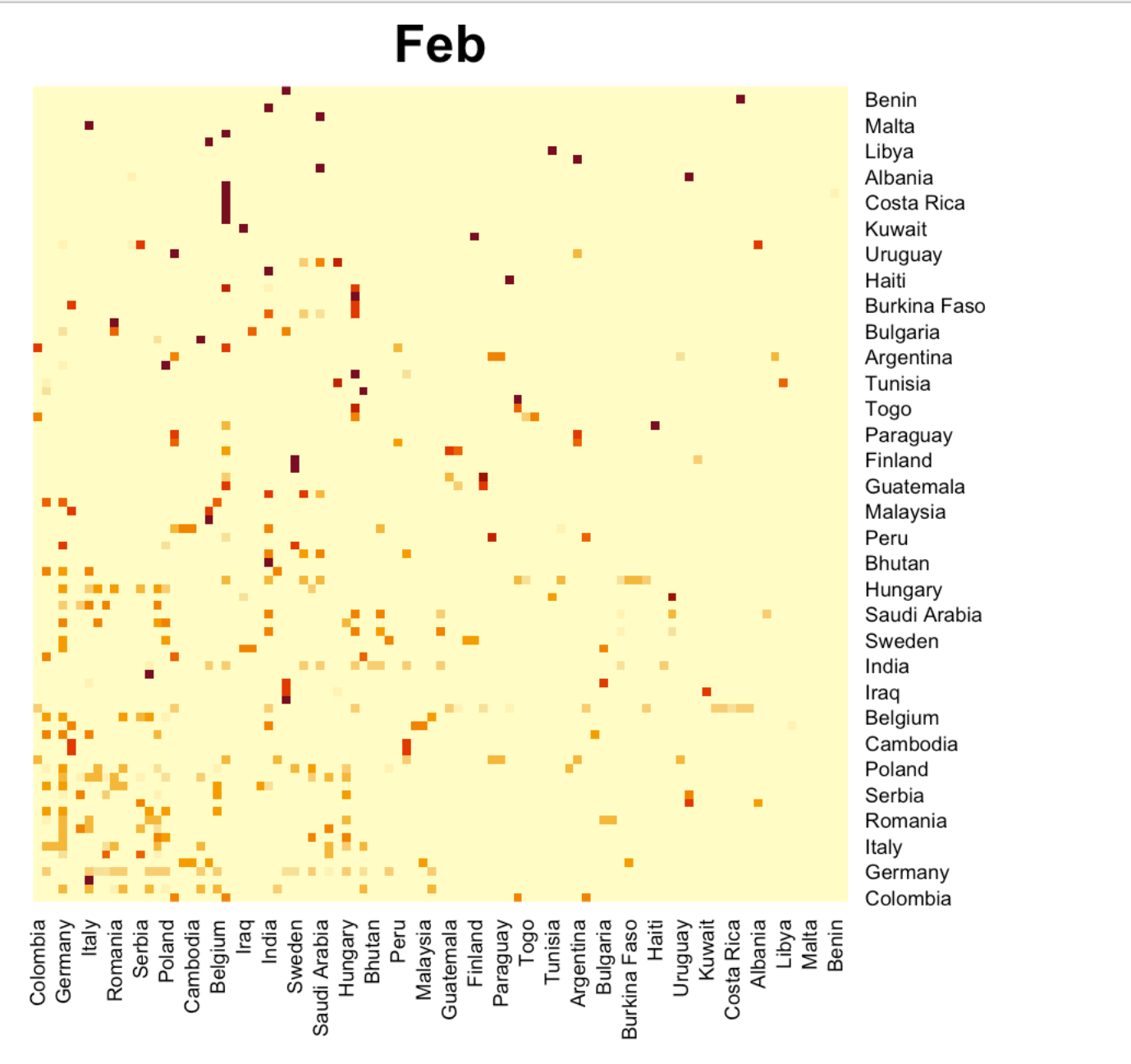
```
library(tidyverse) ;library(plyr) ;library(readr); library(igraph);library(stringr);library(network)
library(diagram)  ;library(plotrix);library("GGally")
invisible(lapply(c("ggplot2", "maps", "network", "sna"), base::library, character.only = TRUE))
```

```
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)
```

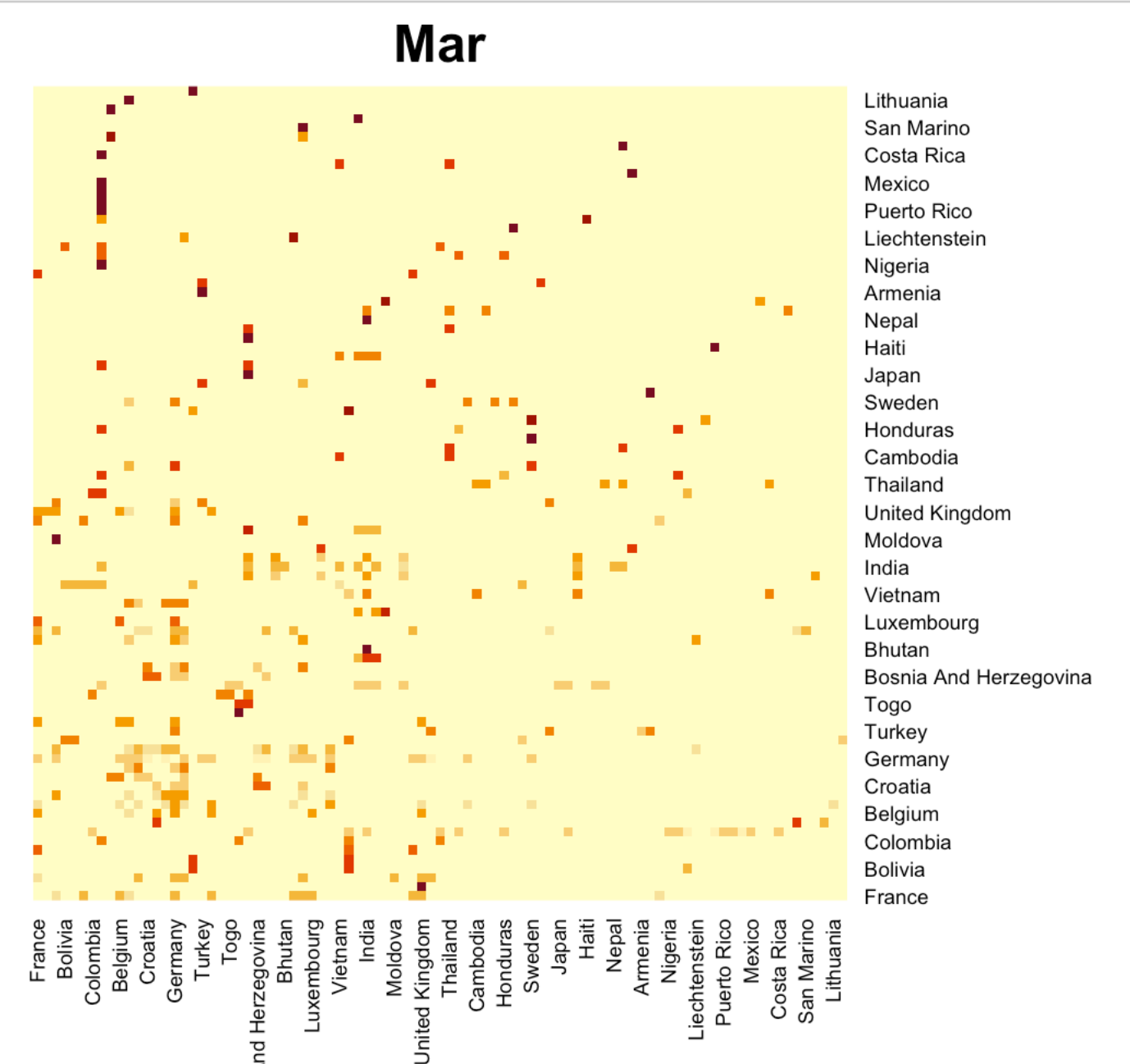
```
FB = dat_csv
FB$polygon1_name=str_to_title(FB$polygon1_name)
FB$polygon2_name=str_to_title(FB$polygon2_name)

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)
Feb_g<- graph.data.frame(Feb_edge,directed = F)
Mar_g<- graph.data.frame(Mar_edge,directed = F)
FB_g<- graph.data.frame(FB_edge,directed = F)

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




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




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



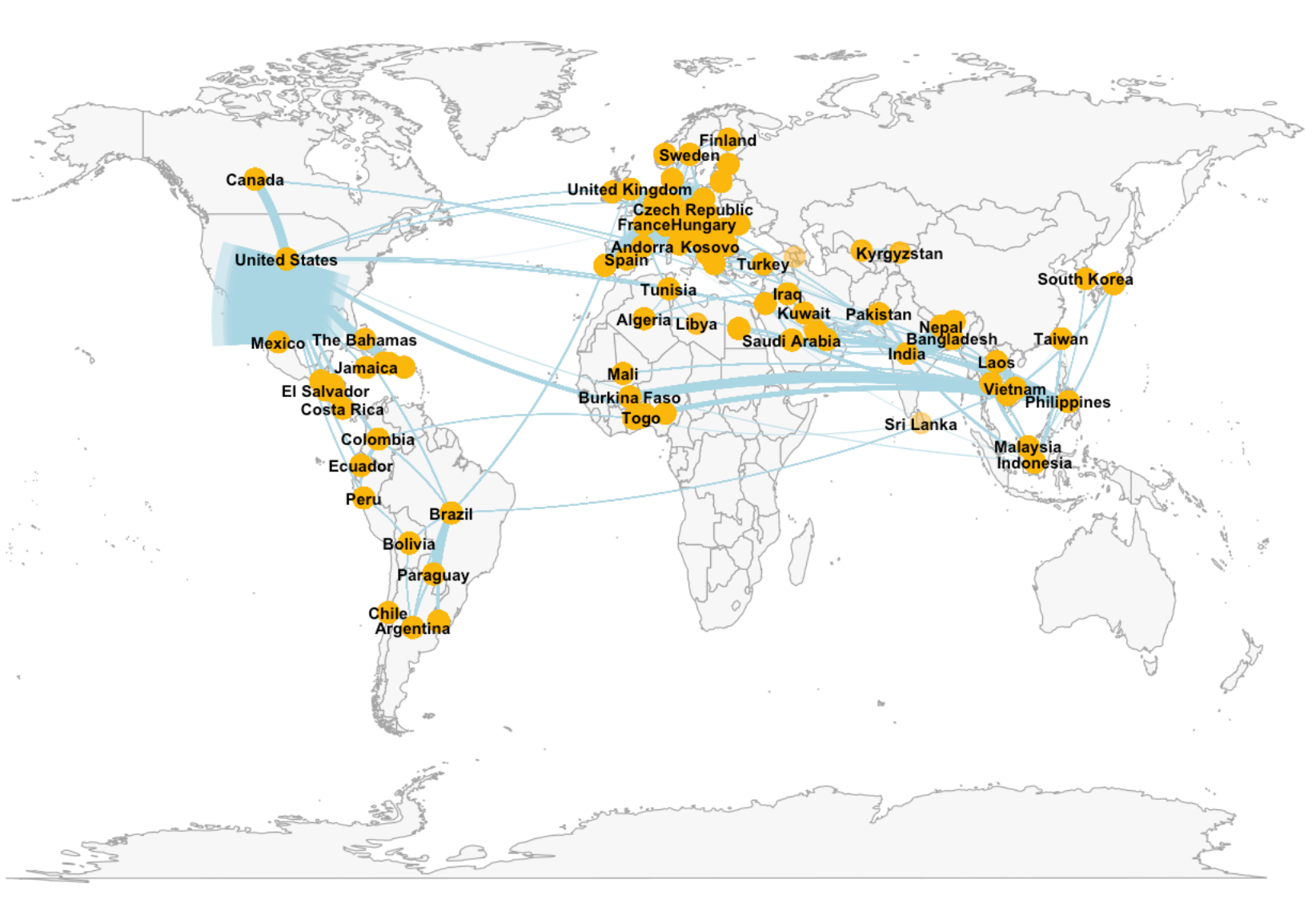

```
Jan_nw=network(Jan_adj,directed = TRUE)
Jan_nw=network(Jan_edge,directed = TRUE,multiple=TRUE)

Jan_nw %v% "lat" <- as.numeric(Jan$latitude1)
Jan_nw %v% "lon" <- as.numeric(Jan$longitude1)
Jan_nw %v% "Country"<-Jan$polygon1_name
```

```
## JAN
Jan_edges <- get.data.frame(Jan_g)

edges_for_plot=merge(x = Jan_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_Jan=edges_for_plot %>% distinct(from, to,metric_value, .keep_all = TRUE)


## FEB
Feb_edges <- get.data.frame(Feb_g)

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)

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)
```

```
data("world.cities")

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

maptheme <- theme(panel.grid = element_blank()) +
  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).
```

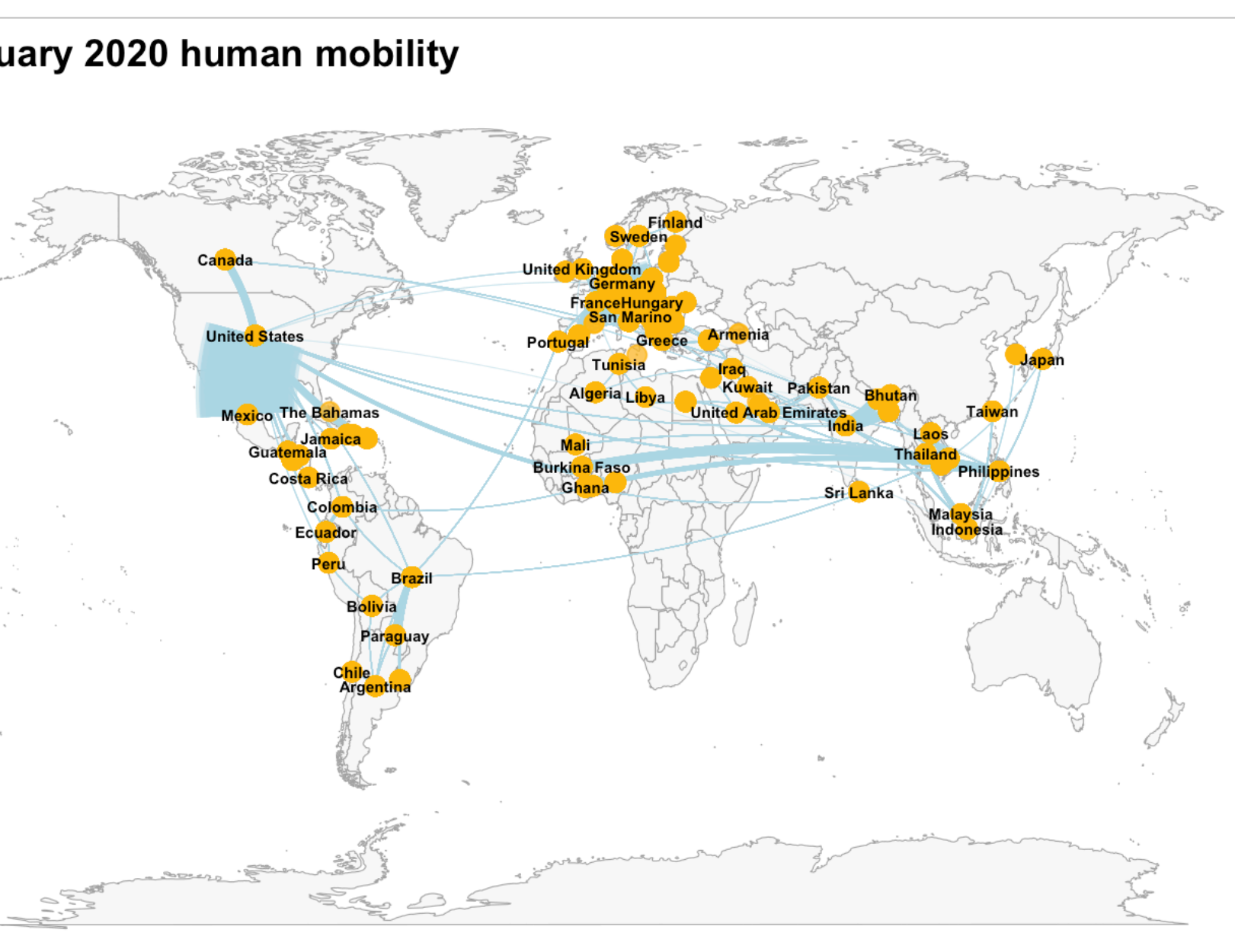
January 2020 human mobility




```
ggplot(world,aes(x = long, y = lat))+
  geom_polygon(aes(group = group), color = "grey65",
               fill = "#f9f9f9", size = 0.2)+
  geom_curve(edges_for_plot_Feb,mapping=aes(x=longitude1,y=latitude1, xend = longitude2, yend = latitude2),
             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




```
ggplot(world,aes(x = long, y = lat))+
  geom_polygon(aes(group = group), color = "grey65",
               fill = "#f9f9f9", size = 0.2)+
  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
```

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

March 2020 human mobility