2019 - 2020 Covid-19 outbreak

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Background

The 2019-2020 Covid-19 outbreak is an ongoing global outbreak of Covid-19 disease 2019 that has been declared a Public Health Emergency of International Concern. It is caused by the SARS-CoV-2 Covid-19, first identified in Wuhan, Hubei, China. Over 100 countries and territories have been affected at the beginning of March 2020 with major outbreaks in central China, South Korea, Italy, Iran, France, and Germany.

Background of the author

As a newbie in the data science world, I would like to keep up with how covid-19 is spreading everyday.

I am hoping we will get through this soon and wish the best for everyone!

Data files

I have been referring to Johns Hopkins CSSE Covid-19

https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf for current cases around the world.

Here is the link to get the data. github link

I got the world population information from https://www.worldometers.info/world-population/population-by-country/

Exploratory Data Analysis

Including the library.

```
library(tidyverse)
library(gridExtra)
library(lubridate)
library(matrixStats)
library(kableExtra)
library(leaflet)
library(mapview)
library(sf)
```

```
library(maps)
library(viridis)
options(digits=2)
```

Loading the data.

```
path <- getwd()
covid_c_US_ts <- "data/time_series_covid_19_confirmed_US.csv"
covid_d_US_ts <- "data/time_series_covid_19_deaths_US.csv"

c_US_ts <- read.csv(paste(path, covid_c_US_ts, sep = "/"), header = TRUE)
c_US_ts_col_count <- length(colnames(c_US_ts))
d_US_ts <- read.csv(paste(path, covid_d_US_ts, sep = "/"), header = TRUE)
d_US_ts_col_count <- length(colnames(d_US_ts))
```

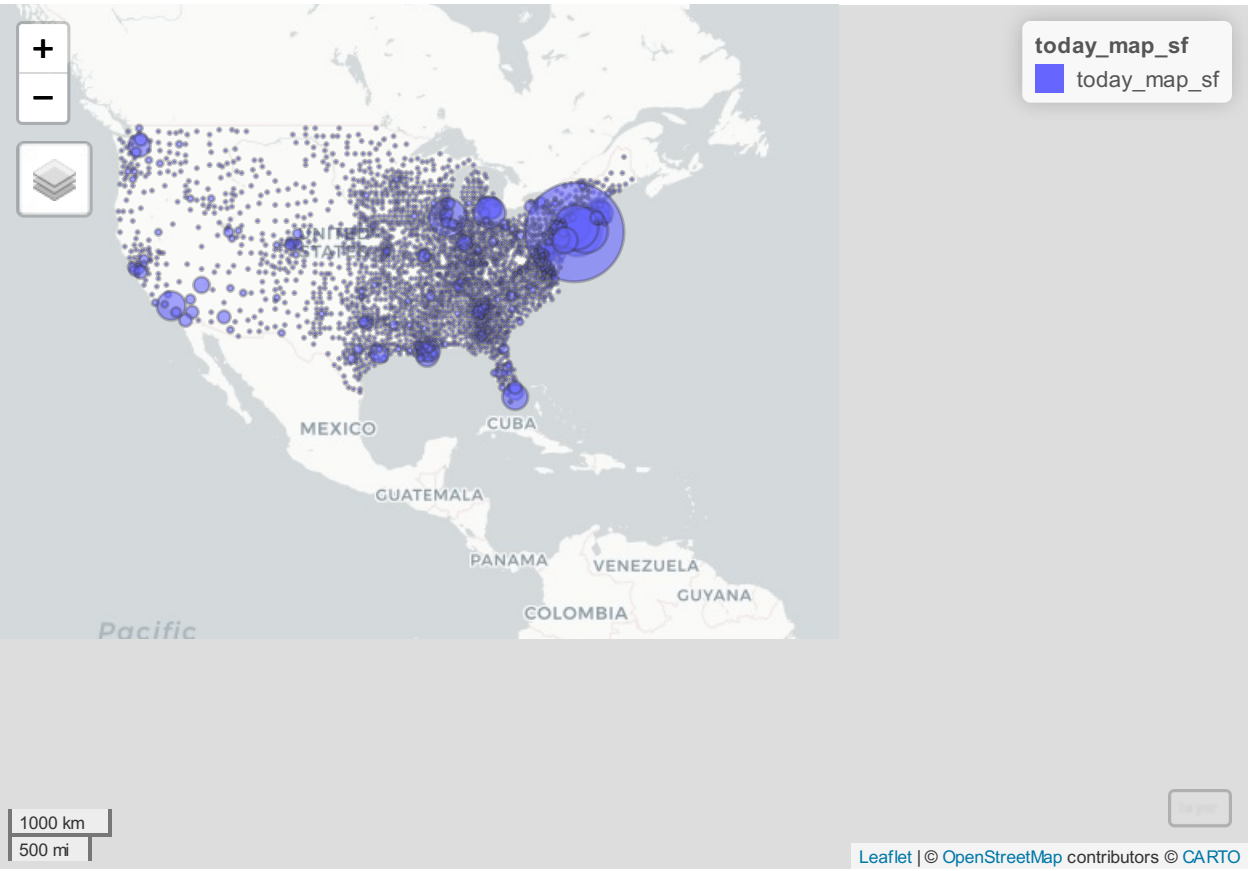
First, I get the confirmed and deaths data ready and combine them.

```
c_US <- c_US_ts %>%
    gather(Date_temp, value, starts_with("X")) %>%
    mutate(Date_temp = str_replace(Date_temp, "X", "")) %>%
    mutate(Date = as.POSIXct(strptime(Date_temp, "%m.%d.%y"))) %>%
    mutate(Confirmed = value) %>%
    select(-value)

d_US <- d_US_ts %>%
    gather(Date_temp, value, starts_with("X")) %>%
    mutate(Date_temp = str_replace(Date_temp, "X", "")) %>%
    mutate(Date = as.POSIXct(strptime(Date_temp, "%m.%d.%y")))

all_US <- cbind(c_US, Deaths = d_US$value)

# str(all_US)

today <- max(all_US$Date)
```

```
today_map <- c_US %>%
    filter(Date == today)

US_exclude <- c("American Samoa", "Guam", "Northern Mariana Islands", "Puerto Rico", "Virgin Islands",
today_map_continous <- today_map %>% filter(!Province_State %in% US_exclude) %>%
    filter(Long_ != 0 & Lat != 0) %>%
    filter(Confirmed != 0)
```

Interactive bubble map with mapview.

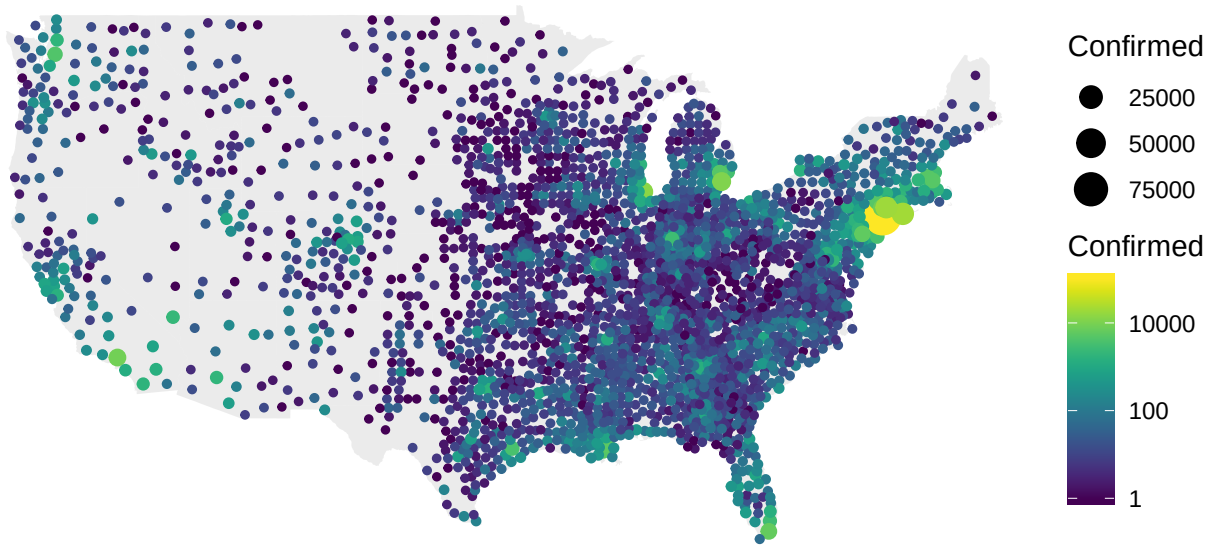
```
today_map_sf <- st_as_sf(today_map_continous, coords = c("Long_", "Lat"), crs = 4326)

cex <- sqrt(today_map_sf$Confirmed)/10
confirmed <- mapview(today_map_sf, grid = FALSE, cex = cex, alpha = 0.3)

confirmed
```




```
mapshot(confirmed, file = "US_Confirmed_bubble_mapview.png")
mapshot(confirmed, url = "US_Confirmed_bubble_mapview.html")
```

static bubble map with ggplot2.

```
# https://www.r-graph-gallery.com/330-bubble-map-with-ggplot2.html

# get the US map from world

# help(package = "maps")

US_map <- map_data("state")

p <- ggplot() + geom_polygon(data = US_map, aes(x = long, y = lat, group = group), fill = "grey", alpha
    geom_point(data = today_map_continous, aes(x = Long_, y = Lat, size = Confirmed, color = Confirmed)
    # scale_size_continuous(trans = "log10") +
    scale_color_viridis(trans = "log10") +
    theme_void() + coord_map()

p
```

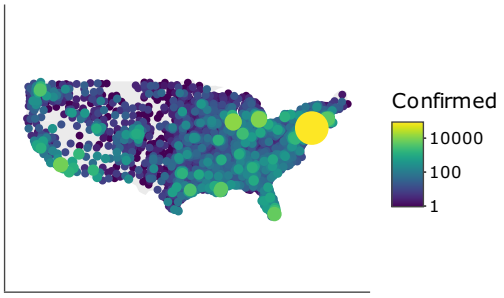


Interactive bubble map with plotly

```
library(plotly)
library(htmlwidgets)

today_map_continous_ordered <- today_map_continous %>%
  arrange(Confirmed) %>%
  mutate(Combined_Key = factor(Combined_Key, unique(Combined_Key))) %>%
  mutate(mytext = paste("City,State,Country: ", Combined_Key, "\n", "Confirmed cases: ", Confirmed, sep

p2 <- today_map_continous_ordered %>%
  ggplot() +
  geom_polygon(data = US_map, aes(x = long, y = lat, group = group), fill = "grey", alpha = 0.3) +
    geom_point(aes(x = Long_, y = Lat, size = Confirmed, color = Confirmed, text = mytext)) +
    # scale_size_continuous(trans = "log10") +
    scale_color_viridis(trans = "log10") +
    theme_void() + coord_map()
```

```
## Warning: Ignoring unknown aesthetics: text
```

```
p2 <- ggplotly(p2, tooltip = "text")
p2
```




```
saveWidget(p2, file = paste0(getwd(), "/US_Confirmed_Bubble_plotly.html"))
```

Static choropleth with tmap

```
library(tigris)
library(tmap)
us_geo <- tigris::states(class = "sf")
```

```
##   |                                                                              |
```

```
# plot(st_geometry(us_geo))
# str(us_geo)
today_c_by_state <- today_map %>% group_by(Province_State) %>%
  summarize(Confirmed = sum(Confirmed)) %>%
  ungroup() %>%
  mutate(Province_State = as.character(Province_State))

combined <- inner_join(us_geo, today_c_by_state, by = c("NAME" = "Province_State"))
# qtm(combined, fill = "Confirmed")
```

```
combined_continuous <- combined %>% filter(REGION != 9) %>%
  filter(!STUSPS %in% c("AK", "HI"))

tm_shape(combined_continuous, projection = 5070) +
  tm_polygons(col = "Confirmed", style = "log10")
```