# Review

# Overview

Review of ggplot

Review of other class material

If there is time/interest

- Bonus features of ggplot:  special geoms, animation, interactive graphics

# Announcements

Midterm exam is on Thursday

- Bring a pen and a pencil
- One page (2 sides) of notes on code and equations
  - You will turn in this page of notes with your exam

Office hours this week

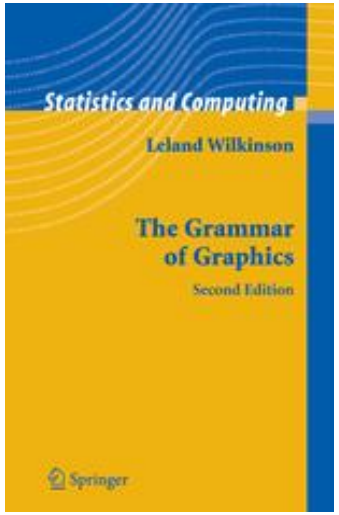
- I will have my office hours on zoom and in person on Wednesday at 11:30am
- No TA office hours

# Review of the grammar of graphics and ggplot

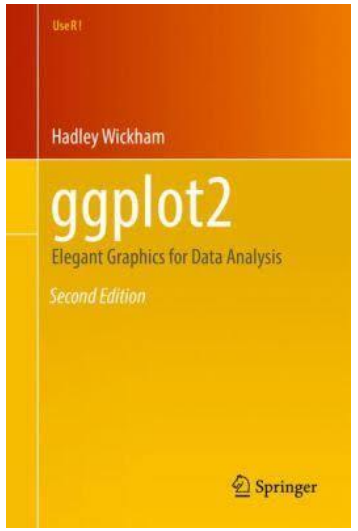
# The grammar of graphics

Leland Wilkinson noticed similarities between many graphs and tried to generate a ‘grammar’ that could be used to express a graph

- i.e., a list elements that can be combined together to create a graph




Hadley Wickham implemented these ideas in R in the ggplot2 package



# Graphs are composed of…

**A Frame**: Coordinate system on which data is placed

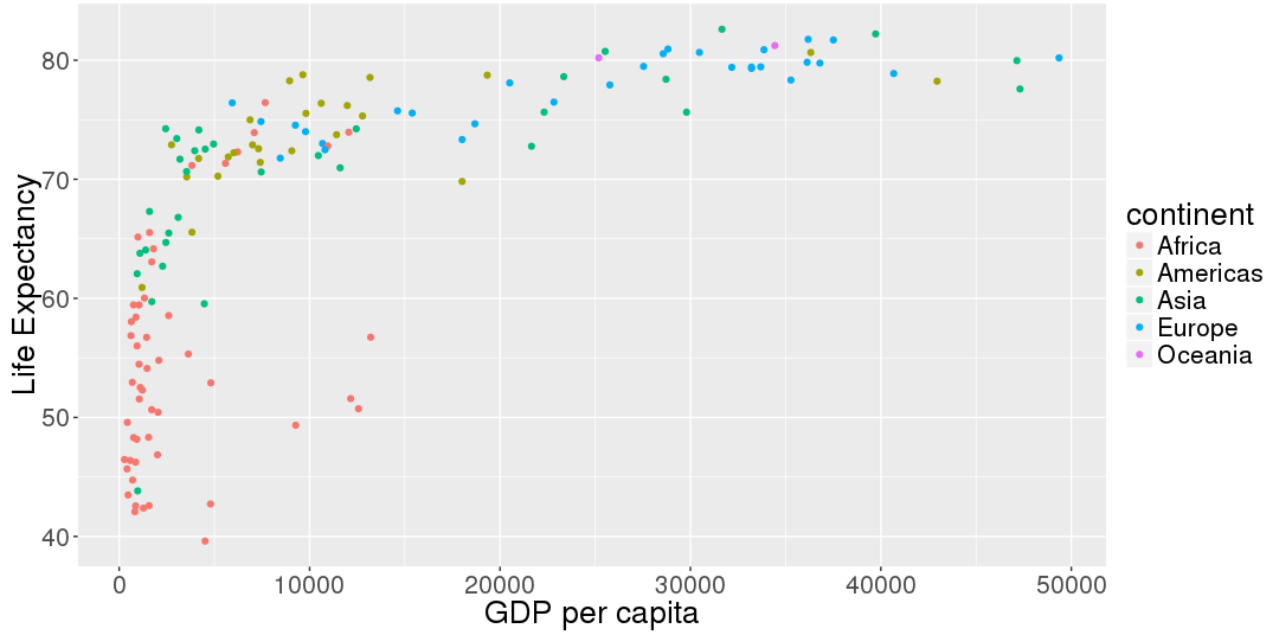
- ggplot() +

**Glyphs**: basic graphic unit representing cases or statistics

- Data is **mapped** onto these aesthetics such as: shape, color, size, etc. and/or aesthetics can be set to a fixed value
  - geom_point(aes(x = gdpPercap, y = lifeExp, color = continent)) geom_point(aes(x = gdpPercap, y = lifeExp), color = "red")

**Scales and guides**: shows how to interpret axes and other properties of the glyphs

- scale_x_continuous(trans = "log10") scale_color_brewer(type = "qua", palette = 2)



# Plots can also contain…

**Facets**: allows for multiple side-by-side graphs based on a categorical variable

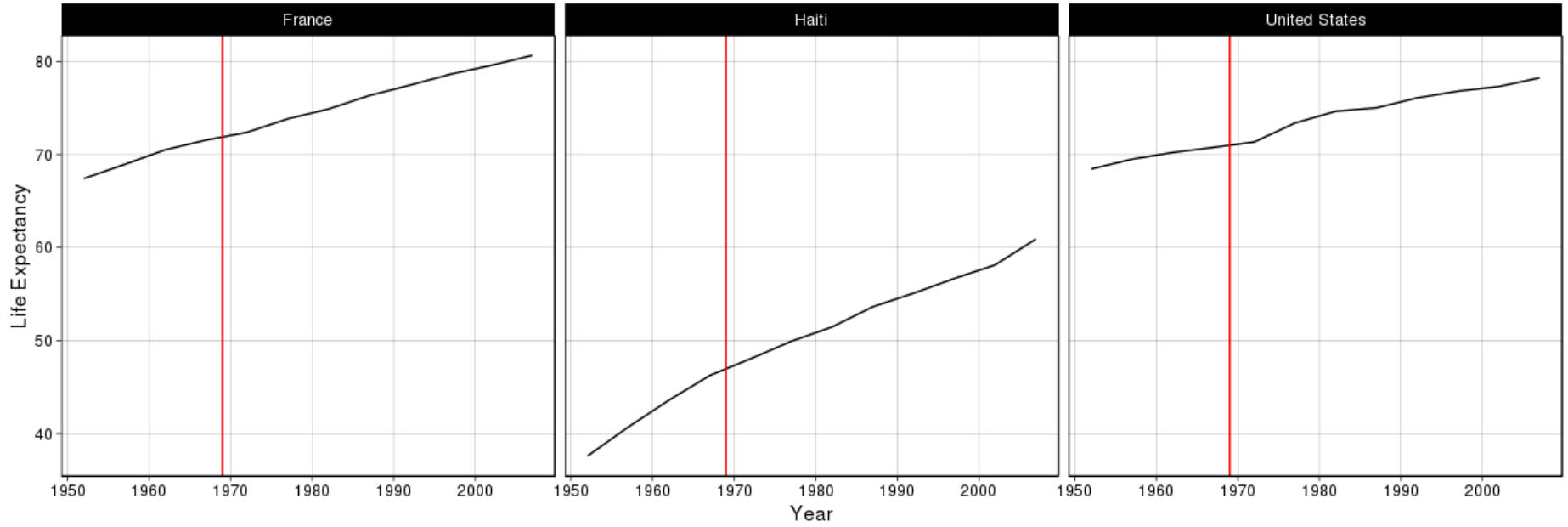
- facet_wrap(~country)

**Layers:** allows for more than one types of data to be mapped onto the same figure

- geom_vline(xintercept = 1969, col = "red")

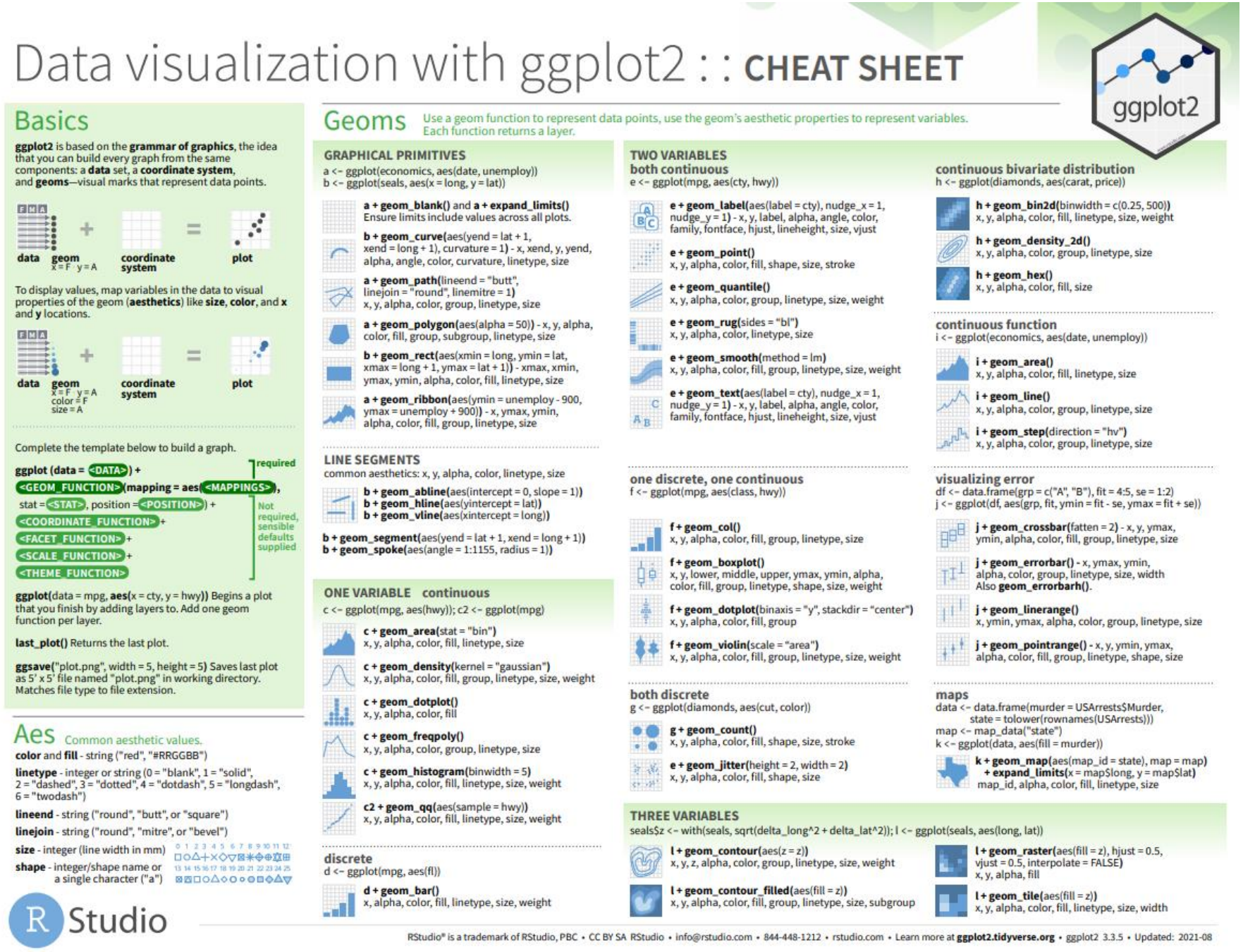
**Theme**: contains finer points of display  (e.g., font size, background color, etc.)

- theme_wsj()



# Questions?

[ggplot2 cheat sheet]



# Review

Let's create groups of ~4 people and spend ~6 minutes:

1. Go around a mention any questions you have about the material covered in class

2. See if you can answer questions that others have

3. Write down questions that your group could not answer and we can go over them as a class

# ggplot bonus features

# Additional geometries: emoGG

There are also additional packages that add more geoms

```
>  library(emoGG)

> ggplot(mtcars, aes(wt, mpg)) +
        geom_emoji(emoji="1f697")
```

# Plotly – interactive plots

```
> library(plotly)

p <- ggplot(gapminder, aes(x = gdpPercap, y = lifeExp,
        size = pop, col = continent, frame = year)) +
        geom_point() +
        scale_x_log10()

ggplotly(p)
```

# Animation

We can create animated images (gifs) using the gganimate package

```
> library(gganimate)
> library(gapminder)
```

In the gapminder video, Hans had the following mapping:

- x = gpd per capita
- y = life expectancy
- size = population
- color = continent
- frame = year

# Recreating gapminder plot

```
ggplot(gapminder, aes(gdpPercap, lifeExp, size = pop)) +
   geom_point(alpha = 0.7, show.legend = FALSE) +
   scale_x_log10() +
   facet_wrap(~continent) +
    # Here comes the gganimate specific bits
    labs(title = 'Year: {frame_time}’,
              x = 'GDP per capita', y = 'life expectancy') +
    transition_time(year) +
    ease_aes('linear')
```

# Data visualization

What interesting data visualizations did you find?