Introduction to $\mathcal{R}$

Session 4: ggplot2 Graphics

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October 11/12, 2018

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Introduction

A Taste of ggplot2

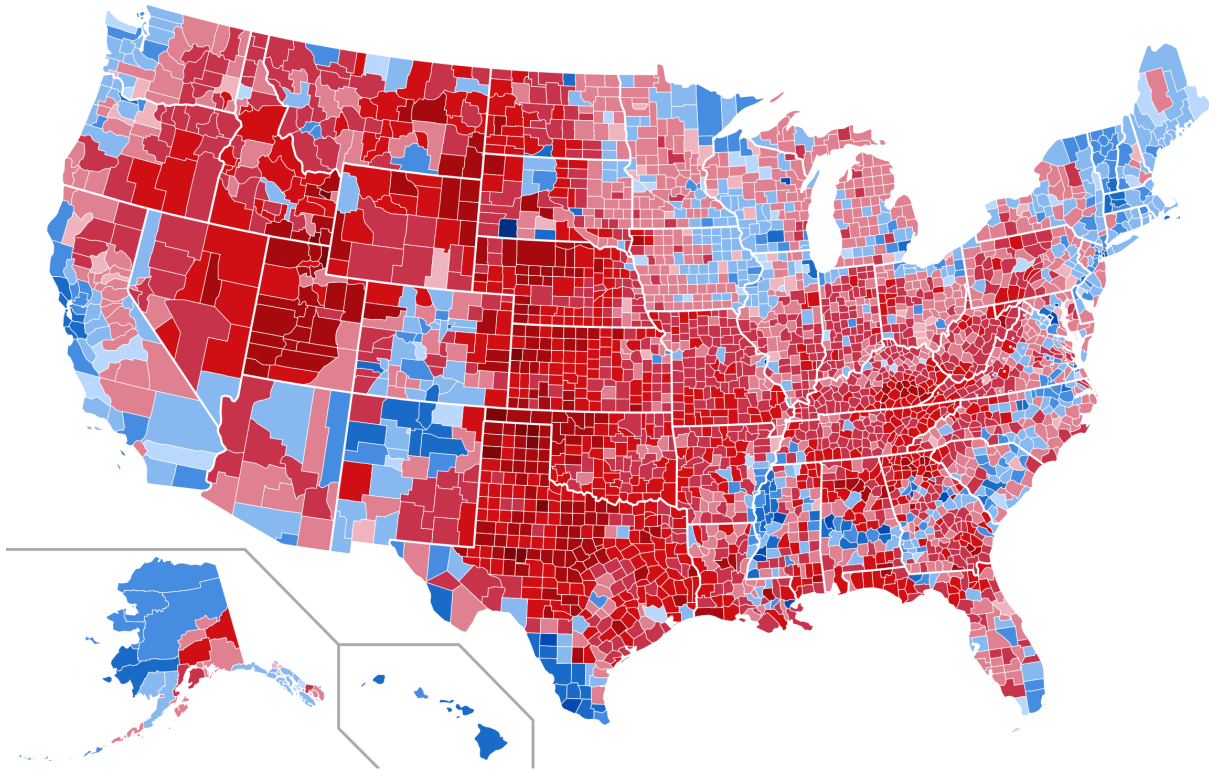
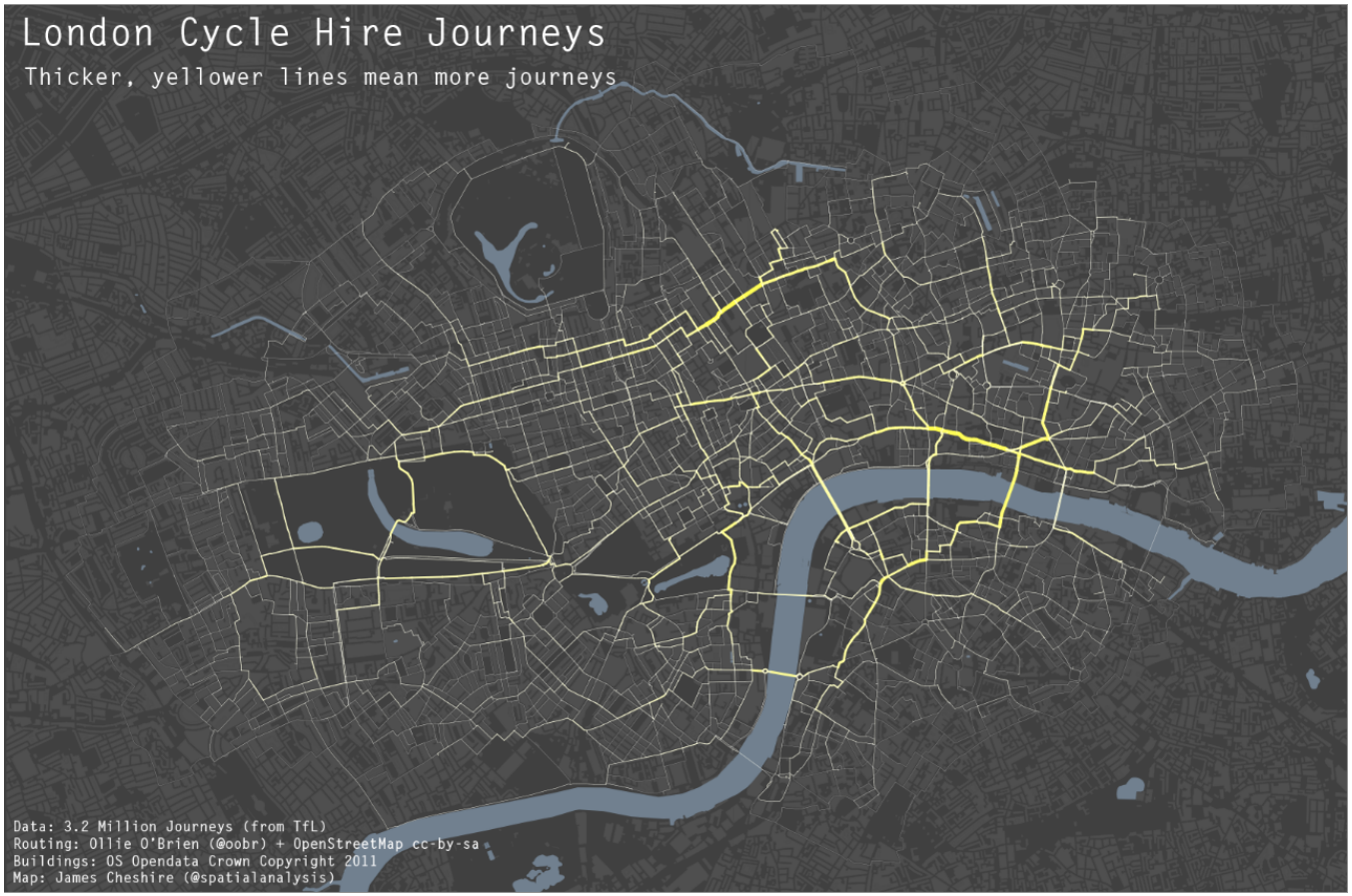


Figure 1: Vote Share in the 2012 Presidential Elections by County[2]

[2] Healan, K. forthc. Data Visualization. A Practical Introduction. https://socviz.co/maps.html (last access: 10/03/2018).

More Tasting: London Bicycle Routes[3]

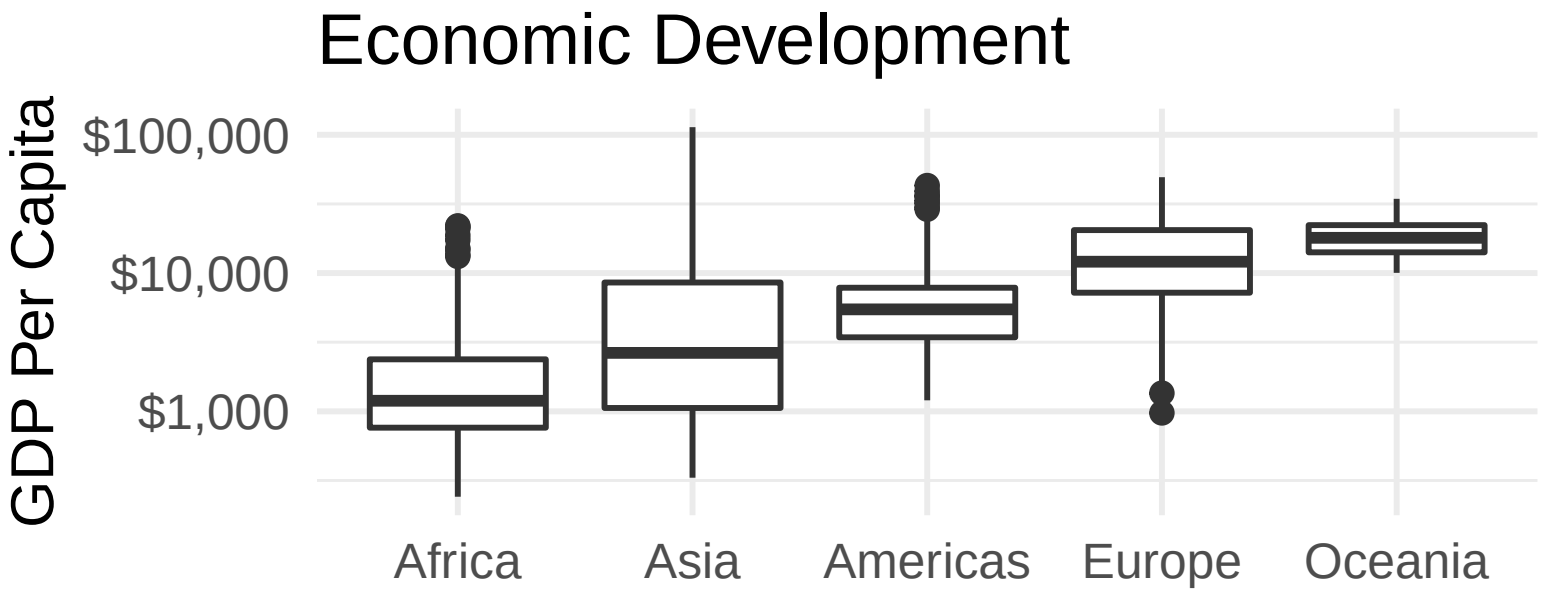


[3] Cheshire, J. 2012. Great maps with ggplot2. http://spatial.ly/2012/02/great-maps-ggplot2/ (last access: 10/06/2018).

More Tasting: Hierarchical Edge Bundling[4]

[4] Holtz, Y. 2017. The R Graph Gallery. https://www.r-graph-gallery.com/311-add-labels-to-hierarchical-edge-bundling/ (last access: 10/06/2018).

More Modesty: We will create this graph together.



Source: Gapminder.

Outline

What is ggplot2?

Graphics Engines in $\mathcal{R}$

- Three major graphics systems in $\mathcal{R}$
  - base graphics: ships with $\mathcal{R}$[5]
  - lattice developed by Deepayan Sarkar
  - ggplot2 developed by Hadley Wickham
- all build on Paul Murrell's grid Graphics
- All differ remarkbly on usability & quality of output

[5] Check out Nathan Yau's tutorials at Flowing Data.

What's the buzz about ggplot2?

- Implements the Grammar of Graphics[6]

  "In brief, the grammar tells us that a statistical graphic is a mapping from data to aesthetic attributes (colour, shape, size) of geometric objects (points, lines, bars)."[7]

- Very generic, schematic approach to data viz
- Flexible themes & fast, high quality results
- Many users, active community, numerous extension
  - create animations, networks, maps, etc.

[6] Wilkinson, L. 1999/2005. The Grammar of Graphics. New York: Springer Science + Business.

[7] Wickham, H. 2009. ggplot2. New York: Springer Science + Business.

How do you talk to ggplot2?

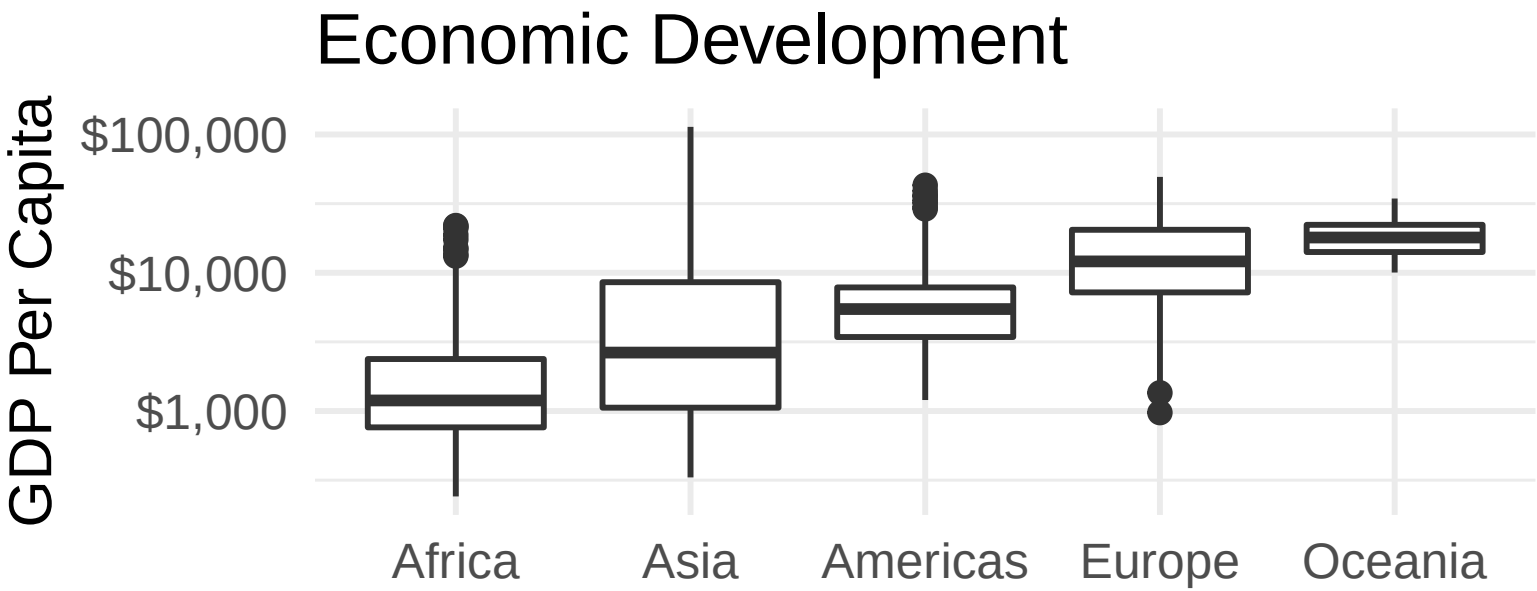
Intuition

- Idea: map data (e.g., gender) to visual plot elements (e.g., shapes)
  - a.k.a. aesthetic mappings
- Answer the following questions for ggplot2:
  1. What is your data is?
  2. What relationships you want to see?
  3. How do you want to see it?
  4. What additional information do you want to see?
  5. What scales, axes, labels should be swown?

A schematic for making a plot

```
p <- ggplot(
    data = <data>, # 1. What is your data?
    mapping = aes( # 2. What var's map unto the plot?
        <aesthetic> = <variable>, # x
        <aesthetic> = <variable>, # y
        <...> = <...> # colour, fill, shape, size,
          # alpha, ...
    )
) + # Add layers to your plot
  geom_<type>(<...>) + # Define your plot type
  scale_<mapping>_<type>(<...>) +  # Adjust scales
  coord_<type>(<...>) + # Adjust co-ordinates
  labs(<...>) # Label plot elements
ggsave(file = <...>, plot = <...>, ...) # Save ur work
```

Our target graph



Source: Gapminder.

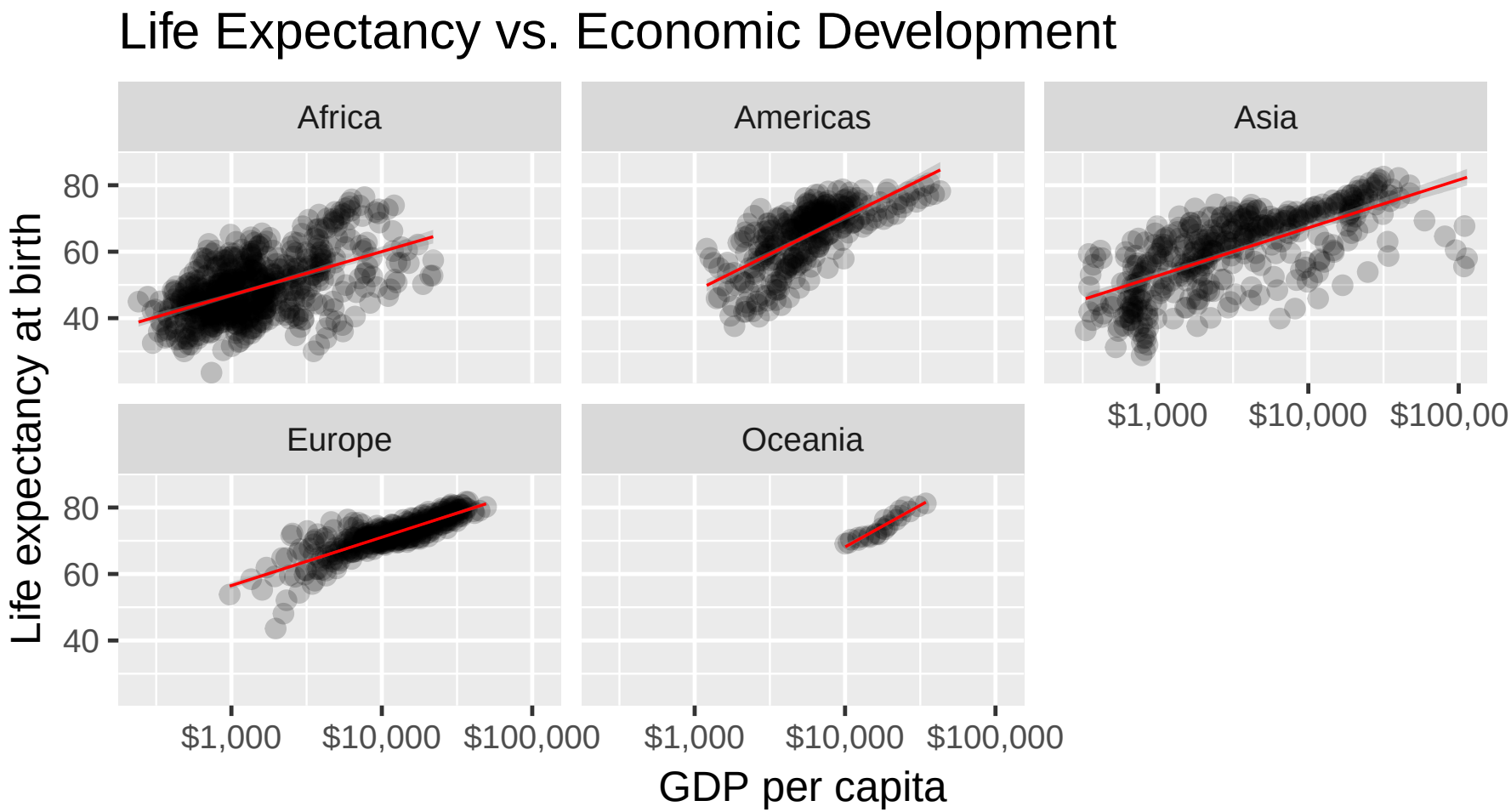
- Install and load packages ggplot2 and gapminder.
- Answer questions 1-5 on paper.
- Use the generic schematic and tidyverse to generate the plot.

Summary

Summary

- There are three major graphics engines: base, ggplot, lattice.
- ggplot2's attraction
  - very generic, schematic approach to viz
  - fast, visually pleasing results
- Principle strategie:
  a. Map data to plot elements
  b. Layer plot elements
- Read Healan, K. forthc. Data Visualization. A Practical Introduction. https://socviz.co/maps.html (last access: 10/03/2018).

Self-practice: Replicate these figures.



Self-practice: Replicate this figure.