ggplot Examples
ggplot Examples
ggplot = “grammar of graphics”

- Set of (grammatical) rules for creating graphics
- Each graphic made up of several independent components
- Each component can be manipulated individually
- And components can be combined in various ways
ggplot’s “Parts of Speech”

- **data**: noun/subject
- **aes**: adjectives
- **geom**: verb
- **stat**: adverb
- **position**: preposition

We will focus on learning how to use **data**, **aes**, and **geom**.
ggplot’s “Sentences”, etc.

- Individual components combine to make a layer (sentence)
- Can layer layers on top of one another (paragraph)
- String it all together with + (punctuation)
Key concepts

- **Layers**: We build `ggplot2` objects by piling one or more layers on top of one another. Each layer contains data, aesthetics, geometry, etc.
- **Aesthetics**: `aes` refer to the information in the plot.
  - For example, the variables associated with the x and y axes.
- **Geometric objects**: `geom` describes how the information is displayed.
  - For example, a scatter plot or a bar plot.

We build up a plot by combining different layers using the `+` operator!
The process

1. define data and aesthetic

   ```r
   ggplot.object <- ggplot(data = dataframe,
                           aes(x = var1, y = var2))
   ```

2. add a layer with, for example, the bar geom, or the point geom

   ```r
   ggplot.object <- ggplot.object + geom_bar()
   ggplot.object <- ggplot.object + geom_point()
   ```

3. show the plot

   ```r
   ggplot.object
   ```
Example: Using ggplot to plot iris data

**STEP 1**

We use the `data` parameter to specify the data frame. We use the `aes` parameter to specify the variables to display.

```r
my_plot <- ggplot(data = iris,
                  aes(x = Species, y = Sepal.Length))
```

This statement creates a ggplot object using the prescribed data and aesthetic.
Bar Plot

STEP 2

We use the `geom_bar` function, to specify that the geometry we want is bars.

```r
bar_plot <- my_plot + geom_bar()
```

This statement adds the geometry layer to the existing ggplot object.
Bar Plot

STEP 3

Display our bar plot:

```
bar_plot
```
**Scatter Plot**

**STEP 1**

We use the `data` parameter to specify the data frame.
We use the `aes` parameter to specify the variables to display.

```r
my_plot <- ggplot(data = iris,
                  aes(x = Petal.Width, y = Petal.Length))
```

This statement creates a ggplot object using the prescribed data and aesthetic.
**Scatter Plot**

**STEP 2**

We use the `geom_point` function, to specify that the geometry we want is points.

```r
scatter_plot <- my_plot + geom_point()
```

This statement adds the geometry layer to the existing ggplot object.
Scatter Plot

STEP 2b

We can also specify color, size, and degree of transparency:

```r
scatter_plot <- my_plot + geom_point(color = "blue",
                    size = 3, alpha = 0.5)
```

We can also customize the labels:

```r
scatter_plot <- scatter_plot + labs(x = "Petal Width",
                        y = "Petal Length")
```
STEP 3

Display our scatter plot:

scatter_plot
Consolidating Code

You don't have to build a ggplot object in separate steps. If you want, you can create the object and display it all in one go:

ggplot(iris, aes(x = Petal.Width, y = Petal.Length)) + geom_point()
Consolidating Code

ggplot(iris, aes(x = Petal.Width, y = Petal.Length)) + geom_point(color = "blue", size = 3, alpha = 0.5) + labs(x = "Petal Width", y = "Petal Length")
Finally, let’s color-code by species!

```r
ggplot(iris, aes(x = Petal.Width, y = Petal.Length, color = Species)) + geom_point(size = 3, alpha = 0.5) + labs(x = "Petal Width", y = "Petal Length")
```
Napoleon’s March
The Minard Map: "Best statistical graphic ever"
The Minard Map

Load the libraries and the data

library(dplyr)
library(ggplot2)
library(scales)
library(ggmap)

minard <- read.csv("minard.csv", row.names = 1, stringsAsFactors = FALSE)
The Minard Map

Create the first layer: background and titles

layer1 <- ggplot(troops,
    aes(x = long, y = lat)
    xlab("") + ylab("") +
    ggtitle("Napoleon's March to Russia")
The Minard Map

Create the second layer: The troops data

layer2 <- layer1 + geom_path(data = troops, aes(size = survivors, color = direction, group = division), lineend = "round", linejoin = "round")
The Minard Map

Create the third layer: Add the cities

```r
layer3 <- layer2 + geom_text(data = cities, aes(label = city), size = 3)
```
The Minard Map

Create the fourth layer:
Adjust the colors and legends

layer1 + layer2 + layer3 +
scale_size("Survivors",
range = c(1, 10),
label = comma) +
scale_color_manual(
"Direction", values =
c("grey50", "red"))
The Minard Map

Change the background to a map of Russia

russia <-
ggmap(get_map(location =
c(left = 22, bottom = 53.5,
right = 39, top = 56.5),
zoom = 6, maptype =
"toner", source =
"stamen"))