

# Data visualizations can be generalized as consisting of three parts

**Data**

**+**

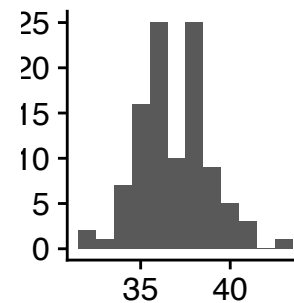
**Geometric Mapping**

**+**

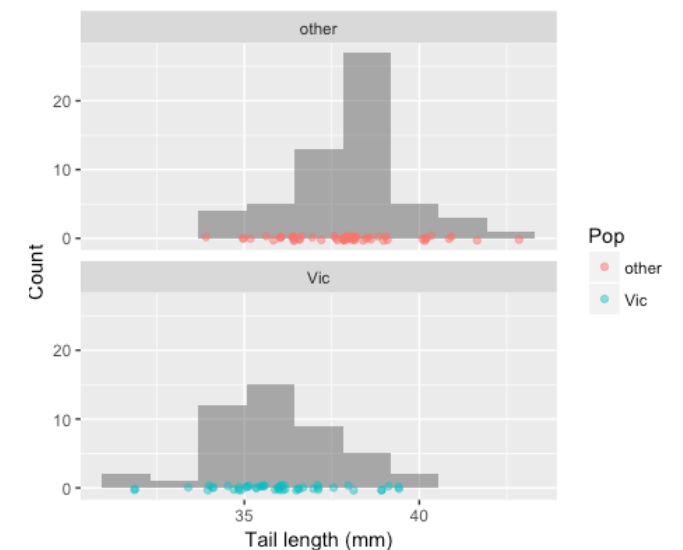
**Aesthetic Properties of the Geometric Mapping**

##	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
## 1	5.1	3.5	1.4	0.2	setosa
## 2	4.9	3.0	1.4	0.2	setosa
## 3	4.7	3.2	1.3	0.2	setosa
## 4	4.6	3.1	1.5	0.2	setosa
## 5	5.0	3.6	1.4	0.2	setosa
## 6	5.4	3.9	1.7	0.4	setosa

**+**



**+**



```
ggplot(data = <DATA>) + <GEOM_FUNCTION>(mapping = aes(<MAPPINGS>))
```

# Example 1: Creating a histogram

**Data**

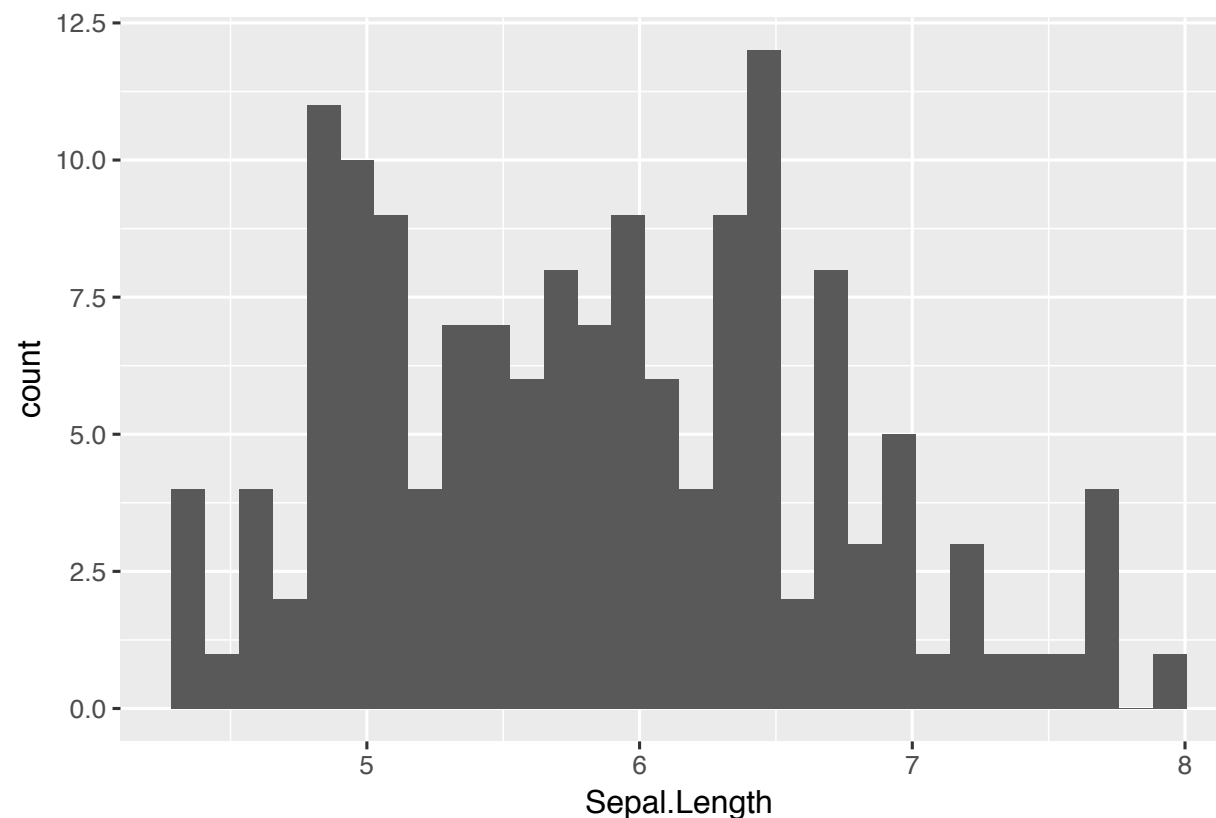
**+**

**Geometric  
Mapping**

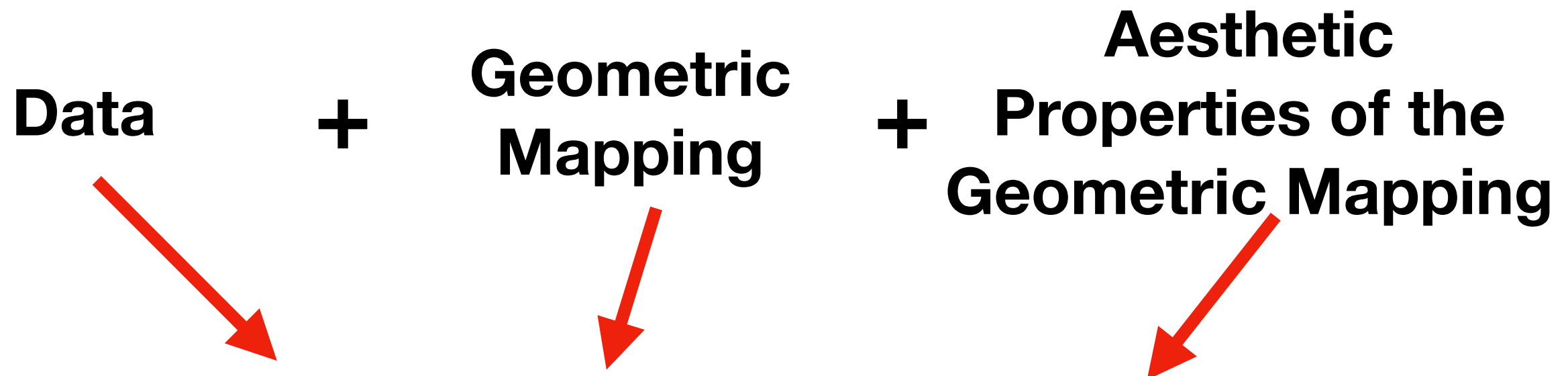
**+**

**Aesthetic  
Properties of the  
Geometric Mapping**

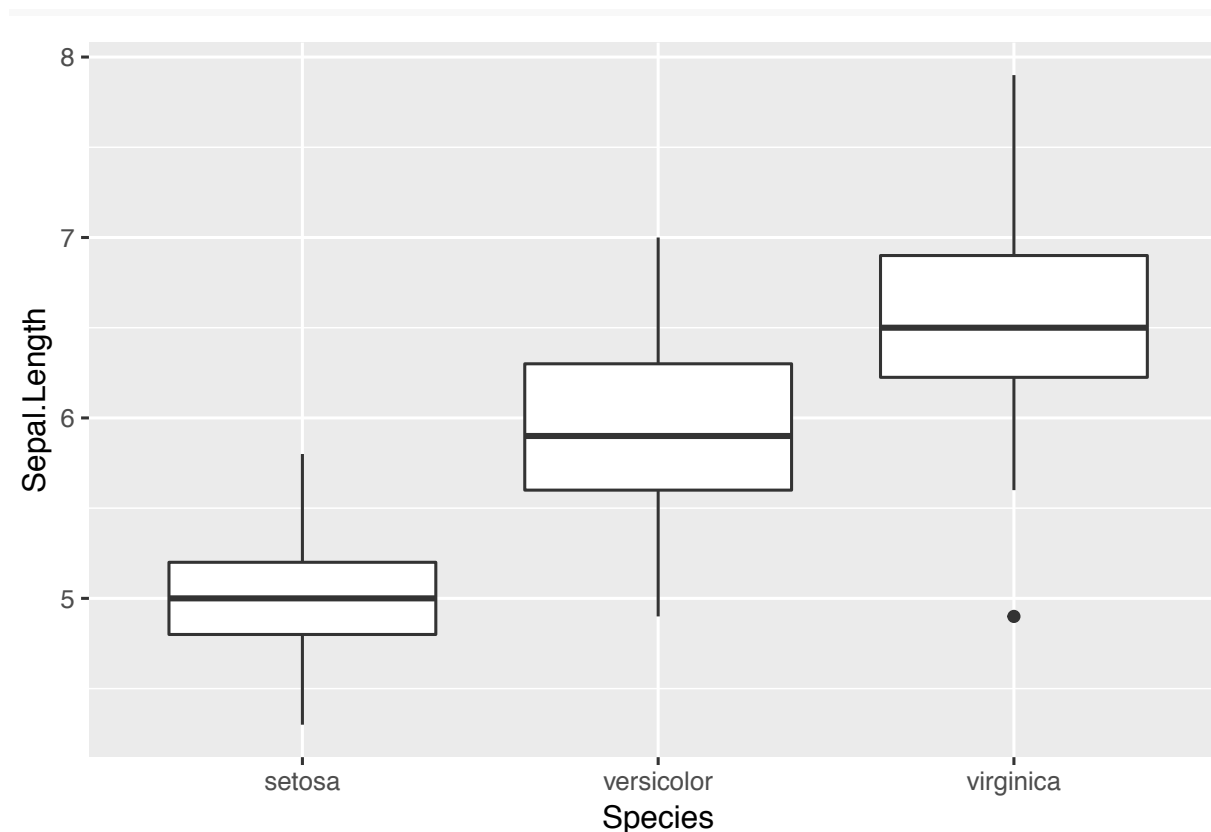
```
ggplot(data = iris) + geom_histogram(mapping = aes(x = Sepal.Length))
```



# Example 2: Creating a Boxplot



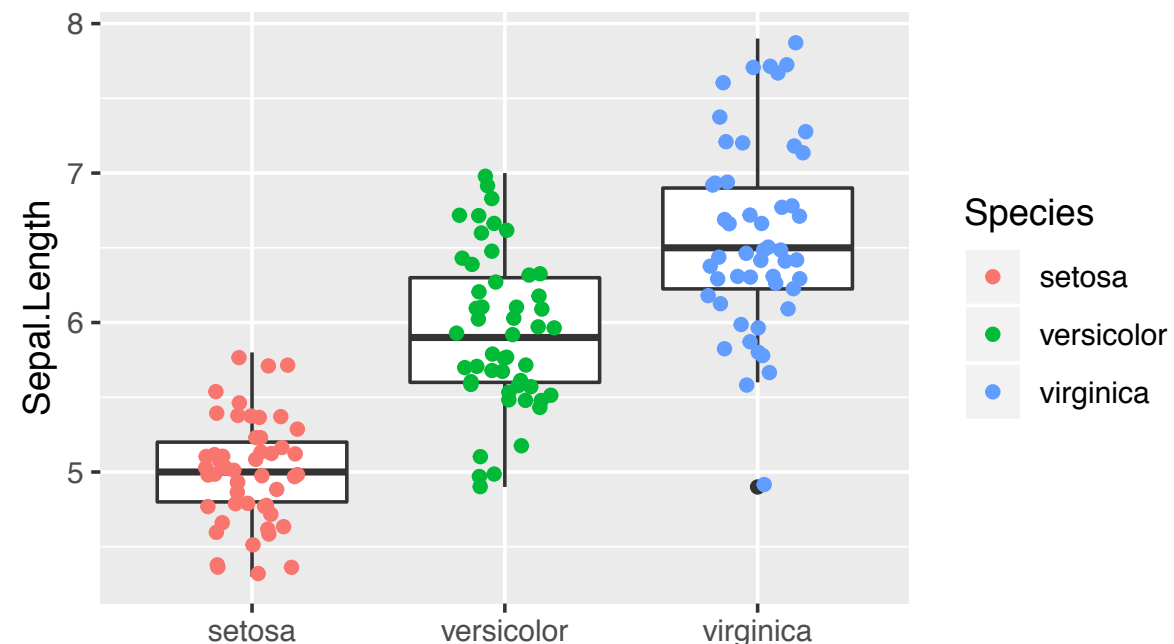
```
ggplot(data = iris) + geom_boxplot(mapping = aes(x = Species,  
                                                  y = Sepal.Length))
```



# Example 3: Combining Geometric Representations

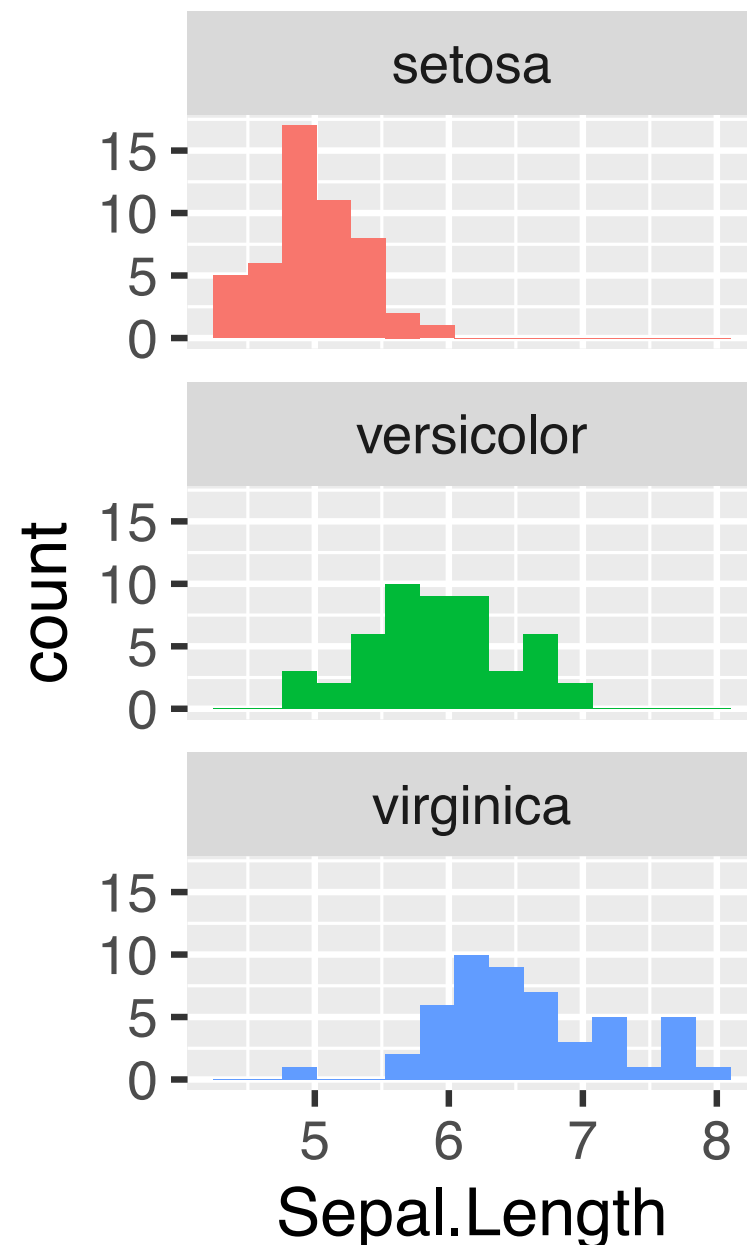
**Data** + **Geometric Mapping** + **Aesthetic Properties of the Geometric Mapping**

```
ggplot(data = iris) + geom_boxplot(mapping = aes(x = Species,  
y = Sepal.Length)) +  
  geom_jitter(mapping = aes(x = Species,  
y = Sepal.Length,  
color = Species),  
width = 0.2)
```



# Faceting creates subplots based on conditioning of one or more variables

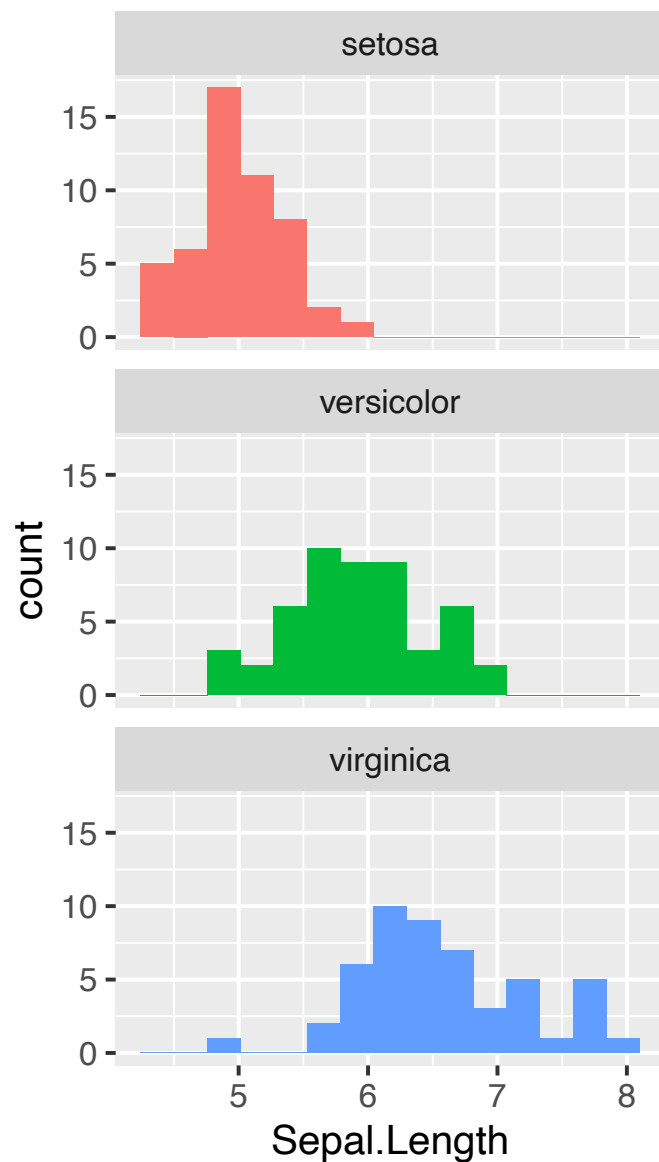
```
ggplot(data = iris, aes(x = Sepal.Length, fill=Species)) +  
  geom_histogram(bins=15) + facet_wrap(~Species,ncol=1)
```



# Themes change look-and-feel across the plot

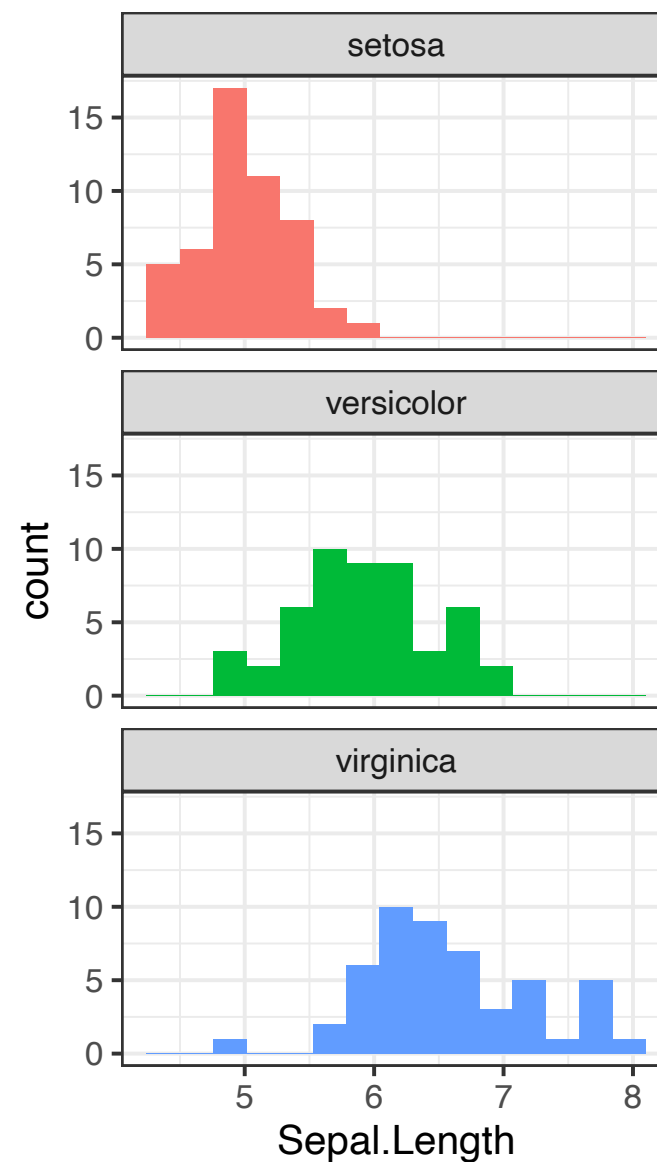
default theme

```
ggplot(data = iris, aes(x = Sepal.Length, fill=Species)) +  
  geom_histogram(bins=15) + facet_wrap(~Species,ncol=1) +  
  theme(aspect.ratio = 0.5, legend.position = "none")
```



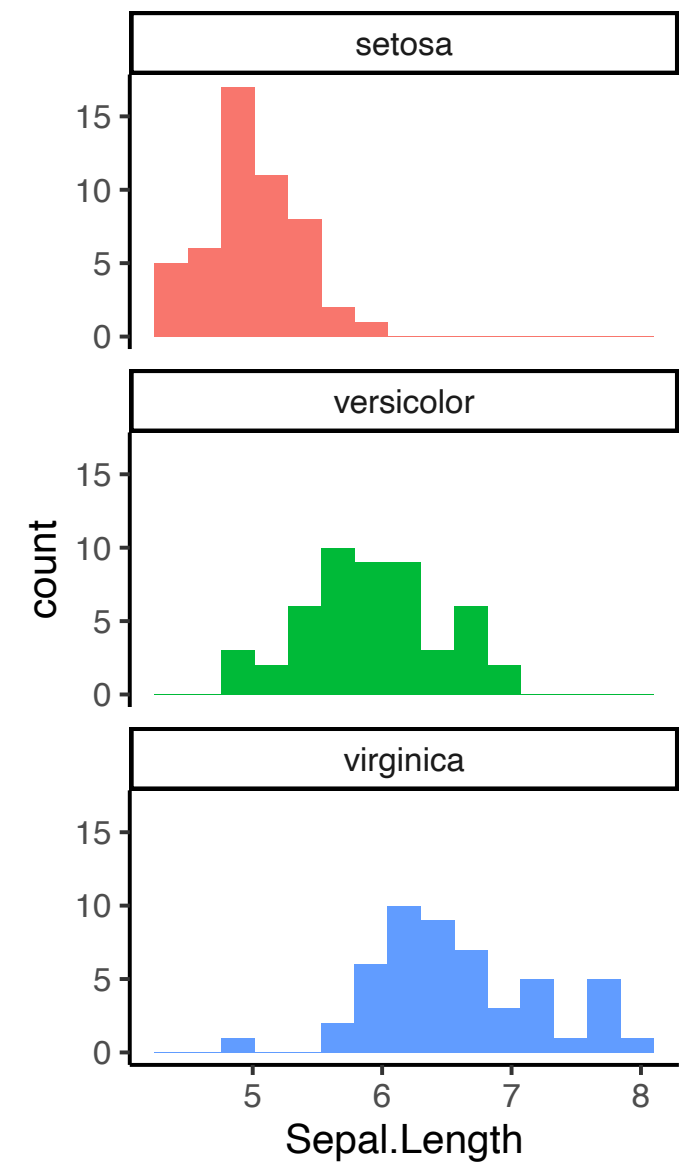
+theme\_bw()

```
ggplot(data = iris, aes(x = Sepal.Length, fill=Species)) +  
  geom_histogram(bins=15) + facet_wrap(~Species,ncol=1) +  
  theme_bw() + theme(aspect.ratio = 0.5, legend.position = "none")
```



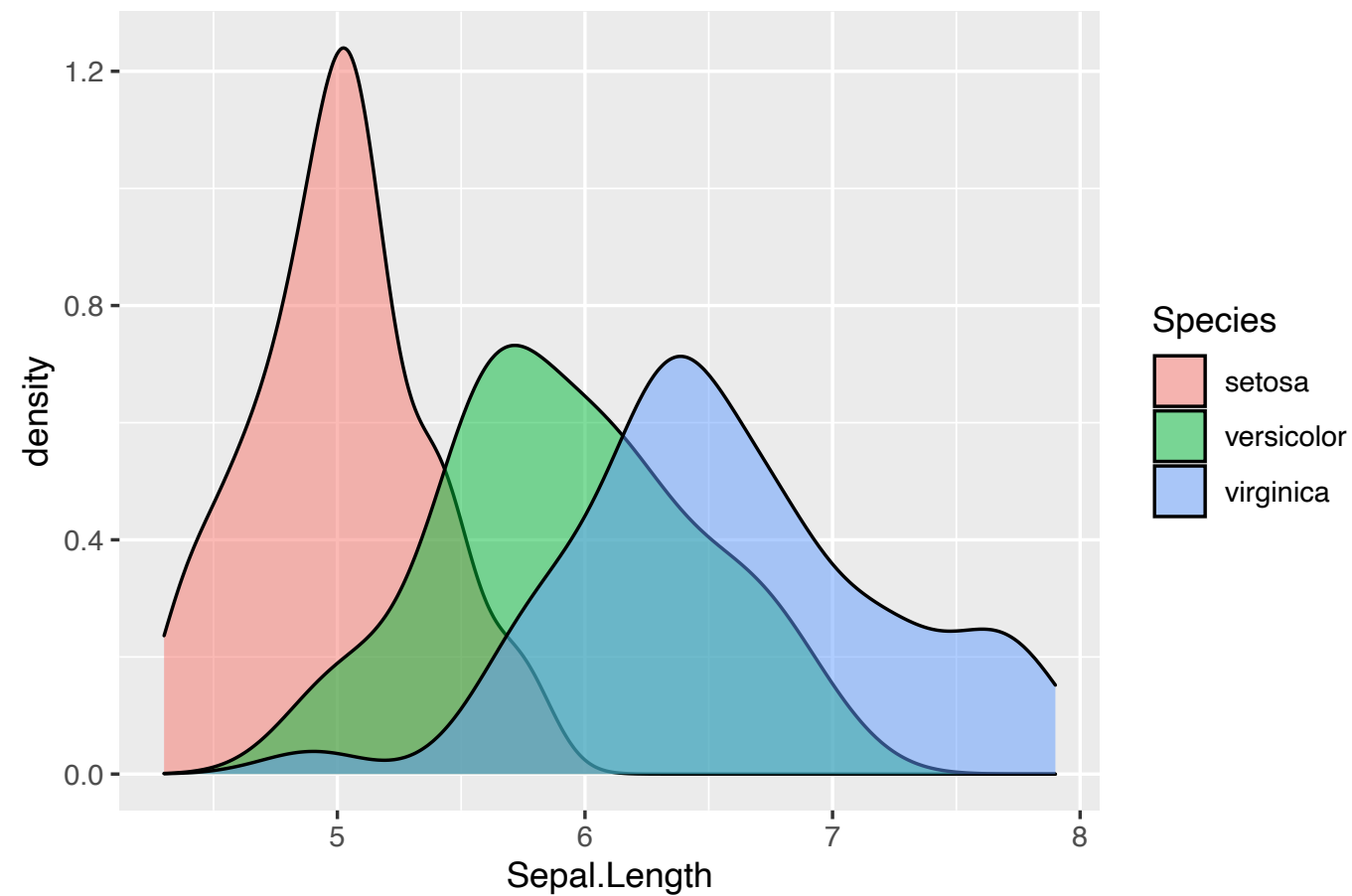
+theme\_classic()

```
ggplot(data = iris, aes(x = Sepal.Length, fill=Species)) +  
  geom_histogram(bins=15) + facet_wrap(~Species,ncol=1) +  
  theme_classic() + theme(aspect.ratio = 0.5, legend.position = "none")
```

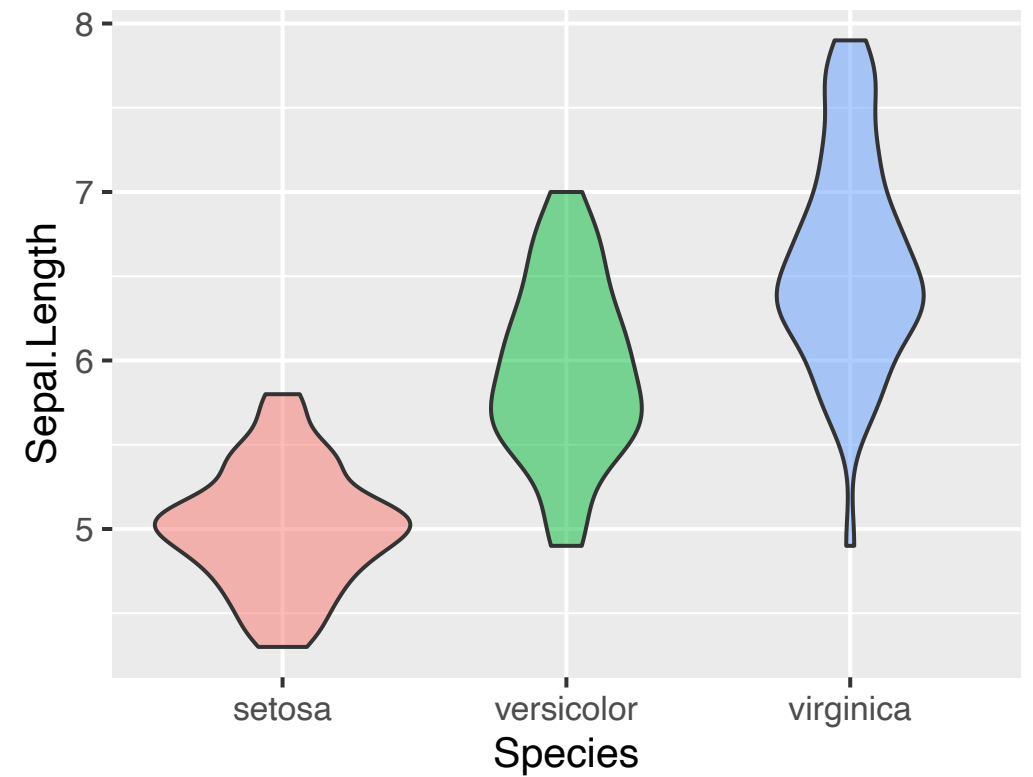


# "Geom" tour: Density and violin plots

```
ggplot(data = iris, aes(x = Sepal.Length, fill=Species)) +  
  geom_density(alpha=0.5)
```

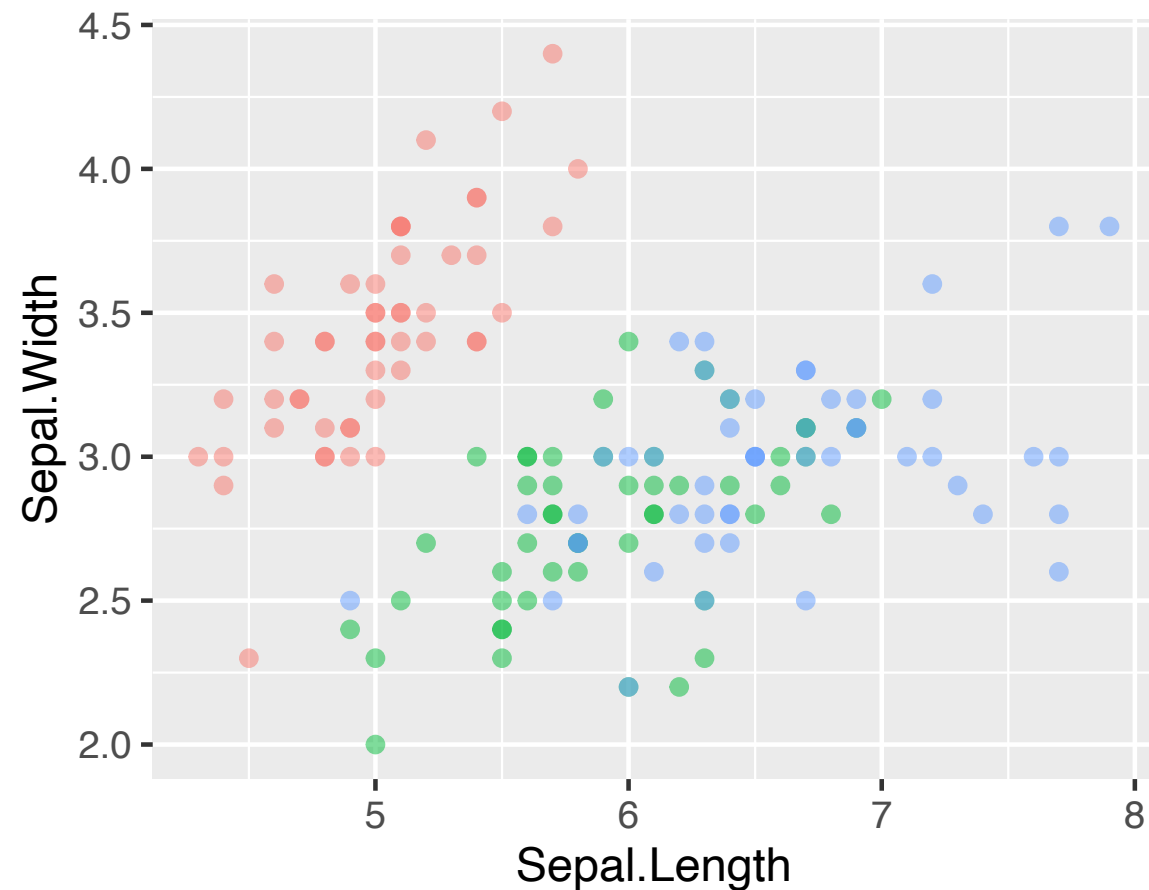


```
ggplot(data = iris, aes(x = Species,  
                        y = Sepal.Length,  
                        fill=Species)) +  
  geom_violin(alpha=0.5)
```

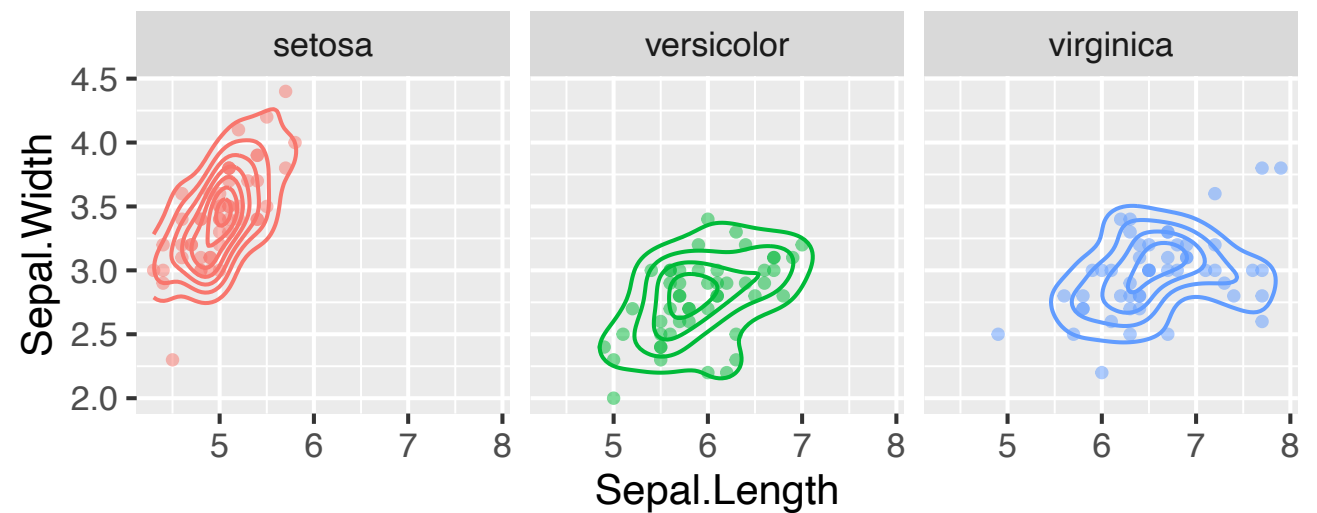


# "Geom" tour: Scatter and 2d density

```
ggplot(data = iris, aes(x = Sepal.Length,  
                        y = Sepal.Width,  
                        color=Species)) +  
geom_point(alpha=0.5)
```



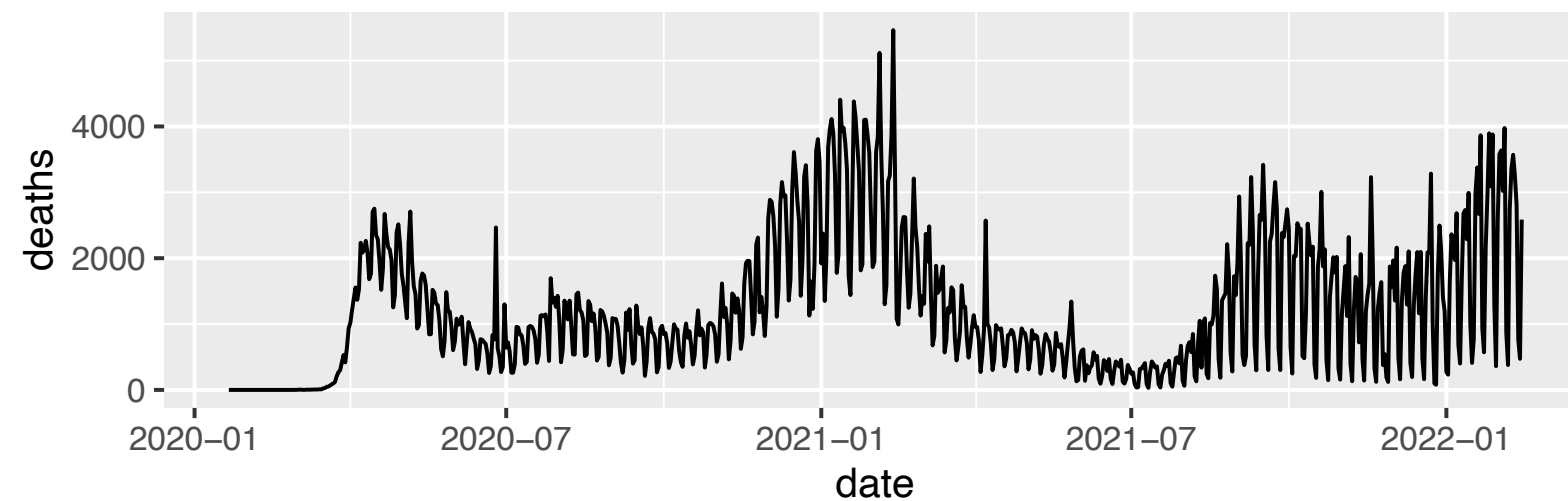
```
ggplot(data = iris, aes(x = Sepal.Length,  
                        y = Sepal.Width,  
                        color=Species)) +  
geom_density_2d() +  
geom_point(alpha=0.5, size=1) +  
facet_wrap(~Species)
```



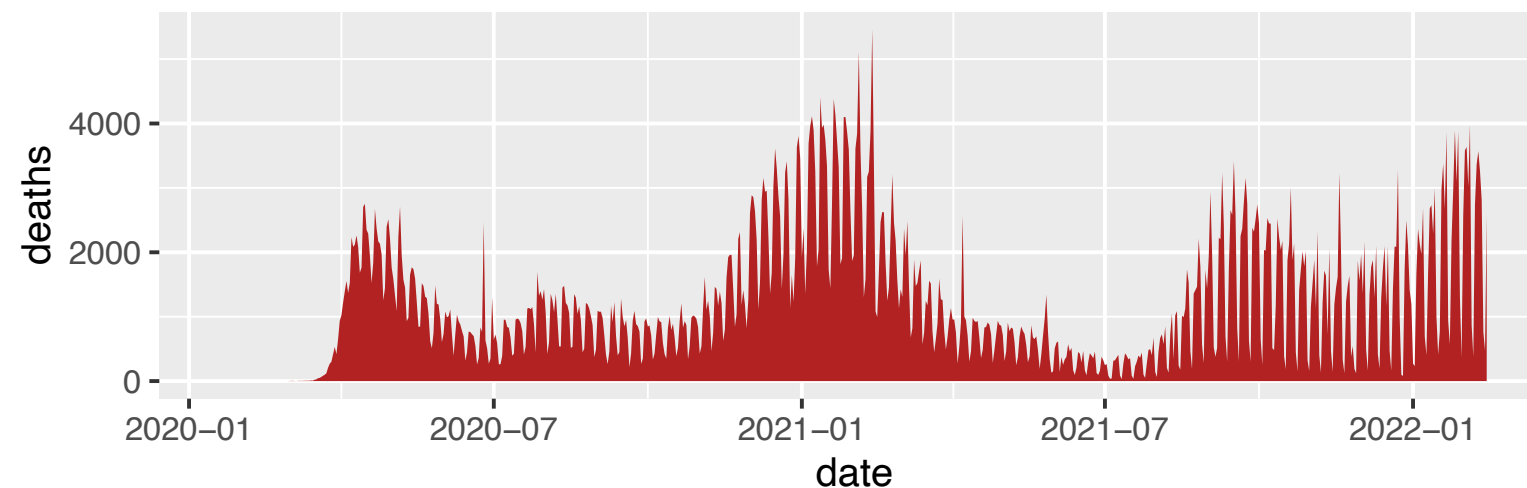


# "Geom" tour: Line and Area plots

```
ggplot(data = covid, aes(x = date, y = deaths)) +  
  geom_line()
```



```
ggplot(data = covid, aes(x = date, y = deaths)) +  
  geom_area(fill="firebrick")
```



# "Geom" tour: Heat maps

```
SE_states <- c("North Carolina", "South Carolina",  
              "Arkansas", "Georgia", "Tennessee",  
              "Louisiana", "Alabama", "Florida")  
  
us_states %>%  
  filter(state %in% SE_states) %>%  
  arrange(state) %>%  
  ggplot(aes(x=date, y=state, fill=cases_avg_per_100k)) +  
    geom_tile() +  
    scale_fill_viridis(option = "C")
```

