

# Homework Exercises Week 03

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keep this chunk in all your RMarkdown scripts

```
knitr::opts_chunk$set(echo = TRUE)
knitr::opts_chunk$set(tidy.opts = list(width.cutoff = 60), tidy = TRUE)
```

## HOMEWORK EXERCISES

### Part 1

Create a density plot showing the distribution of body mass for each species. Use `facet_wrap()` to create separate density plots for males and females. Adjust the bandwidth parameter and color transparency. 10 pts

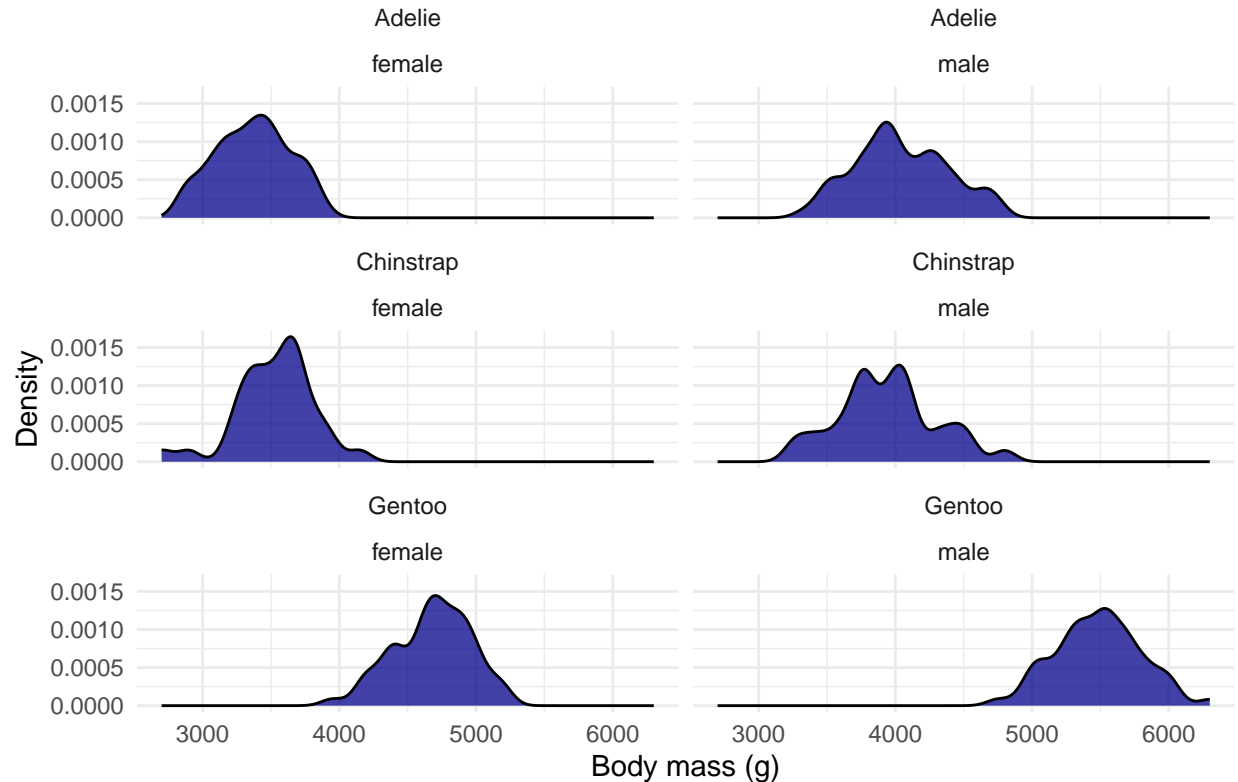
```
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
## v dplyr      1.1.4      v readr      2.1.5
## v forcats    1.0.0      v stringr   1.5.1
## v ggplot2    3.5.1      v tibble    3.2.1
## v lubridate  1.9.3      v tidyr     1.3.1
## v purrr      1.0.2
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()     masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(palmerpenguins)
library(ggthemes)
data(penguins)
```

```
na.omit(penguins) %>%
  ggplot(aes(x = body_mass_g)) + geom_density(fill = "darkblue",
  alpha = 0.75, bw = 80) + facet_wrap(vars(species, sex), nrow = 3) +
  labs(title = "Body mass by species and sex", x = "Body mass (g)",
  y = "Density") + theme_minimal()
```

## Body mass by species and sex

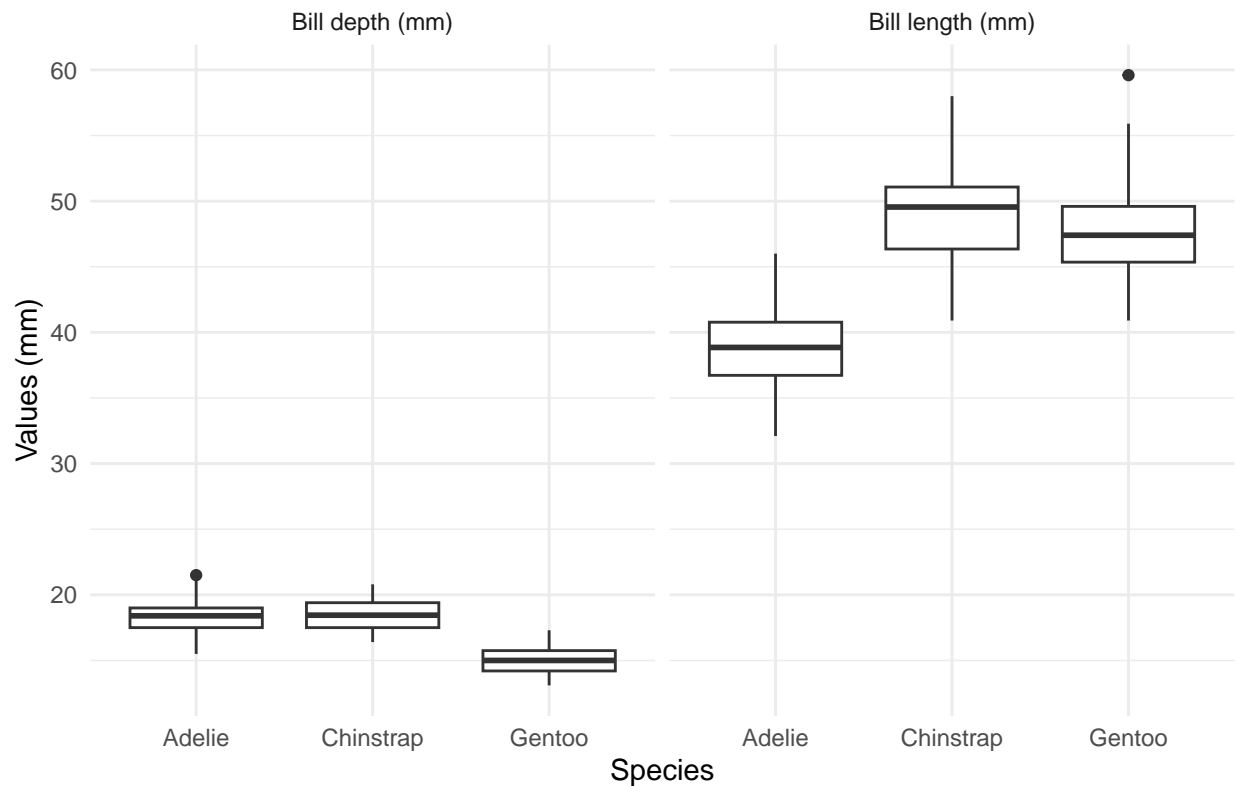


Reshape the data into long (tidy) format. Create a boxplot of bill length and bill depth by species using the penguins dataset. Use `facet_grid()` to place both boxplots on the same row. 10 pts

```
penguins_long <- na.omit(penguins) %>%
  rename(`Bill length (mm)` = bill_length_mm, `Bill depth (mm)` = bill_depth_mm) %>%
  pivot_longer(cols = c("Bill length (mm)", "Bill depth (mm)"), names_to = "Measurement",
               values_to = "Values")

penguins_long %>%
  filter(Measurement == c("Bill length (mm)", "Bill depth (mm)")) %>%
  ggplot(aes(x = species, y = Values)) + geom_boxplot() + facet_grid(cols = vars(Measurement)) +
  theme_minimal() + labs(title = "Bill depth and bill length by species",
                          y = "Values (mm)", x = "Species")
```

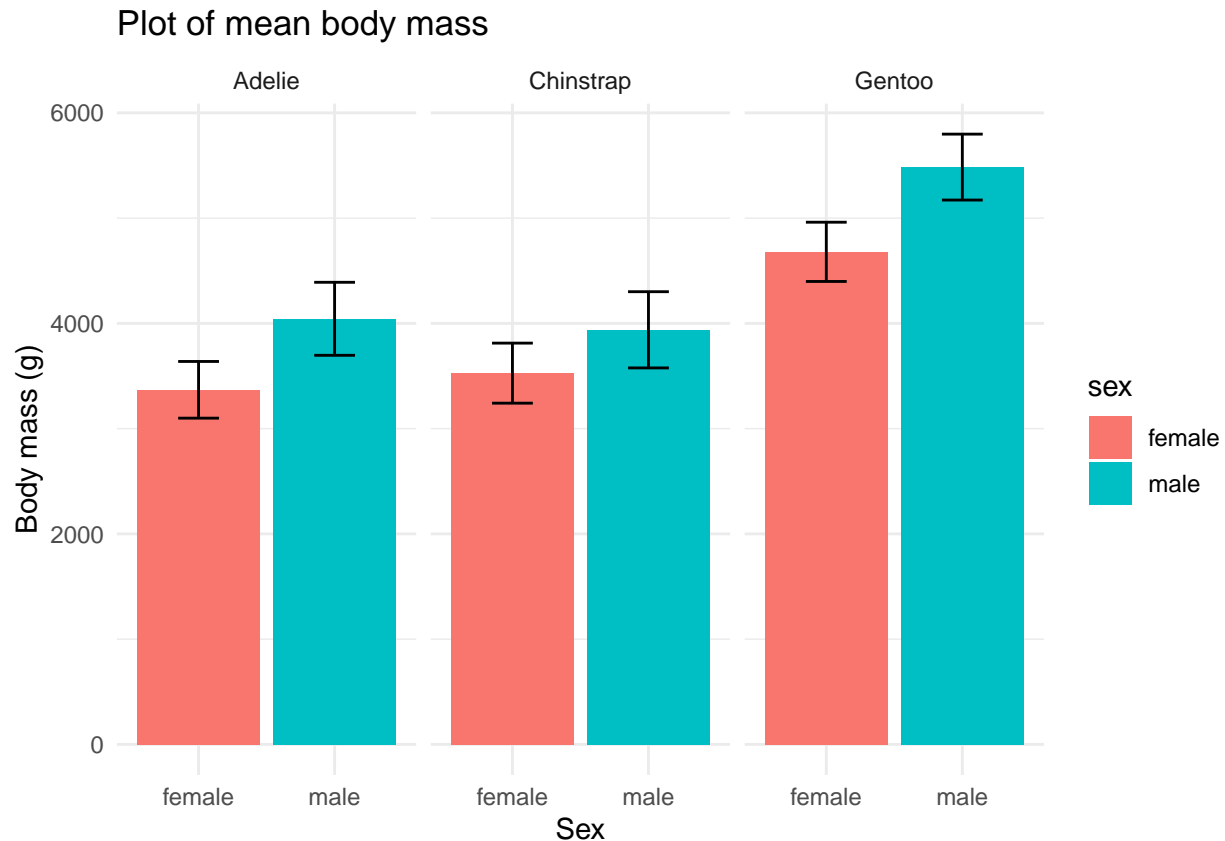
## Bill depth and bill length by species



Plot the mean body mass by species and by sex to assess whether sexual dimorphism in body weight varies by species. Use facets to create one graph per species showing the mean for each sex. Add error bars for the standard deviation of weight to all plots. Evaluate the result. 10 pts

```
na.omit(penguins) %>%
  group_by(sex, species) %>%
  summarize(mean_body_mass = mean(body_mass_g), sd_body_mass = sd(body_mass_g)) %>%
  ggplot(aes(x = sex, y = mean_body_mass, fill = sex)) + theme_minimal() +
  geom_col() + labs(title = "Plot of mean body mass", x = "Sex",
    y = "Body mass (g)") + geom_errorbar(aes(ymin = mean_body_mass -
    sd_body_mass, ymax = mean_body_mass + sd_body_mass), width = 0.3) +
  facet_wrap(~species)
```

```
## 'summarise()' has grouped output by 'sex'. You can override using the '.groups'
## argument.
```



*## Evaluation: The male penguins in each species has a  
## larger body mass than their female counterparts. The  
## Chinstrap species appears to have the least difference  
## of body mass between both sexes.*

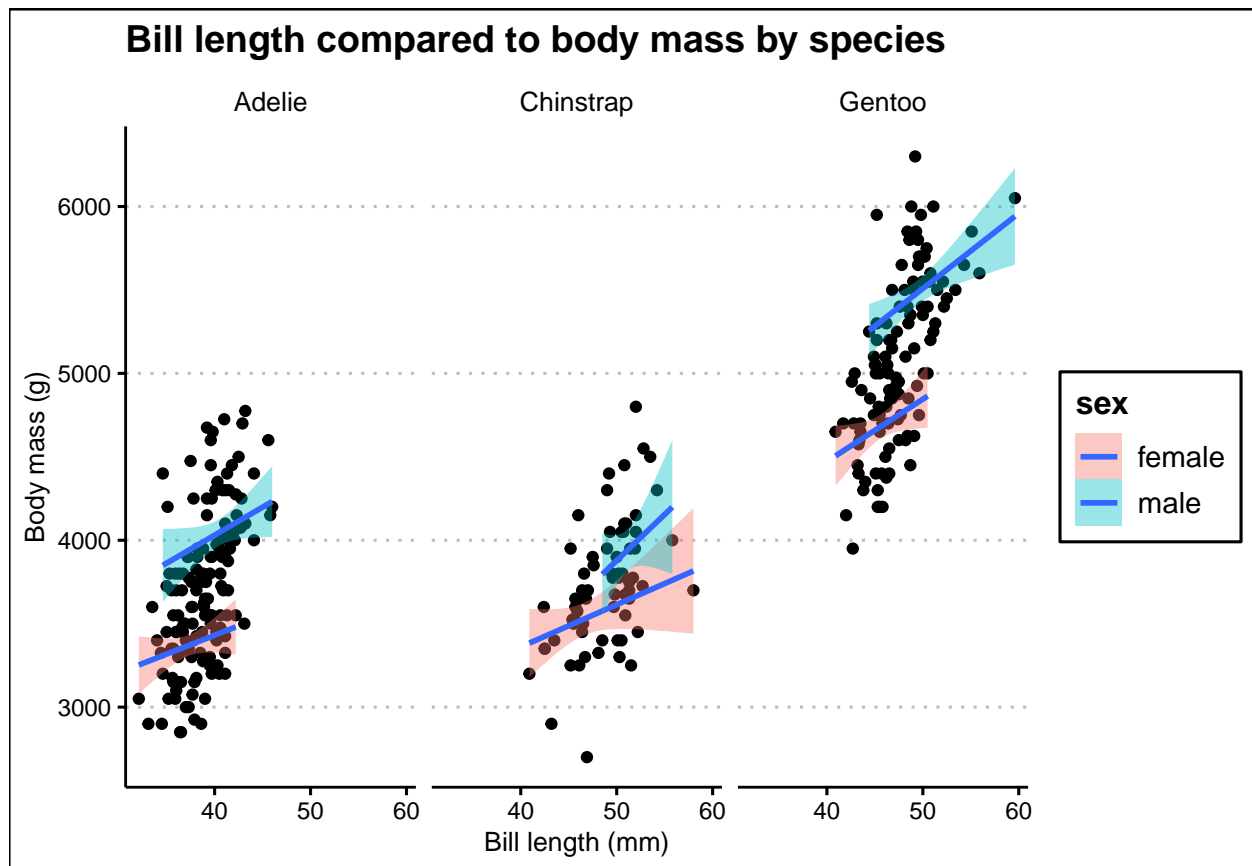
## Part 2

Identify a research question or hypothesis about the penguins dataset. Create a customized ggplot2 visualization to explore this question. For example, you might investigate the relationship between body mass and flipper length within a specific species or compare the distribution of measurements between different islands. Please do not copy any example from lecture or lab, so be sure to ask a question that was not already visualized previously. 10 pts

Question: Is there a relationship between bill length and body mass? i.e. does a “bigger” bill also relate to bigger penguins? Can we compare between species and sexes?

```
# Add all code to explore your question visually here. Then
# answer your question below.
na.omit(penguins) %>%
  ggplot(aes(x = bill_length_mm, y = body_mass_g)) + geom_point() +
  geom_smooth(method = "lm", aes(fill = sex)) + facet_wrap(~species) +
  theme_clean() + labs(title = "Bill length compared to body mass by species",
    x = "Bill length (mm)", y = "Body mass (g)")
```

```
## 'geom_smooth()' using formula = 'y ~ x'
```



Answer: Generally, yes. We can see the upward trend of the data points in the graphs which indicates that a larger bill size relates to a larger body mass in penguins of all species and in both sexes.