

In class activity 4

2024-09-11

1. Using the `lm()` function estimate the value of the parameters β_0 , β_1 and β_2 from the model:

$$\text{blood pressure}_i = \beta_0 + \beta_1 \text{age}_i + \beta_2 \text{sex}_i + \epsilon_i$$

```
mbp <- lm(formula = blood_pressure ~ age + sex, data = blood)
```

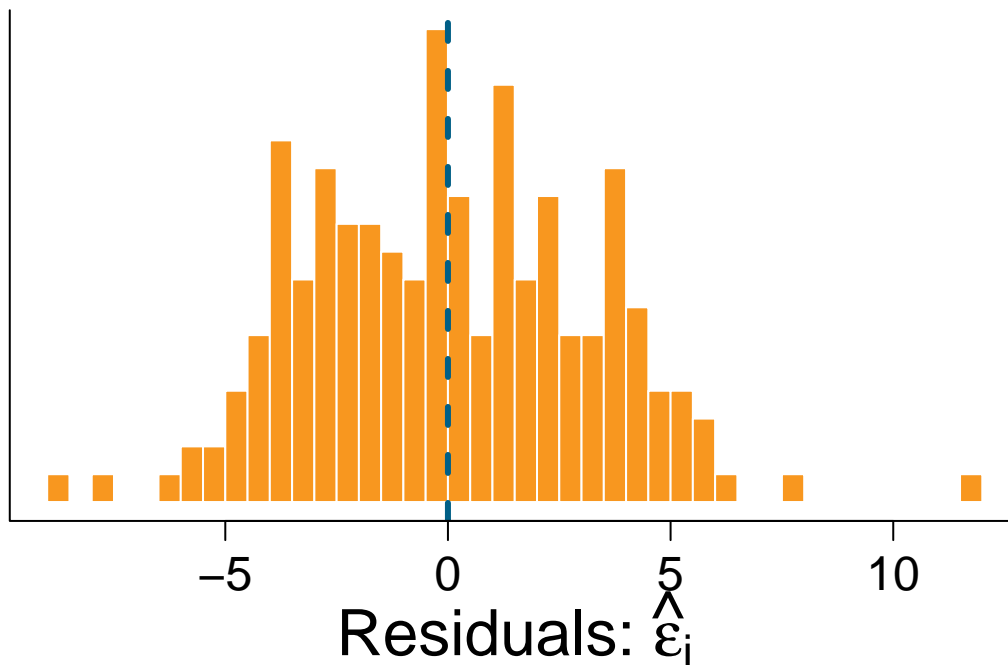
The estimated value of $\hat{\beta}_0$ was 105.79

The estimated value of $\hat{\beta}_1$ was 0.51

The estimated value of $\hat{\beta}_2$ was -3.48

1. Make a histogram of the residuals.

```
hist(x = mbp$residuals, breaks = 40,  
     axes = FALSE, ann = FALSE, freq = FALSE,  
     border = "white", col = "#f8971f")  
abline(v = mean(mbp$residuals), lty = 2, lwd = 3,  
       col = "#005f86")  
box(bty = "l")  
axis(side = 1, cex.axis = 1.5)  
mtext(side = 1, cex = 2, line = 3,  
      text = expression(  
        x = paste("Residuals: ",  
                  hat(epsilon)[i])))
```

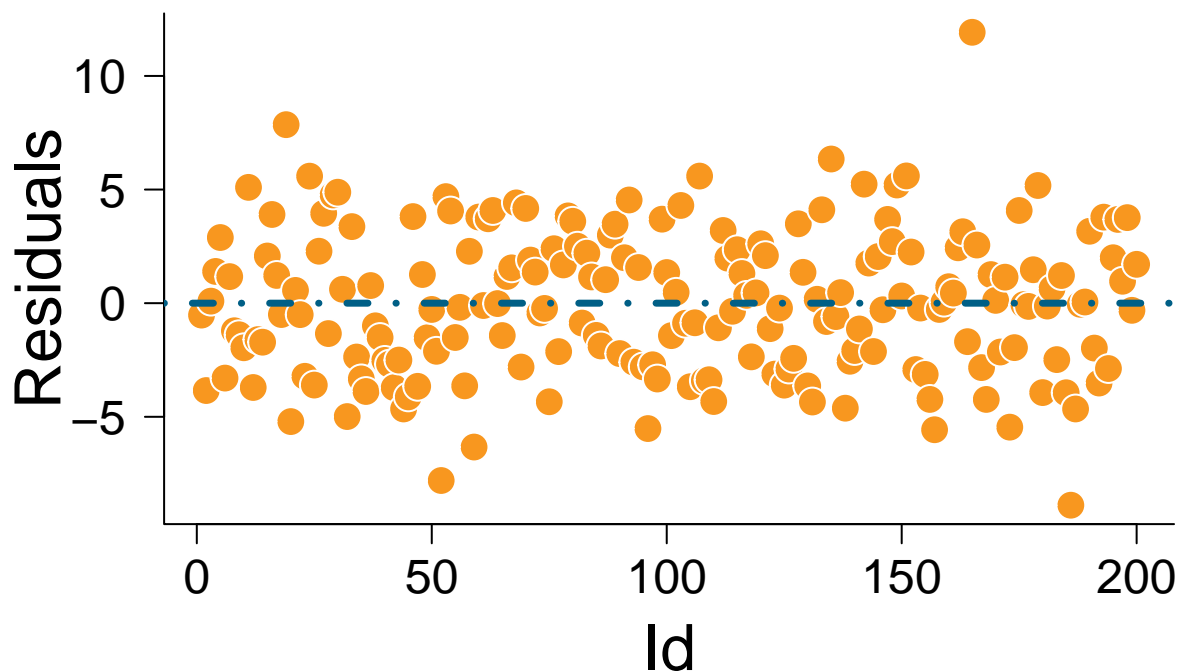


1. Make a scatter plot of the residuals as a function of id number.

```

# Plot residual against
# its corresponding id (order)
plot(x = blood$id, y = mbp$residuals, ann = FALSE,
     axes = FALSE, cex = 2, pch = 21,
     col = "white", bg = "#f8971f")
box(bty = "l")
axis(side = 1, cex.axis = 1.5)
axis(side = 2, cex.axis = 1.5, las = 2)
mtext(text = "Residuals", side = 2, line = 2.5,
      cex = 2)
mtext(text = "Id", side = 1, line = 3,
      cex = 2)
# what should we expect?
abline(h = 0, col = "#005f86", lty = 4,
       lwd = 3.5)

```



1. Make a scatter plot of blood pressure by age and add the expected lines for male and female participants.

```

plot(x = blood$age, y = blood$blood_pressure,
     pch = 21, col = "white", cex = 1.3, ann = FALSE, axes = FALSE,
     bg = ifelse(test = blood$sex == "female",
                  yes = "#ffa600",
                  no = "#003f5c"))

# adding details to the plot
box(bty = "l")
axis(side = 1)
axis(side = 2, las = 2)
mtext(text = "Age", side = 1, line = 2.3, cex = 1.7)
mtext(text = "Blood pressure", side = 2, line = 2.8, cex = 1.7)

curve(expr = mbp$coefficients[1] + mbp$coefficients[2] * x + mbp$coefficients[3],
      from = 38, to = 70, add = TRUE,

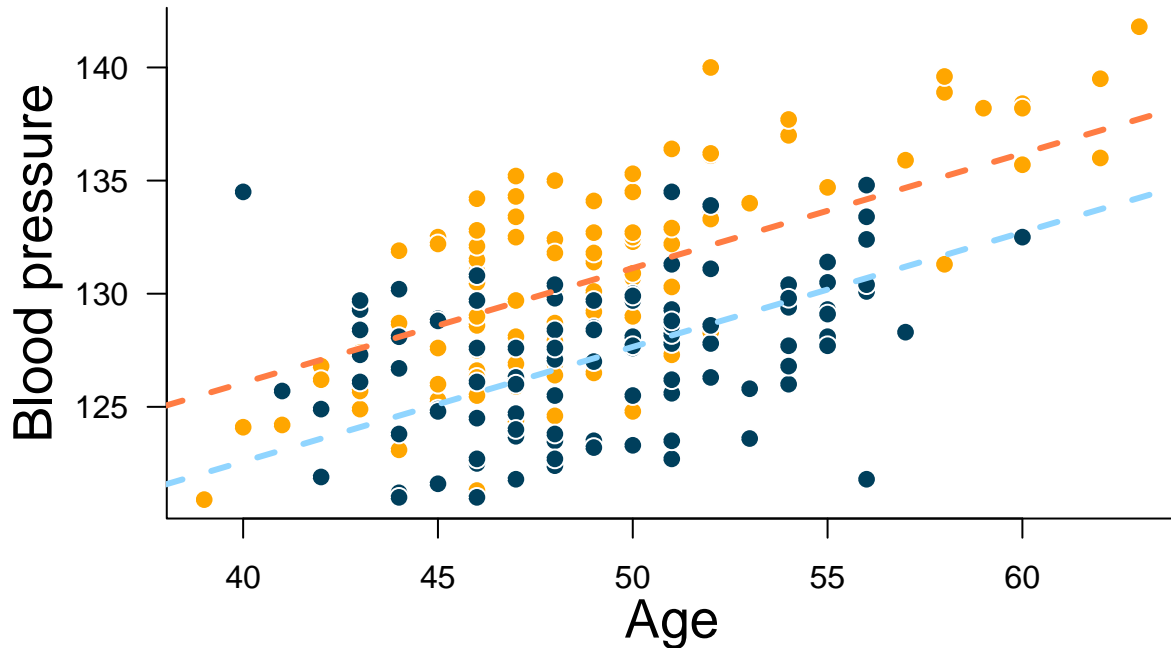
```

```

lwd = 3, lty = 2, col = "#90d5ff")

curve(expr = mbp$coefficients[1] + mbp$coefficients[2] * x,
      from = 38, to = 70, add = TRUE,
      lwd = 3, lty = 2, col = "#ff7c43")

```



```

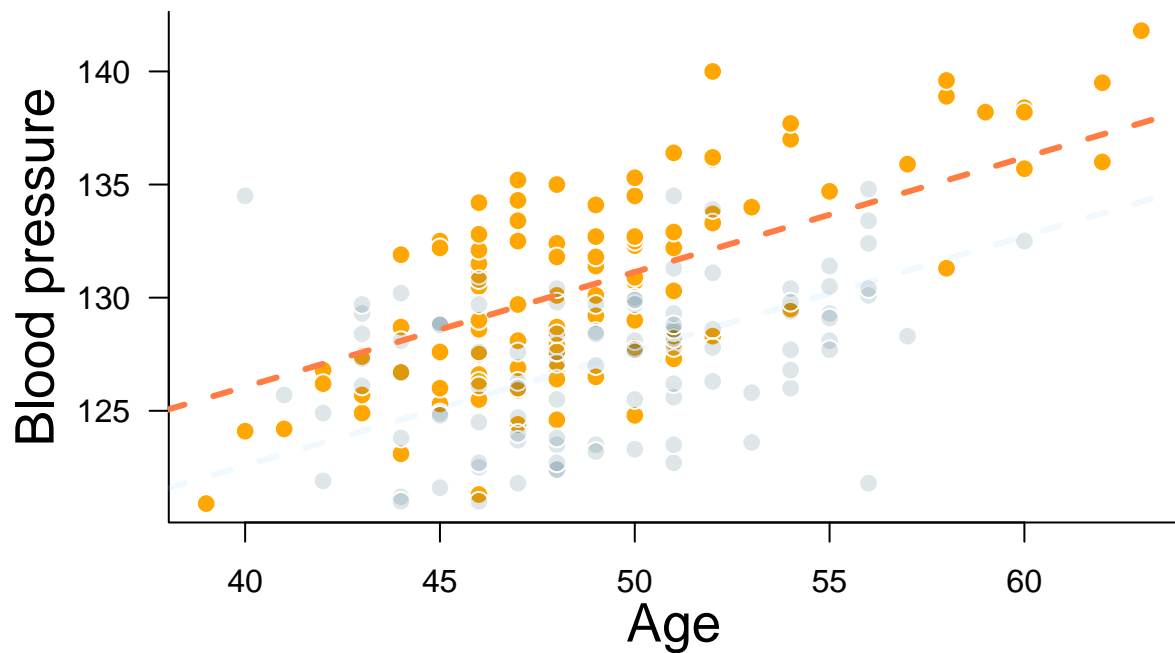
plot(x = blood$Age, y = blood$blood_pressure,
     pch = 21, col = "white", cex = 1.3, ann = FALSE, axes = FALSE,
     bg = ifelse(test = blood$sex == "female",
                  yes = "#ffa600",
                  no = "#003f5c22"))

# adding details to the plot
box(bty = "l")
axis(side = 1)
axis(side = 2, las = 2)
mtext(text = "Age", side = 1, line = 2.3, cex = 1.7)
mtext(text = "Blood pressure", side = 2, line = 2.8, cex = 1.7)

curve(expr = mbp$coefficients[1] + mbp$coefficients[2] * x + mbp$coefficients[3],
      from = 38, to = 70, add = TRUE,
      lwd = 3, lty = 2, col = "#90d5ff22")

curve(expr = mbp$coefficients[1] + mbp$coefficients[2] * x,
      from = 38, to = 70, add = TRUE,
      lwd = 3, lty = 2, col = "#ff7c43")

```



```
plot(x = blood$age, y = blood$blood_pressure,
     pch = 21, col = "white", cex = 1.3, ann = FALSE, axes = FALSE,
     bg = ifelse(test = blood$sex == "female",
                  yes = "#ffa600",
                  no = "#003f5c"))

# adding details to the plot
box(bty = "n")
axis(side = 1)
axis(side = 2, las = 2)
mtext(text = "Age", side = 1, line = 2.3, cex = 1.7)
mtext(text = "Blood pressure", side = 2, line = 2.8, cex = 1.7)

curve(expr = mbp$coefficients[1] + mbp$coefficients[2] * x + mbp$coefficients[3],
      from = 38, to = 70, add = TRUE,
      lwd = 3, lty = 2, col = "#90d5ff")

curve(expr = mbp$coefficients[1] + mbp$coefficients[2] * x,
      from = 38, to = 70, add = TRUE,
      lwd = 3, lty = 2, col = "#ff7c43")
```

