High Dimensional Exercise 4

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Prepare

First we insert data of Beats per minute and age as columns of a new dataframe.

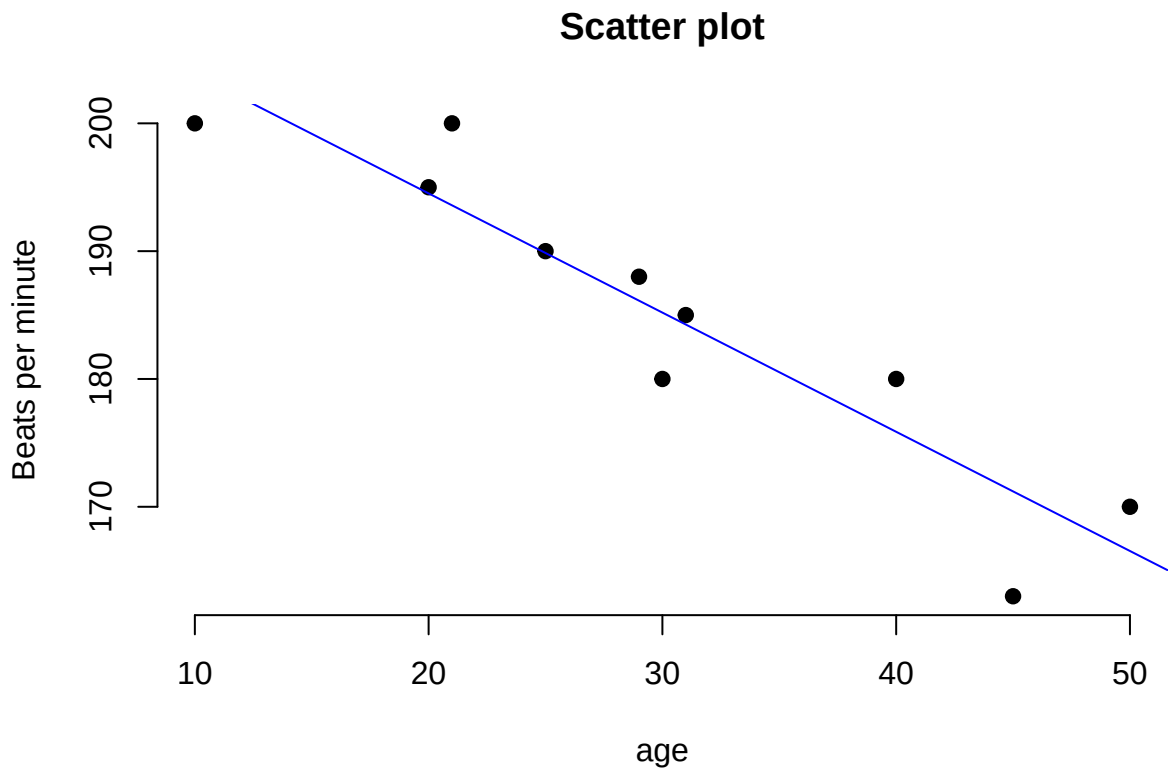
```
BeatsPerMin <- c(200, 195, 200, 190, 188, 180, 185, 180, 163, 170)
Age<- c(10, 20, 21, 25, 29, 30, 31, 40, 45, 50)

df <- data.frame(BeatsPerMin, Age)
```

Question 1: Drawing Scatterplot

Draw the scatterplot

```
x <- Age
y <- BeatsPerMin
# Plot with main and axis titles
# Change point shape (pch = 19) and remove frame.
# Add regression line
plot(x, y, main = "Scatter plot",
     xlab = "age", ylab = "Beats per minute",
     pch = 19, frame = FALSE)
abline(lm(y ~ x, data = df), col = "blue")
```



Question 2: Regression Model

Build the linear regression model $Y_i = b_0 + b_1 \cdot t_i + \epsilon_i$ and estimate b_0 and b_1.

$b_0 = 213.1721, b_1 = -0.9326$

```
model <- lm(BeatsPerMin ~ Age, data = df)
summary(model)
```

```
##
## Call:
## lm(formula = BeatsPerMin ~ Age, data = df)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.2038 -2.8485  0.6099  3.0630  6.4131
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 213.1721     4.2296  50.400 2.66e-11 ***
## Age          -0.9326     0.1312  -7.108 0.000101 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.79 on 8 degrees of freedom
## Multiple R-squared:  0.8633, Adjusted R-squared:  0.8462
## F-statistic: 50.53 on 1 and 8 DF,  p-value: 0.0001011
```

Question 3: Hypothesis Testing

Verify the null hypothesis $H_0 : b_1 = 0$ against the alternative $H_1 : b_1 \neq 0$ with a significance level $\alpha = 0.05$.

The lm function provides p-values for significance of both intercept and slope. Since we are interested in the slope, we can compare the p-value (0.000101) with $\alpha = 0.05$, concluding that p-value is less than alpha, we reject the null hypothesis. This underlines that the dependent variable (age) has influence of target variable (beats per minute).