My Second `knitr` Document

Jane Doe

September 12, 2020

1 Introduction

We want to know if iris sepal length is correlated with iris petal width or petal length.

2 Methods

To examine the relationship between iris sepal length and petal width and petal length, we used the following linear regression model:

$$
\begin{aligned}
&y_i = \beta_0 + \beta_1 x_{i,1} + \beta_2 x_{i,2} + \epsilon_i, \\
&\epsilon_i \sim \text{Normal}(0, \sigma^2),
\end{aligned}
$$

where y_i represents iris sepal length for the $i = 1, \ldots, n$ flowers, $x_{i,1}$ represents the i^{th} flower's average petal width, and $x_{i,2}$ represents the i^{th} flower's average petal length. To estimate model parameters, we used `R` statistical software. The `R` script is shown, below.

2.1 `R` script for iris data

```r
###
### Load the datasets library which contains the iris data
###

library(datasets)
data(iris)

###
### set the response variable to the object called "y"
###

y=iris$Sepal.Length

###
### Define the predictor variables
###

x1=iris$Petal.Length
x2=iris$Petal.Width

###
### Fit the linear model to the data
###

linMod=lm(y~x1+x2)
betas=coef(linMod)
```

```r
std.er=coef(summary(linMod))[, 2]
sigma=sqrt(deviance(linMod)/df.residual(linMod))
```

3 Results

3.1 Parameter Estimates

The estimated intercept of our model, β_0, was 4.19. Thus, the expected sepal length for an iris with mean petal length equal to zero, and mean petal width equal to zero was 4.19. The estimated regression parameter for petal length, β_1, was 0.54. Thus, as petal length increased by one unit, the expected value of sepal length incresed by 0.54.

Our fitted model is:

$$
\begin{aligned}
&y_i = 4.19 + 0.54x_{i,1} + -0.32x_{i,2} + \epsilon_i,\\
&\epsilon_i \sim \text{Normal}(0, 0.4^2),
\end{aligned}
$$

3.2 Figures

To see the marginal relationship between y_i and $x_{i,1}$ and $x_{i,2}$, see Fig. 1

3.3 Tables

To see the parameter estimates and associated standard errors see Table 1.

Table 1: Parameter estimates and SE of parameters from our fitted model.

Parameter	Estimate	SE
β_0	4.19	0.1
β_1	0.54	0.07
β_2	-0.32	0.16
σ^2	0.4^2	-

4 Discussion

Discuss the results here...

```
###
### Plot the relationship between the response variable
### and each predictor variable
###

par(mfrow=c(2,1),mar=c(4,4,2,2))

## Top figure
plot(x1,y)
x1.pred=seq(range(x1)[1],range(x1)[2],length.out=10)
x2.mean=mean(x2)

y.pred1=betas[1]+betas[2]*x1.pred+betas[3]*x2.mean
lines(x1.pred,y.pred1,col=2,lwd=3)

## Bottom figure
plot(x2,y)
x1.mean=mean(x1)
x2.pred=seq(range(x2)[1],range(x2)[2],length.out=10)

y.pred2=betas[1]+betas[2]*x1.mean+betas[3]*x2.pred
lines(x2.pred,y.pred2,col=2,lwd=3)
```

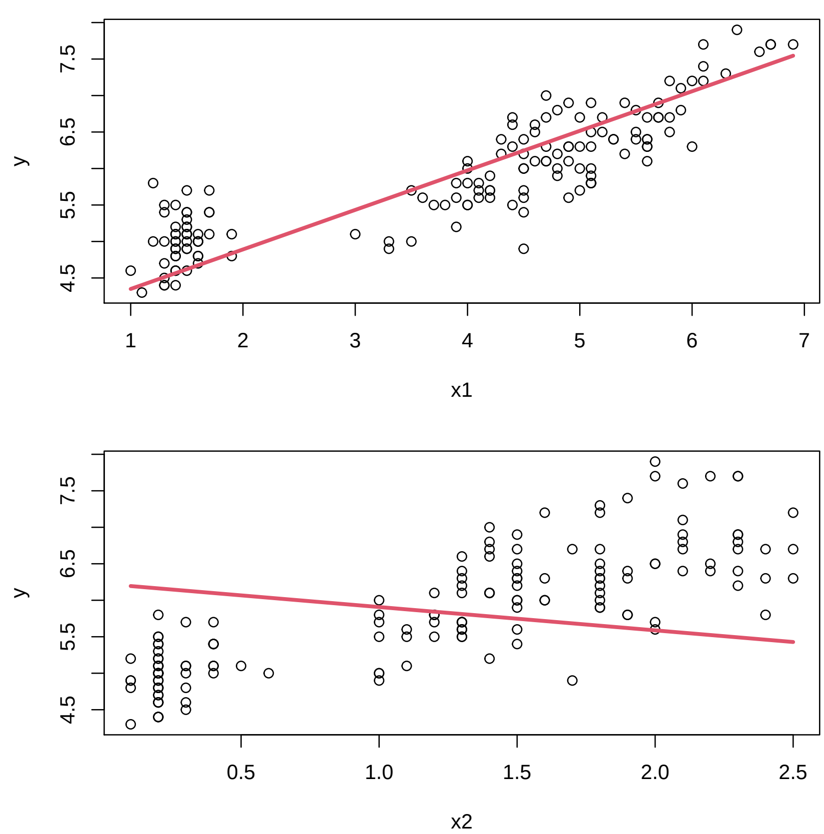

Figure 1: Marginal plot of the relationship between response variable and predictors.