Homework Coding 1

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Question 3.4.2

Business Card

```
########################################
########################################
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########################################
########################################
```

Question 3.4.3

```
# Installing packages from CRAN
##install.packages("neuralnet")

# Reading library
library("neuralnet")

# Getting help
?neuralnet
```

Example for neuralnet:

```
# Creating data
data1 <- c(10,20,30,40,50,60)
data2 <- c(20,40,60,80,80,20)
data3 <- c(0,1,1,1,1,1)

# Using dataframe for combining
my_df <- data.frame(data1, data2, data3)

# Neuralnet function to fit neural network
neu_data <- neuralnet(data3~data1+data2, data=my_df, hidden=3,act.fct="logistic"
                      ,linear.output = FALSE)
```

Result (Appendix 1)

Meaning of argument:

formula (data3~data1+data2: A implementing this method of the model that has to be fitted.

data = my_df: the variables stated in formula are stored in a dataframe. Hidden=3: the number of hidden neurons (vertices) in each layer is specified by a vector of numbers.

act.fct: the output of the cross product of the covariate or neurons and the weights is smoothed using this differentiable function.

linear.output: logical. Set linear output to TRUE if act.fct should not be applied to the output neurons, otherwise to FALSE.

Question 3.4.8

(a) Transformmatrix function for Exercise 7 from chapter 2

```
#Creating matrix table
my_matrix <- matrix(c(10,11,9,15,19,52,19,7,10,22,28,40,6,99,33,35,26,5,87,91,0,
                      12,16,81,200),nrow=5,ncol=5,byrow=TRUE)

#Creating a UDF function
transformmatrix <- function(x){
  try(mean_diag <- mean(diag(x)))
  try(med_diag <- median(diag(x)))
  try(print(c(mean_diag,med_diag)))
} #closing

# Print transformmatrix
transformmatrix(my_matrix)
```

```
## [1] 64.4 19.0
```

After applying transformmatrix function to the given matrix, we get two vectors with values of 64.4 (mean) and 19.0 (median)

(b) Transformmatrix from an example chapter 2.1

```
# Creating matrix table for chapter 2.1
my_matrix2 <- matrix(c(1,2,3,4,5,6,7,8,9),nrow=3,ncol=3,byrow=TRUE)

# Printing transformmatrix
transformmatrix(my_matrix2)
```

```
## [1] 5 5
```

After applying transformmatrix function to the given matrix, we get two vectors with values of 5 (mean) and 5 (median)

Question 4.4.10

```
# Importing required library
library(MASS)

# Creating table for the data
my_data <- airquality
```

This data frame has 153 observations and 6 variables (Appendix 2)

```
# Define function
# For loop over the dataframe to remove NA values
my_func <- function(my_data, col_idx){
  for(i in col_idx){
    new_df <- my_data[-which(is.na(my_data[,i])),]
    return(new_df)
  }
} #closing loop
```

```
# Test function
df_test <- my_func(my_data,2)
```

This test data frame has 146 observations and 6 variables (Appendix 3)

Example for UDF (Appendix 4):

```
# Creaing dataframe
new_idx <- c(1,1,2)
# Test function
df_newUDF <- my_func(my_data,new_idx)
```

Appendix:

Appendix 1

Name	Type	Value
neu_data	list [14] (S3: nn)	List of length 14
call	language	neuralnet(formula = data3 ~ data1 + data2, data = my_df, hidden = 3, act.fc ...
response	double [6 x 1]	0 1 1 1 1 1
covariate	double [6 x 2]	10 20 30 40 50 60 20 40 60 80 80 20 ...
model.list	list [2]	List of length 2
err.fct	function	function(x, y) { ... }
act.fct	function	function(x) { ... }
linear.output	logical [1]	FALSE
data	list [6 x 3] (S3: data.frame)	A data.frame with 6 rows and 3 columns
exclude	NULL	Pairlist of length 0
net.result	list [1]	List of length 1
weights	list [1]	List of length 1
generalized.weights	list [1]	List of length 1
startweights	list [1]	List of length 1
result.matrix	double [16 x 1]	0.00215 0.00749 80.00000 -4.36671 0.70998 -0.20926 ...

Appendix 2:

```
my_data                  153 obs. of 6 variables
  $ Ozone  : int  41 36 12 18 NA 28 23 19 8 NA ...
  $ Solar.R: int  190 118 149 313 NA NA 299 99 19 194 ...
  $ Wind   : num  7.4 8 12.6 11.5 14.3 14.9 8.6 13.8 20.1 8.6 ...
  $ Temp   : int  67 72 74 62 56 66 65 59 61 69 ...
  $ Month  : int  5 5 5 5 5 5 5 5 5 5 ...
  $ Day    : int  1 2 3 4 5 6 7 8 9 10 ...
```

Appendix 3:

```
df_test                  146 obs. of 6 variables
  $ Ozone  : int  41 36 12 18 23 19 8 NA 16 11 ...
  $ Solar.R: int  190 118 149 313 299 99 19 194 256 290 ...
  $ Wind   : num  7.4 8 12.6 11.5 8.6 13.8 20.1 8.6 9.7 9.2 ...
  $ Temp   : int  67 72 74 62 65 59 61 69 69 66 ...
  $ Month  : int  5 5 5 5 5 5 5 5 5 5 ...
  $ Day    : int  1 2 3 4 7 8 9 10 12 13 ...
```

Appendix 4:

```
df_newUDF                116 obs. of 6 variables
  $ Ozone  : int  41 36 12 18 28 23 19 8 7 16 ...
  $ Solar.R: int  190 118 149 313 NA 299 99 19 NA 256 ...
  $ Wind   : num  7.4 8 12.6 11.5 14.9 8.6 13.8 20.1 6.9 9.7 ...
  $ Temp   : int  67 72 74 62 66 65 59 61 74 69 ...
  $ Month  : int  5 5 5 5 5 5 5 5 5 5 ...
  $ Day    : int  1 2 3 4 6 7 8 9 11 12 ...
```