**Problem 01: Classification using Neural Network on R**

**Training Dataset**:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **age** | **income** | **Student** | **credit\_rating** | **class** |
| youth | high | No | Fair | No |
| youth | high | No | Excellent | No |
| middle\_age | high | No | Fair | Yes |
| senior | medium | No | Fair | Yes |
| senior | low | Yes | Fair | Yes |
| senior | low | Yes | Excellent | No |
| middle\_age | low | Yes | Excellent | Yes |
| youth | medium | No | Fair | No |
| youth | low | Yes | Fair | Yes |
| senior | medium | Yes | Fair | Yes |

**Test Dataset:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **age** | **income** | **Student** | **credit\_rating** | **class** |
| youth | medium | Yes | Excellent | Yes |
| middle\_age | medium | No | Excellent | Yes |
| middle\_age | high | Yes | Fair | Yes |
| senior | medium | No | Excellent | No |

**R Code:**

library(RWeka)

library(caret)

library(nnet)

train <- read.csv(file.choose(),header = TRUE)

test <- read.csv(file.choose(),header = TRUE)

model <- train(class~., method='nnet', data = train)

prediction <- predict(model, test)

cfMatrix <- confusionMatrix(data=prediction, test$class)

cfMatrix

**Output:**> cfMatrix

Confusion Matrix and Statistics

Reference

Prediction No Yes

No 0 2

Yes 1 1

Accuracy : 0.25

95% CI : (0.0063, 0.8059)

No Information Rate : 0.75

P-Value [Acc > NIR] : 0.9961

Kappa : -0.5

Mcnemar's Test P-Value : 1.0000

Sensitivity : 0.0000

Specificity : 0.3333

Pos Pred Value : 0.0000

Neg Pred Value : 0.5000

Prevalence : 0.2500

Detection Rate : 0.0000

Detection Prevalence : 0.5000

Balanced Accuracy : 0.1667

'Positive' Class : No

**Problem 02: Testing Class With Unknown Data using Neural**

**Network in R**

**Training Dataset**:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **age** | **income** | **Student** | **credit\_rating** | **class** |
| youth | high | No | Fair | No |
| youth | high | No | Excellent | No |
| middle\_age | high | No | Fair | Yes |
| senior | medium | No | Fair | Yes |
| senior | low | Yes | Fair | Yes |
| senior | low | Yes | Excellent | No |
| middle\_age | low | Yes | Excellent | Yes |
| youth | medium | No | Fair | No |
| youth | low | Yes | Fair | Yes |
| senior | medium | Yes | Fair | Yes |
| youth | medium | Yes | Excellent | Yes |
| middle\_age | medium | No | Excellent | Yes |
| middle\_age | high | Yes | Fair | Yes |
| senior | medium | No | Excellent | No |

**Test Dataset:**

|  |  |  |  |
| --- | --- | --- | --- |
| **age** | **income** | **student** | **credit\_rating** |
| youth | medium | yes | fair |

**R Code:**

library(RWeka)

library(nnet)

train <- read.csv(file.choose(),header = TRUE)

test <- read.csv(file.choose(),header = TRUE)

classification <- nnet(class~., size=2, data = train) #size is hidden layer size

prediction <- predict(classification, test, type = "class")

prediction

**Output:**

> prediction

[1] "Yes"

**Problem 03: Finding Accuracy When Cross Validate, k = 2**

**Using Neural Network in R**

**Training Dataset**:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **age** | **income** | **Student** | **credit\_rating** | **class** |
| youth | high | No | Fair | No |
| youth | high | No | Excellent | No |
| middle\_age | high | No | Fair | Yes |
| senior | medium | No | Fair | Yes |
| senior | low | Yes | Fair | Yes |
| senior | low | Yes | Excellent | No |
| middle\_age | low | Yes | Excellent | Yes |
| youth | medium | No | Fair | No |
| youth | low | Yes | Fair | Yes |
| senior | medium | Yes | Fair | Yes |
| youth | medium | Yes | Excellent | Yes |
| middle\_age | medium | No | Excellent | Yes |
| middle\_age | high | Yes | Fair | Yes |
| senior | medium | No | Excellent | No |

**R Code:**

library(RWeka)

library(caret)

library(nnet)

data <-read.csv(file.choose(),header = TRUE)

kfolds <- createFolds(data$class, k=2)

sum = 0

for(i in kfolds){

train <- data[-i,]

test <- data[i,]

model <- train(class~., method='nnet', data = train)

prediction <- predict(model, test)

cfMatrix <- confusionMatrix(data = prediction, test$class)

sum <- sum + cfMatrix$overall[1]

}

accuracy <- sum/length(kfolds)

accuracy

**Output:**

> accuracy

Accuracy

0.5208333