# Set working directory and seed for reproducibility

getwd()

set.seed(206396)

# Load the dataset

data <- read.csv('merged data set for neural network.csv', header = TRUE)

# View the structure of the data

str(data)

# Normalize continuous variables using Min-Max normalization

data$AGE\_CATEGORICAL <- (data$AGE\_CATEGORICAL - min(data$AGE\_CATEGORICAL)) /

(max(data$AGE\_CATEGORICAL) - min(data$AGE\_CATEGORICAL))

data$GENDER <- (data$GENDER - min(data$GENDER)) / (max(data$GENDER) - min(data$GENDER))

data$MAIN\_ <- (data$MAIN\_ - min(data$MAIN\_)) / (max(data$MAIN\_) - min(data$MAIN\_))

data$ToNT <- (data$ToNT - min(data$ToNT)) / (max(data$ToNT) - min(data$ToNT))

# Check the distribution of a normalized variable

hist(data$ToNT)

# Partition the data into training (70%) and testing (30%) sets

ind <- sample(2, nrow(data), replace = TRUE, prob = c(0.7, 0.3))

training <- data[ind == 1, ]

testing <- data[ind == 2, ]

# Load necessary libraries

library(neuralnet)

# Build a neural network model

nn\_model <- neuralnet(

status ~ AGE\_CATEGORICAL + GENDER + MAIN\_ + ToNT,

data = training,

hidden = 1,

err.fct = "ce", # Cross-entropy error

linear.output = FALSE

)

# Visualize the neural network structure

plot(nn\_model)

# Make predictions using the training data

output\_train <- compute(nn\_model, training[,-1]) # Exclude 'status' column

predicted\_train <- ifelse(output\_train$net.result > 0.5, 1, 0)

# Confusion matrix and misclassification error for training data

conf\_matrix\_train <- table(predicted\_train, training$status)

accuracy\_train <- sum(diag(conf\_matrix\_train)) / sum(conf\_matrix\_train)

misclassification\_train <- 1 - accuracy\_train

# Print results for training data

print(conf\_matrix\_train)

cat("Training Accuracy:", accuracy\_train, "\n")

cat("Training Misclassification Error:", misclassification\_train, "\n")

# Make predictions using the testing data

output\_test <- compute(nn\_model, testing[,-1]) # Exclude 'status' column

predicted\_test <- ifelse(output\_test$net.result > 0.5, 1, 0)

# Confusion matrix and misclassification error for testing data

conf\_matrix\_test <- table(predicted\_test, testing$status)

accuracy\_test <- sum(diag(conf\_matrix\_test)) / sum(conf\_matrix\_test)

misclassification\_test <- 1 - accuracy\_test

# Print results for testing data

print(conf\_matrix\_test)

cat("Testing Accuracy:", accuracy\_test, "\n")

cat("Testing Misclassification Error:", misclassification\_test, "\n")