**#Load Libraries**

**> library(randomForest)**

**randomForest 4.7-1.1**

**Type rfNews() to see new features/changes/bug fixes.**

**>**

**> # Define the formula for the Random Forest model**

**> formula\_rf <- as.formula("diagnosis ~ radius\_ratio + perimeter\_area\_ratio + concavity\_ratio + `texture\_worst\_mean\_ratio` + `texture\_mean\_se\_ratio`")**

**>**

**> # Train a Random Forest model**

**> random\_forest\_model <- randomForest(formula\_rf, data = train\_data, ntree = 500, importance = TRUE)**

**>**

**> # Print the summary of the model**

**> print(random\_forest\_model)**

**Call:**

**randomForest(formula = formula\_rf, data = train\_data, ntree = 500, importance = TRUE)**

**Type of random forest: classification**

**Number of trees: 500**

**No. of variables tried at each split: 2**

**OOB estimate of error rate: 9.25%**

**Confusion matrix:**

**B M class.error**

**B 235 10 0.04081633**

**M 26 118 0.18055556**

**>**

**> # Make predictions on the test data**

**> predictions\_rf <- predict(random\_forest\_model, newdata = test\_data)**

**>**

**> # Get predicted probabilities**

**> probabilities\_rf <- predict(random\_forest\_model, newdata = test\_data, type = "response")**

**>**

**> # Confusion Matrix**

**> conf\_matrix\_rf <- table(test\_data$diagnosis, predictions\_rf)**

**>**

**> # Accuracy**

**> accuracy\_rf <- sum(diag(conf\_matrix\_rf)) / sum(conf\_matrix\_rf)**

**>**

**> # Precision**

**> precision\_rf <- conf\_matrix\_rf["M", "M"] / sum(conf\_matrix\_rf["M", ])**

**>**

**> # Recall**

**> recall\_rf <- conf\_matrix\_rf["M", "M"] / sum(conf\_matrix\_rf[, "M"])**

**>**

**> # F1-Score**

**> f1\_score\_rf <- 2 \* (precision\_rf \* recall\_rf) / (precision\_rf + recall\_rf)**

**>**

**> # Print the results for Random Forest**

**> cat("Random Forest - Confusion Matrix:\n", conf\_matrix\_rf, "\n")**

**Random Forest - Confusion Matrix:**

**97 9 2 59**

**> cat("Random Forest - Accuracy: ", accuracy\_rf, "\n")**

**Random Forest - Accuracy: 0.9341317**

**> cat("Random Forest - Precision: ", precision\_rf, "\n")**

**Random Forest - Precision: 0.8676471**

**> cat("Random Forest - Recall: ", recall\_rf, "\n")**

**Random Forest - Recall: 0.9672131**

**> cat("Random Forest - F1-Score: ", f1\_score\_rf, "\n")**

**Random Forest - F1-Score: 0.9147287**

**> # Now, let's perform a paired t-test between Decision Tree and Random Forest**

**> # Assuming you have vectors of metrics for Decision Tree (from the previous example) and Random Forest**

**> metrics\_model\_DT <- c(accuracy\_ctree, precision\_ctree, recall\_ctree, f1\_score\_ctree)**

**> metrics\_model\_RF <- c(accuracy\_rf, precision\_rf, recall\_rf, f1\_score\_rf)**

**>**

**> # Perform paired t-test**

**> t\_test\_result\_rf <- t.test(metrics\_model\_DT, metrics\_model\_RF, paired = TRUE)**

**>**

**> # Print the t-test result**

**> print(t\_test\_result\_rf)**

**Paired t-test**

**data: metrics\_model\_DT and metrics\_model\_RF**

**t = -4.6582, df = 3, p-value = 0.01867**

**alternative hypothesis: true mean difference is not equal to 0**

**95 percent confidence interval:**

**-0.19400956 -0.03651707**

**sample estimates:**

**mean difference**

**-0.1152633**