QDA_KNN_NB

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```
test_df<-read.csv("test.csv")
train_df<-read.csv("train.csv")
```

QDA

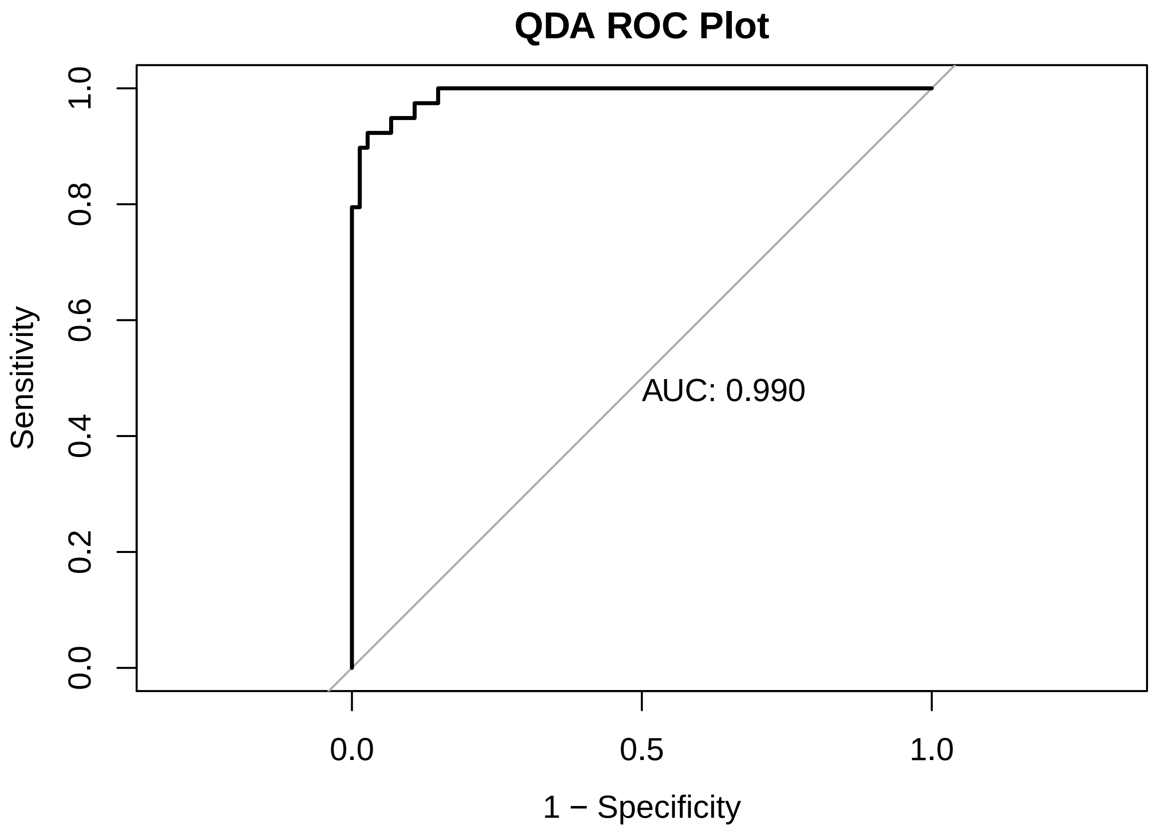
```
set.seed(1)
qda.fit <- qda(diagnosis~.,
               data = train_df)
ctrl <- trainControl(method = "repeatedcv",
                     repeats = 5,
                     summaryFunction = twoClassSummary,
                     classProbs = TRUE)
model.qda <- train(x = train_df[,-1],
                   y = train_df$diagnosis,
                   method = "qda",
                   metric = "ROC",
                   trControl = ctrl)

qda.pred <- predict(qda.fit, newdata = test_df)
head(qda.pred$posterior)
```

```
##                B            M
## 1  1.000000e+00 7.538445e-16
## 2  1.000000e+00 5.398040e-15
## 3  1.000000e+00 3.363637e-13
## 4 2.919084e-127 1.000000e+00
## 5  1.000000e+00 3.555226e-22
## 6  1.000000e+00 2.735734e-10
```

```
roc.qda <- roc(test_df$diagnosis, qda.pred$posterior[,2],
               levels = c("B","M"))

plot(roc.qda, legacy.axes = TRUE, print.auc = TRUE,main="QDA ROC Plot")
```



AUC Value for QDA is 0.990 as shown above.

KNN

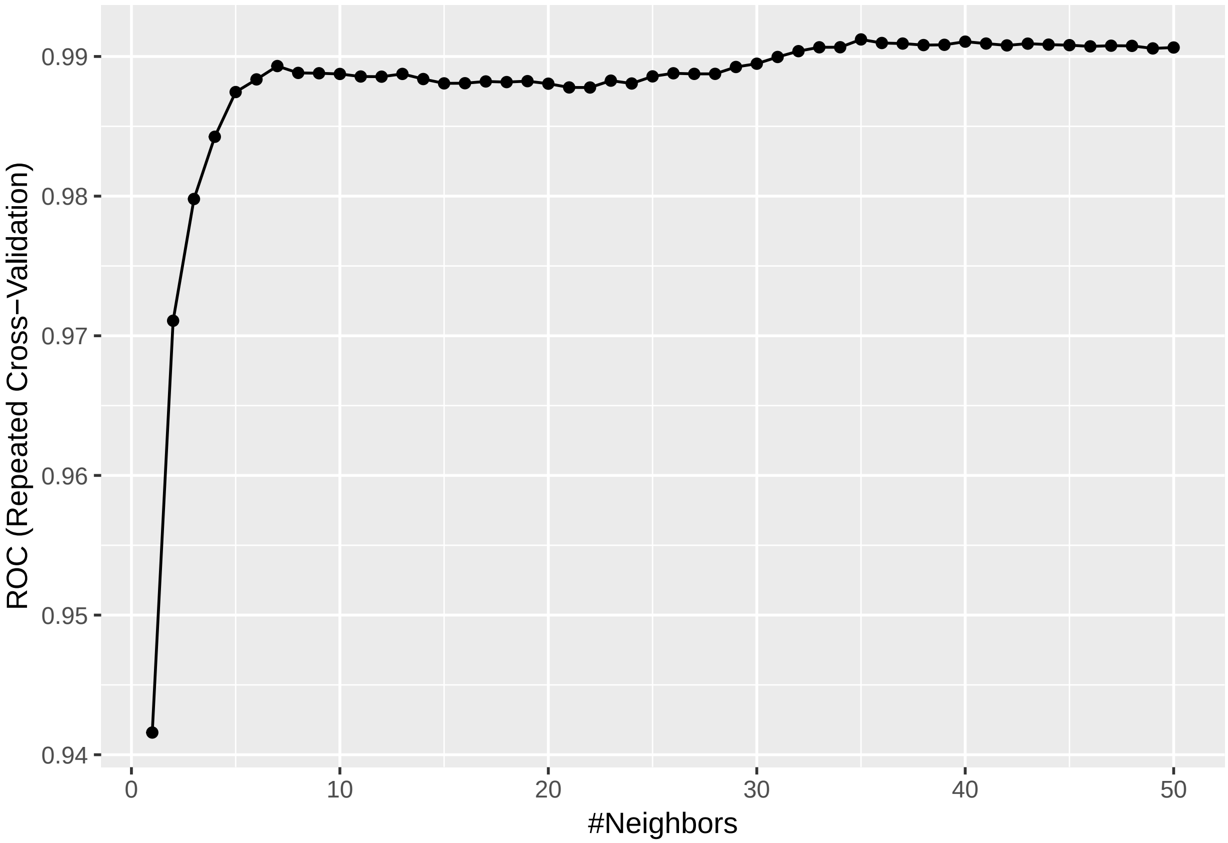
```
set.seed(1)
model.knn <- train(x = train_df[,-1],
                   y = train_df$diagnosis,
                   method = "knn",
                   preProcess = c("center", "scale"),
                   tuneGrid = data.frame(k = seq(1,50,by=1)),
                   trControl = ctrl)
```

```
## Warning in train.default(x = train_df[, -1], y = train_df$diagnosis, method
## = "knn", : The metric "Accuracy" was not in the result set. ROC will be
## used instead.
```

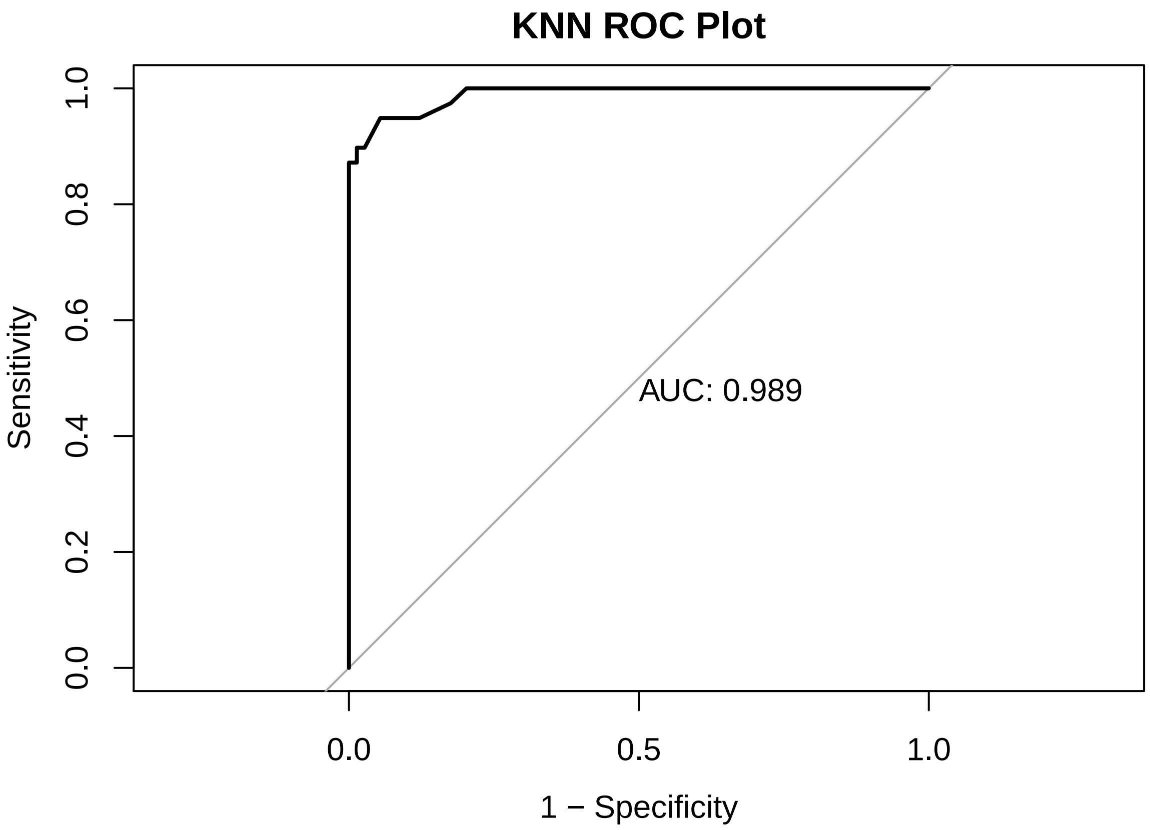
```
model.knn$bestTune
```

```
##     k
## 35 35
```

```
ggplot(model.knn)
```



```
pred_knn = predict.train(model.knn, newdata = test_df, type = 'prob')
roc_knn <- roc(test_df$diagnosis, pred_knn[,2],
               levels = c("B", "M"))
plot.roc(roc_knn, legacy.axes = TRUE, print.auc = TRUE,main="KNN ROC Plot")
```



AUC Value for KNN is 0.989 as shown above.

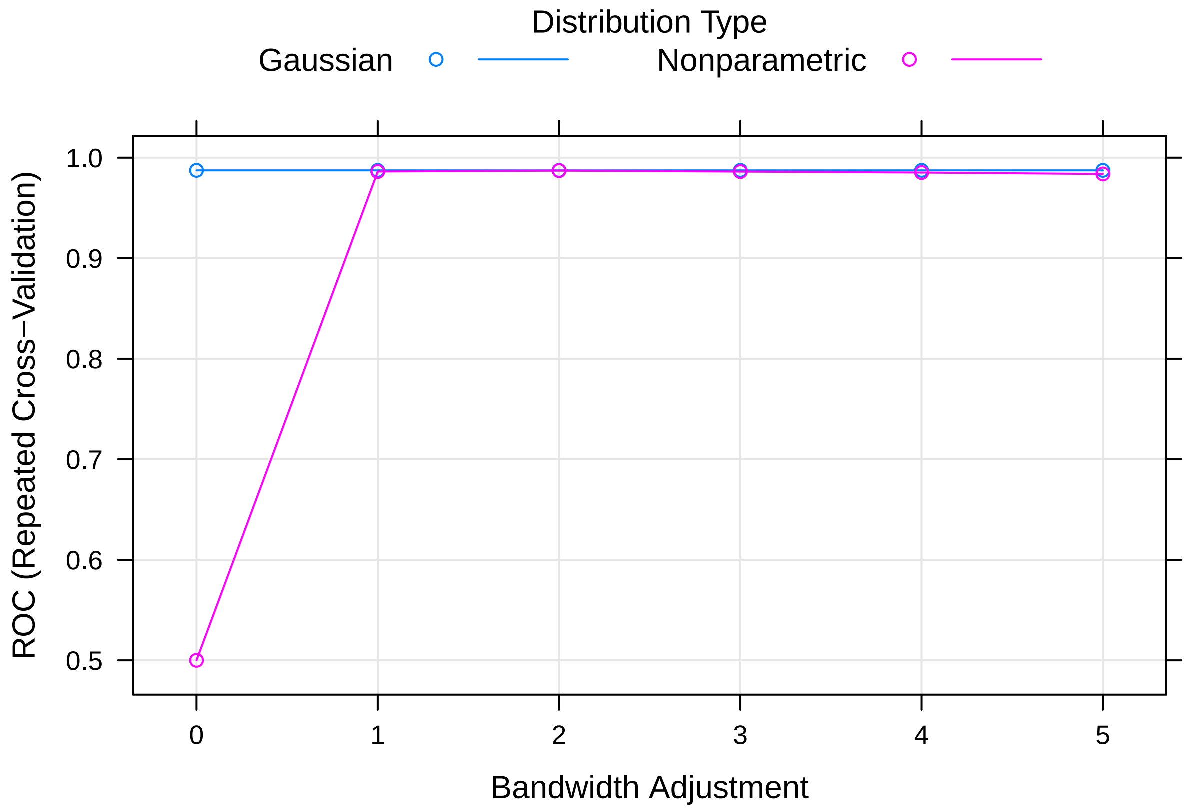
Bayes

```r
set.seed(1)

nbGrid <- expand.grid(usekernel = c(FALSE,TRUE),
                      fL = 1,
                      adjust = seq(0,5,by = 1))

model.nb <- train(x = train_df[,-1],
                  y = train_df$diagnosis,
                  method = "nb",
                  tuneGrid = nbGrid,
                  metric = "ROC",
                  trControl = ctrl)

plot(model.nb)
```



Compare QDA, NB and KNN

```
res <- resamples(list(QDA=model.qda,NB = model.nb, KNN = model.knn))
summary(res)
```

```
##
## Call:
## summary.resamples(object = res)
##
## Models: QDA, NB, KNN
## Number of resamples: 50
##
## ROC
##           Min.   1st Qu.    Median      Mean  3rd Qu. Max. NA's
## QDA 0.9406130 0.9879202 0.9939812 0.9911740 1.000000    1    0
## NB  0.9636015 0.9794685 0.9890008 0.9873719 0.995907    1    0
## KNN 0.9621849 0.9849138 0.9945004 0.9912221 1.000000    1    0
##
## Sens
##           Min.   1st Qu.    Median      Mean   3rd Qu. Max. NA's
## QDA 0.8928571 0.9642857 0.9649015 0.9682266 1.0000000    1    0
## NB  0.8571429 0.9285714 0.9642857 0.9472660 0.9655172    1    0
## KNN 0.9285714 0.9655172 1.0000000 0.9879557 1.0000000    1    0
##
## Spec
##           Min.   1st Qu.    Median      Mean   3rd Qu. Max. NA's
## QDA 0.8333333 0.9411765 0.9411765 0.9513725 1.0000000    1    0
## NB  0.7058824 0.8455882 0.8888889 0.8981046 0.9411765    1    0
## KNN 0.7058824 0.8259804 0.8823529 0.8816993 0.9411765    1    0
```

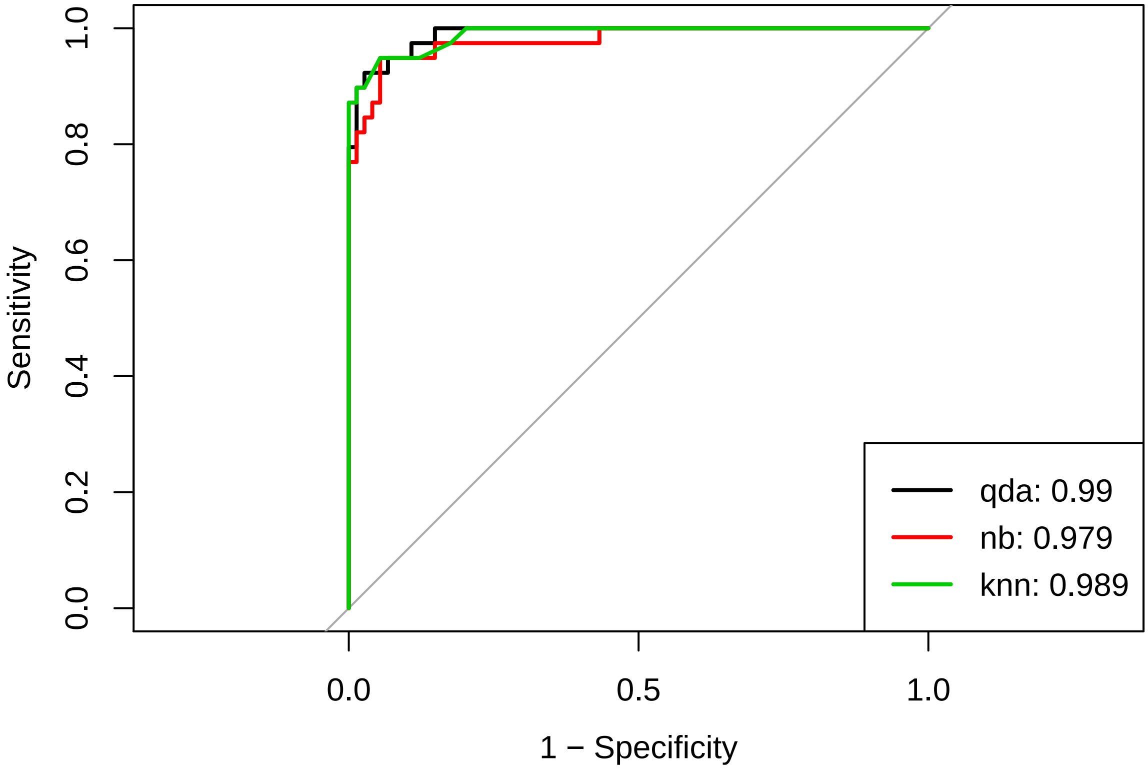
Now let's look at the test set performance.

```
library(stats)
pred_knn = predict.train(model.knn, newdata = test_df, type = 'prob')[,2]
pred_qda = predict.train(model.qda, newdata = test_df, type = 'prob')[,2]
pred_nb = predict.train(model.nb, newdata = test_df, type = 'prob')[,2]

roc.nb <- roc(test_df$diagnosis, pred_nb)
roc.qda <- roc(test_df$diagnosis, pred_qda)
roc.knn <- roc(test_df$diagnosis, pred_knn)

auc <- c(roc.qda$auc[1], roc.nb$auc[1], roc.knn$auc[1])


plot(roc.qda, col = 1,legacy.axes=TRUE)
plot(roc.nb, col = 2,add=TRUE)
plot(roc.knn, col = 3,add=TRUE)
modelNames <- c("qda","nb","knn")
legend("bottomright", legend = paste0(modelNames, ": ", round(auc,3)),
       col = 1:6, lwd = 2)
```


Sensitivity
1 − Specificity
qda: 0.99
nb: 0.979
knn: 0.989