MA679 Hw6

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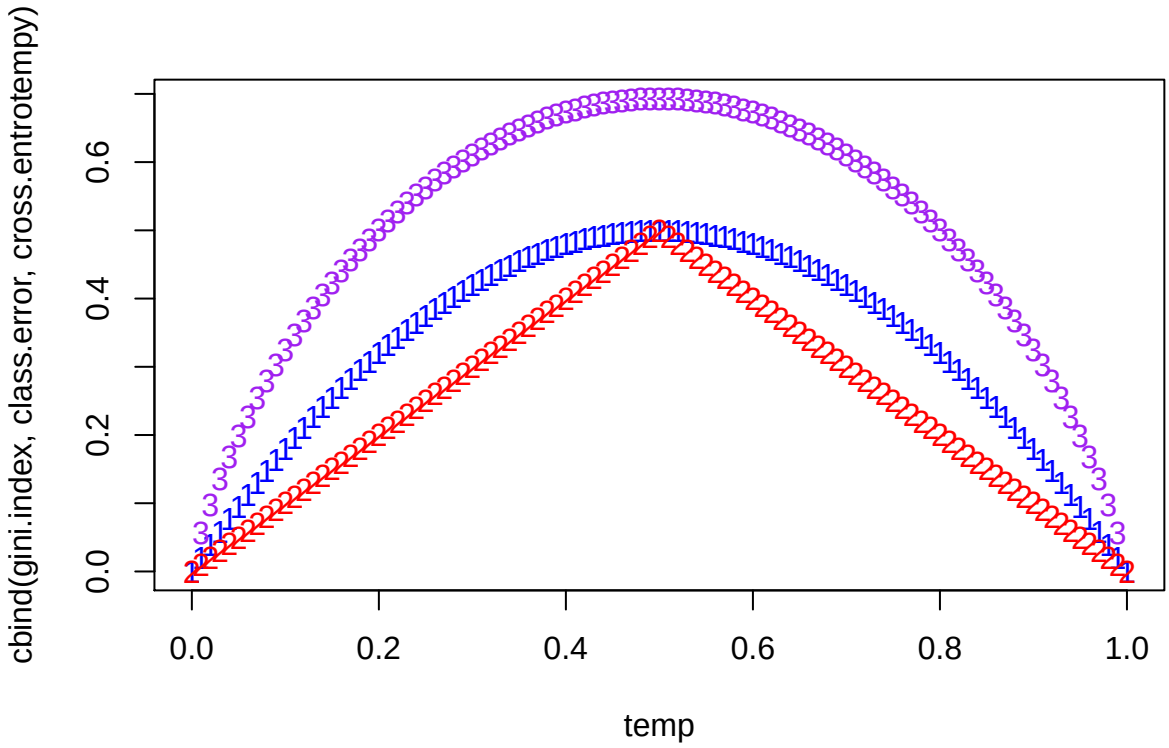
8.1 and 8.2 are in the next page

8.3

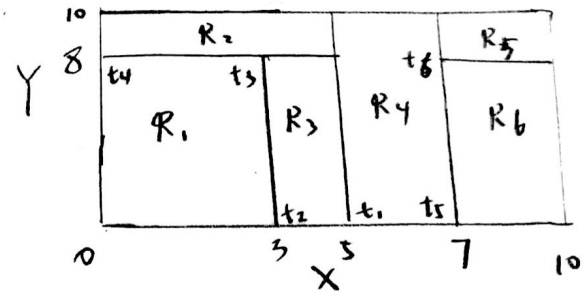
```
temp <- seq(0, 1, 0.01)
gini.index <- 2 * temp * (1 - temp)
class.error <- 1 - pmax(temp, 1 - temp)
cross.entrotempy <- - (temp * log(temp) + (1 - temp) * log(1 - temp))
matplot(temp, cbind(gini.index, class.error, cross.entrotempy), col = c("blue", "red", "purple"))
```



8.5

```
#1. We classify X as Red as it is the most commonly occurring class among the 10 predictions (6 for Red
#2. With the average probability approach, we classify X as Green as the average of the 10 probabilitie
```

8.1



8.2

$\hat{f}^1(x) = c_1 I(x_1 < t_1) + c_1' = \frac{1}{\lambda} f_1(x_1)$

Since $\hat{f}(x) = \lambda \hat{f}^1(x)$ and $r_i = y_i - \lambda \hat{f}^1(x_i)$

$f^2(x) = c_2 I(x_2 < t_2) + c_2' = \frac{1}{\lambda} f_2(x_2)$

$\hat{f}(x) = \hat{\lambda}\hat{f}^1(x) + \lambda \hat{f}^2(x)$ and $r_i = y_i - \hat{\lambda}\hat{f}^1(x_i) - \lambda \hat{f}^2(x_i) \; \forall i$

$\therefore \hat{f}(x) = \sum_{i=1}^{p} f_i(x_i)$

Figure 1: 8.1&8.2

8.7

```
library(MASS)
library(randomForest)
```

```
## randomForest 4.6-14
```

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

```
set.seed(2)
train <- sample(1:nrow(Boston), nrow(Boston) / 2)
Boston.train <- Boston[train, -14]
Boston.test <- Boston[-train, -14]
Y.train <- Boston[train, 14]
Y.test <- Boston[-train, 14]
rf.boston1 <- randomForest(Boston.train, y = Y.train, xtest = Boston.test, ytest = Y.test, mtry = ncol(
rf.boston2 <- randomForest(Boston.train, y = Y.train, xtest = Boston.test, ytest = Y.test, mtry = (ncol
rf.boston3 <- randomForest(Boston.train, y = Y.train, xtest = Boston.test, ytest = Y.test, mtry = sqrt(
plot(1:500, rf.boston1$test$mse, col = "green", type = "l", xlab = "Number of Trees", ylab = "Test MSE"
lines(1:500, rf.boston2$test$mse, col = "red", type = "l")
lines(1:500, rf.boston3$test$mse, col = "blue", type = "l")
legend("topright", c("m = p", "m = p/2", "m = sqrt(p)"), col = c("green", "red", "blue"), cex = 1, lty =
```