Teachers Logistic Regression code

2025-04-15

```r
library(jpeg)
```

```
## Warning: package 'jpeg' was built under R version 4.4.3
```

```r
pm <- read.csv("D:\\MATH 3333\\Winter 25\\Final Project\\photoMetaData.csv")
n <- nrow(pm)

trainFlag <- (runif(n) > 0.5)
y <- as.numeric(pm$category == "outdoor-day")

X <- matrix(NA, ncol=3, nrow=n)
for (j in 1:n) {
  img <- readJPEG(paste0("D:\\MATH 3333\\Winter 25\\Final Project\\columbiaImages\\columbiaImages\\",pm$
  X[j,] <- apply(img,3,median)
  print(sprintf("%03d / %03d", j, n))
}
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## [1] "783 / 800"
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## [1] "799 / 800"
## [1] "800 / 800"
```

```r
# build a glm model on these median values
out <- glm(y ~ X, family=binomial, subset=trainFlag)
out$iter
```

```
## [1] 5
```

```r
summary(out)
```

```
##
## Call:
## glm(formula = y ~ X, family = binomial, subset = trainFlag)
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)   -1.996      0.302  -6.609 3.86e-11 ***
## X1            -6.775      2.088  -3.245  0.00117 **
## X2             2.343      3.220   0.728  0.46692
## X3             9.890      2.237   4.420 9.87e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 531.66  on 417  degrees of freedom
## Residual deviance: 419.40  on 414  degrees of freedom
## AIC: 427.4
##
## Number of Fisher Scoring iterations: 5
```

```r
# How well did we do?
pred <- 1 / (1 + exp(-1 * cbind(1,X) %*% coef(out)))
y[order(pred)]
```

```
##    [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
##   [38] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
##   [75] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
##  [112] 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
##  [149] 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
##  [186] 0 0 0 0 0 1 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0
##  [223] 0 1 0 0 0 0 0 0 0 0 0 0 1 1 0 0 1 0 0 0 1 0 1 0 0 0 0 0 0 0 0 1 1 1 0 1 0
##  [260] 0 0 0 1 0 0 0 0 0 1 1 0 1 1 0 1 1 0 0 1 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0
##  [297] 1 0 1 1 0 0 0 0 0 0 1 0 0 0 0 1 0 1 0 0 0 1 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0
##  [334] 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0 1 0 1 1 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0
##  [371] 0 0 0 0 0 0 1 0 0 0 0 1 0 0 1 0 0 1 1 0 1 0 1 0 1 0 1 0 0 1 0 1 0 0 0 0 1 0
##  [408] 1 1 0 0 1 0 0 0 0 0 1 0 1 0 0 0 1 0 0 0 0 1 0 1 0 1 0 0 0 0 1 0 0 1 0 0 0
##  [445] 0 1 0 1 0 0 1 0 1 0 0 1 0 0 0 0 0 0 0 1 0 0 0 1 1 1 0 0 1 0 0 0 1 0 1 0
##  [482] 1 0 0 0 0 0 1 1 0 1 1 1 0 0 0 0 0 0 0 0 1 1 1 1 0 1 0 0 1 1 1 0 1 1 1 1
##  [519] 0 1 0 0 1 0 1 0 1 0 1 0 0 0 1 1 0 0 0 1 0 0 1 0 1 0 1 0 1 1 0 1 0 0 1 1 1 1 1 1
##  [556] 0 0 0 1 1 1 1 0 1 0 0 0 1 0 0 1 1 0 0 1 0 1 1 1 0 1 0 0 1 1 1 1 0 1 1 1 0
##  [593] 1 0 0 1 0 1 1 1 0 0 1 0 1 1 0 0 1 1 1 1 1 1 0 0 1 1 0 0 1 1 0 1 0 1 0 0 1
##  [630] 1 0 0 0 1 1 1 0 1 1 0 1 0 1 0 1 0 0 0 1 1 1 0 0 1 1 1 1 1 0 1 1 0 1 0 1 0
##  [667] 1 1 0 1 1 1 0 1 0 0 1 0 1 0 1 0 0 0 0 1 1 1 1 0 1 1 1 1 1 1 0 1 1 1 1 1 0
##  [704] 1 0 1 0 1 1 1 1 0 1 1 1 1 1 0 1 1 0 1 1 1 0 0 1 1 1 0 1 1 1 0 0 1 0 1 1 0
##  [741] 1 1 0 0 1 1 1 1 0 0 1 1 1 0 1 1 1 0 1 1 1 1 1 0 0 1 1 1 1 0 0 1 0 1 1 1 1
##  [778] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```r
y[!trainFlag][order(pred[!trainFlag])]
```

```
##    [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
##   [38] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
##   [75] 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
##  [112] 1 0 1 0 0 1 0 1 0 0 0 0 1 1 0 0 0 0 1 1 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0
##  [149] 0 0 1 1 0 0 0 0 0 0 0 0 0 1 0 0 1 0 1 0 1 0 0 0 0 0 1 0 0 0 0 0 0 1 1 0 1
##  [186] 0 0 1 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 1 0 0 1 0 1 0 1 0 0 0 0 1 0 0 0 0
##  [223] 0 1 1 0 0 1 0 0 0 0 0 1 1 1 1 0 1 1 1 1 1 0 1 0 1 1 0 0 0 0 1 0 1 0 1 1
##  [260] 0 1 1 1 0 0 0 0 1 0 0 0 1 0 1 0 1 0 1 1 1 1 1 1 1 0 0 1 1 1 1 1 1 1 0 0 1
##  [297] 0 0 1 0 1 0 1 1 0 0 1 1 1 1 1 0 1 1 1 1 0 1 1 0 1 1 0 1 1 1 0 1 0 1 1 0 1
##  [334] 1 1 0 1 1 1 1 0 0 0 1 1 1 1 1 1 1 0 0 0 1 1 0 1 1 1 0 1 1 0 1 1 0 1 1 1 1
##  [371] 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```r
mean((as.numeric(pred > 0.5) == y)[trainFlag])
```

```
## [1] 0.7344498
```

```r
mean((as.numeric(pred > 0.5) == y)[!trainFlag])
```

```
## [1] 0.7434555
```

```r
## ROC curve (see lecture 12)
roc <- function(y, pred) {
  alpha <- quantile(pred, seq(0,1,by=0.01))
  N <- length(alpha)

  sens <- rep(NA,N)
```

```
  spec <- rep(NA,N)
  for (i in 1:N) {
    predClass <- as.numeric(pred >= alpha[i])
    sens[i] <- sum(predClass == 1 & y == 1) / sum(y == 1)
    spec[i] <- sum(predClass == 0 & y == 0) / sum(y == 0)
  }
  return(list(fpr=1- spec, tpr=sens))
}

r <- roc(y[!trainFlag], pred[!trainFlag])
plot(r$fpr, r$tpr, xlab="false positive rate", ylab="true positive rate", type="l")
abline(0,1,lty="dashed")
```
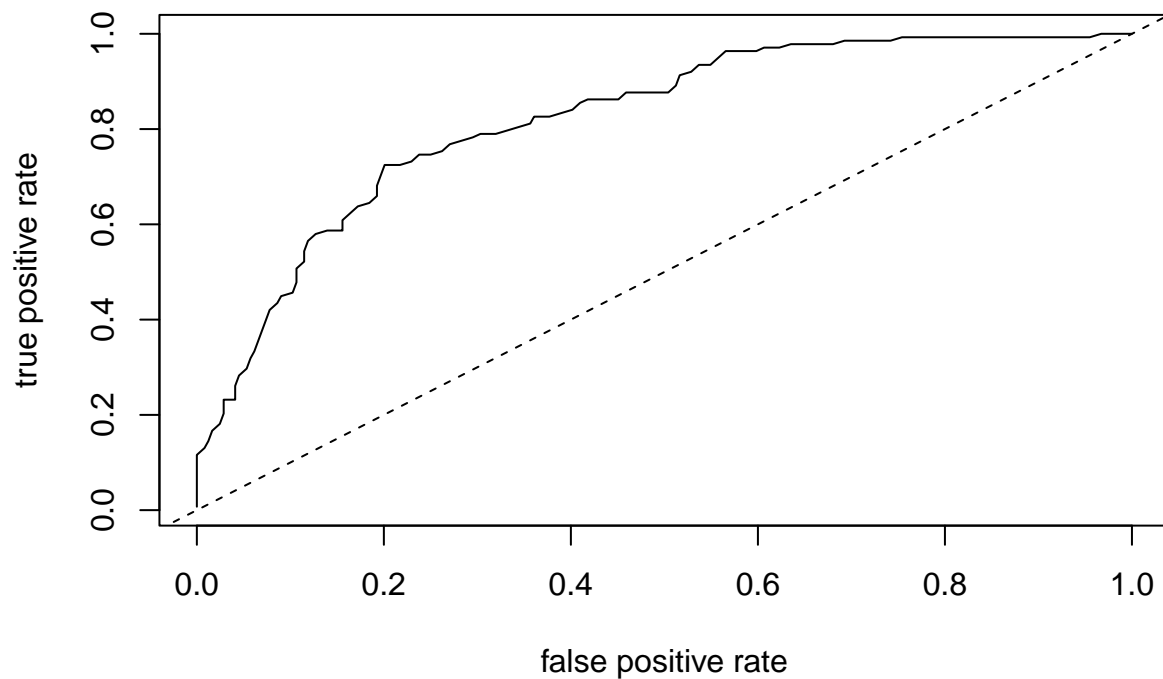


```
# auc
auc <- function(r) {
  sum((r$fpr) * diff(c(0,r$tpr)))
}
glmAuc <- auc(r)
glmAuc
```

```
## [1] 0.8234141
```