Homework 6
Zhaoxing Wu
Stat 443

Method	Error
Mice + LDA	0.006289308
Amelia + LDA	0.008805031
Mice + multinomial logistic regression	0.013836478
Amelia + multinomial logistic regression	0.01886792

R code:
```r
z <- read.table(file="fish.txt",header=TRUE,stringsAsFactors=TRUE)
y <- z$species
z$sex[z$sex == "unknown"] <- NA
z <- droplevels(z)
x <- z[,-1]
out <- amelia(x,noms=7, p2s=0)

error = function(df){
  count = 0
  for (i in 1:length(y)){
    lda.model = lda(y[-i] ~., data = df[-i, ])
    predicted <- predict(lda.model, newdata=df[i, ],type="class")

    if (predicted$class != y[i])
      count = count + 1
  }
  return(count)
}
pct_lda = (error(out$imputations$imp1)+ error(out$imputations$imp2)+ error(ou
t$imputations$imp3)+ error(out$imputations$imp4)+ error(out$imputations$imp
5))/5/length(y)
```

[1] 0.008805031

```r
z <- read.table(file="fish.txt",header=TRUE,stringsAsFactors=TRUE)
z <- na.omit(z) ## remove observations with NAs
mul <- multinom(species ~ ., data=z)

error2 = function(df){
  count = 0
  for (i in 1:length(y)){
    mul.model = multinom(y[-i] ~., data = df[-i, ])
    predicted <- predict(mul.model, newdata=df[i, ],type="class")

    if (predicted != y[i])
      count = count + 1
  }
```

```r
  return(count)
}

pct_multinom = (error2(out$imputations$imp1)+ error2(out$imputations$imp2)+ e
rror2(out$imputations$imp3)+ error2(out$imputations$imp4)+ error2(out$imputat
ions$imp5))/5/length(y)
```

[1] 0.01886792

```r
z <- read.table(file="fish.txt",header=TRUE,stringsAsFactors=TRUE)
y <- z$species
z$sex[z$sex == "unknown"] <- NA
z <- droplevels(z)
out <- mice(z[,-1])

pct_mice =(error(complete(out,1)) + error(complete(out,2)) + error(complete(o
ut,3)) + error(complete(out,4)) + error(complete(out,5)))/5/length(y)
pct_mice
```

[1] 0.006289308

```r
pct_mice_mul =(error2(complete(out,1)) + error2(complete(out,2)) + error2(com
plete(out,3)) + error2(complete(out,4)) + error2(complete(out,5)))/5/length
(y)
```

[1] 0.013836478