Predictions

2023-04-30

```
library(nnet)
library(ggplot2)
library(MASS)
library(knitr)
```

```
load(file = file.path(root_dir, "R_data", "pca_wm.Rda"))
load(file = file.path(root_dir, "R_data", "pca_gm.Rda"))
load(file = file.path(root_dir, "R_data", "pca_cb.Rda"))


wm_mn <- mn_reg(pca_wm)
```

```
## # weights:  486 (322 variable)
## initial  value 381.218464
## iter  10 value 104.832115
## iter  20 value 75.867692
## iter  30 value 72.373119
## iter  40 value 71.891046
## iter  50 value 71.481349
## iter  60 value 69.461093
## iter  70 value 58.652359
## iter  80 value 56.134542
## iter  90 value 55.996863
## iter 100 value 55.874935
## final  value 55.874935
## stopped after 100 iterations
```

```
gm_mn <- mn_reg(pca_gm)
```

```
## # weights:  438 (290 variable)
## initial  value 381.218464
## iter  10 value 107.760603
## iter  20 value 67.127917
## iter  30 value 63.056758
## iter  40 value 62.307456
## iter  50 value 61.954740
## iter  60 value 61.427758
## iter  70 value 59.854614
## iter  80 value 57.542159
## iter  90 value 55.868385
## iter 100 value 55.625698
## final  value 55.625698
## stopped after 100 iterations
```

```
cb_mn <- mn_reg(pca_cb)
```

```
## # weights:  477 (316 variable)
```

```
## initial  value 381.218464
## iter  10 value 123.372823
## iter  20 value 80.516871
## iter  30 value 67.061821
## iter  40 value 63.722742
## iter  50 value 62.338213
## iter  60 value 61.352293
## iter  70 value 60.435883
## iter  80 value 59.633238
## iter  90 value 57.899273
## iter 100 value 55.850165
## final  value 55.850165
## stopped after 100 iterations
```

```
# summarizing mn
summary(cb_mn$mod)$AIC
```

```
## [1] 743.7003
```

```
summary(cb_mn$mod)$coefficients[,1:7]
```

```
##   (Intercept)          PC1          PC2           PC3          PC4          PC5
## 1   0.3186001 0.0001579984 -0.003168193  0.0002402674 0.0020288032 -0.002147857
## 2  -0.2649286 0.0006565155 -0.003594123 -0.0020043322 0.0008837553 -0.001516434
##             PC6
## 1 -0.0030775688
## 2 -0.0001549175
```

```
summary(cb_mn$mod)$standard.errors[,1:7]
```

```
##   (Intercept)         PC1         PC2        PC3         PC4         PC5
## 1   0.7676946 0.002226282 0.003230171 0.00803471 0.002191439 0.003940935
## 2   1.2398172 0.005972785 0.006975156 0.02273857 0.016354958 0.022886824
##           PC6
## 1 0.004625589
## 2 0.025704408
```

```
summary(wm_mn$mod)$AIC
```

```
## [1] 755.7499
```

```
summary(wm_mn$mod)$coefficients[,1:7]
```

```
##   (Intercept)          PC1          PC2          PC3          PC4          PC5
## 1   0.7972221 -0.001449435 2.041148e-03 0.0002575271 0.0006543859 -0.0007743157
## 2  -0.9123362 -0.001737895 3.023331e-05 0.0045734096 0.0004952741 -0.0011499025
##             PC6
## 1 -0.0003778949
## 2  0.0031140628
```

```
summary(wm_mn$mod)$standard.errors[,1:7]
```

```
##   (Intercept)          PC1         PC2         PC3         PC4        PC5
## 1   0.2995953 0.0005807201 0.001137606 0.001208143 0.001392137 0.00129055
## 2   0.5993041 0.0011947912 0.001968472 0.006735544 0.008806892 0.00229598
##           PC6
## 1 0.001830363
## 2 0.004416580
```

```
summary(gm_mn$mod)$AIC
```

```
## [1] 691.2514
```

```
summary(gm_mn$mod)$coefficients[,1:7]
```

```
##   (Intercept)           PC1          PC2          PC3         PC4          PC5
## 1   0.4291705 -7.179037e-05 -0.004137747 0.0034652684 0.001526389 -0.001405439
## 2  -0.3730595  6.749766e-04 -0.001829438 0.0008440987 0.001289152 -0.001465138
##             PC6
## 1  0.0015107737
## 2 -0.0002454374
```

```
summary(gm_mn$mod)$standard.errors[,1:7]
```

```
##   (Intercept)          PC1         PC2         PC3         PC4         PC5
## 1   0.4543218 0.0008733233 0.001824357 0.002816659 0.001955144 0.001679500
## 2   0.5194136 0.0010218373 0.001959657 0.003642420 0.002374480 0.002197226
##           PC6
## 1 0.002254085
## 2 0.003288200
```

```
wm_lda <- lda_reg(pca_wm)
gm_lda <- lda_reg(pca_gm)
cb_lda <- lda_reg(pca_cb)

# summarizing lda
summary(wm_lda$mod)
```

```
##         Length Class  Mode
## prior     3    -none- numeric
## counts    3    -none- numeric
## means   480    -none- numeric
## scaling 320    -none- numeric
## lev       3    -none- character
## svd       2    -none- numeric
## N         1    -none- numeric
## call      3    -none- call
## terms     3    terms  call
## xlevels   0    -none- list
```

```
summary(gm_lda$mod)
```

```
##         Length Class  Mode
## prior     3    -none- numeric
## counts    3    -none- numeric
## means   432    -none- numeric
## scaling 288    -none- numeric
## lev       3    -none- character
## svd       2    -none- numeric
## N         1    -none- numeric
## call      3    -none- call
## terms     3    terms  call
## xlevels   0    -none- list
```

```
summary(cb_lda$mod)
```

```
##         Length Class  Mode
## prior      3    -none- numeric
## counts     3    -none- numeric
## means    471    -none- numeric
## scaling  314    -none- numeric
## lev        3    -none- character
## svd        2    -none- numeric
## N          1    -none- numeric
## call       3    -none- call
## terms      3    terms  call
## xlevels    0    -none- list
```

```
# not enough data for QDA
#wm_qda <- qda_reg(pca_ls_wm)
#gm_qda <- qda_reg(pca_ls_gm)
#cb_qda <- qda_reg(pca_ls_cb)

# confusion matrix
wm_mn$cm
```

```
##             y_preds
##              CN_pred MCI_pred AD_pred
##   CN_actual       27        2       1
##   MCI_actual       1       40       0
##   AD_actual        4        4       8
```

```
gm_mn$cm
```

```
##             y_preds
##              CN_pred MCI_pred AD_pred
##   CN_actual       27        3       0
##   MCI_actual       6       34       1
##   AD_actual        0        5      11
```

```
cb_mn$cm
```

```
##             y_preds
##              CN_pred MCI_pred AD_pred
##   CN_actual       27        1       2
##   MCI_actual       7       31       3
##   AD_actual        2        3      11
```

```
wm_lda$cm
```

```
##             y_preds
##              CN_pred MCI_pred AD_pred
##   CN_actual       27        2       1
##   MCI_actual       4       37       0
##   AD_actual        0        3      13
```

```
gm_lda$cm
```

```
##             y_preds
##              CN_pred MCI_pred AD_pred
##   CN_actual       29        0       1
##   MCI_actual       4       37       0
##   AD_actual        1        2      13
```

```
cb_lda$cm
```

```
##             y_preds
##              CN_pred MCI_pred AD_pred
##   CN_actual       29        0       1
##   MCI_actual       3       37       1
##   AD_actual        1        3      12
```

Plot method comparison

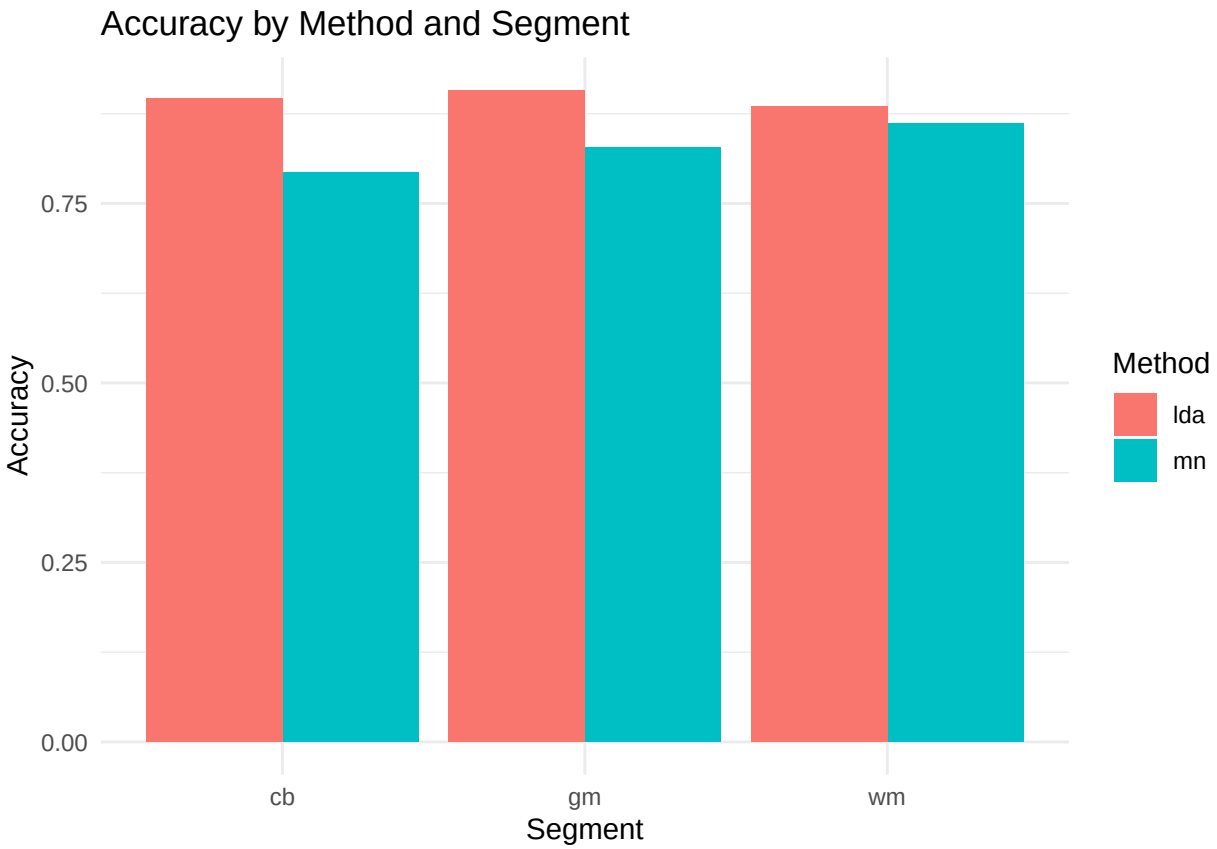
```
method <- c(rep("mn", 3), rep("lda", 3))
segment <- rep(c("wm", "gm", "cb"), 2)
accuracy <- c(wm_mn$accuracy, gm_mn$accuracy, cb_mn$accuracy,
              wm_lda$accuracy, gm_lda$accuracy, cb_lda$accuracy)

# combine the vectors into a data frame
df <- data.frame(method = method, segment = segment, accuracy = accuracy)

kable(df, format = "markdown")
```

method	segment	accuracy
mn	wm	0.8620690
mn	gm	0.8275862
mn	cb	0.7931034
lda	wm	0.8850575
lda	gm	0.9080460
lda	cb	0.8965517

```
ggplot(df, aes(x = segment, y = accuracy, fill = method)) +
  geom_bar(stat = "identity", position = position_dodge()) +
  labs(title = "Accuracy by Method and Segment",
       x = "Segment", y = "Accuracy",
       fill = "Method") +
  theme_minimal()
```


Accuracy by Method and Segment
Accuracy
0.75
0.50
0.25
0.00
cb
gm
wm
Segment
Method
lda
mn