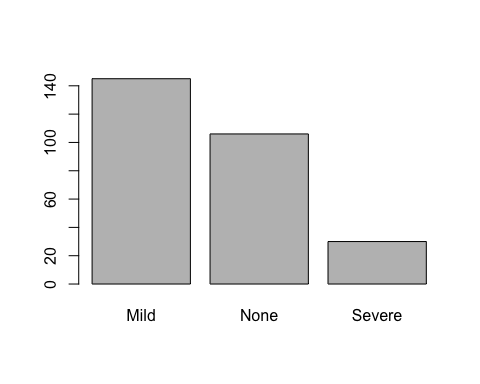
Ch12

Chathrua Gunasekara

November 22, 2014

1.a

## Loading required package: lattice  
## Loading required package: ggplot2

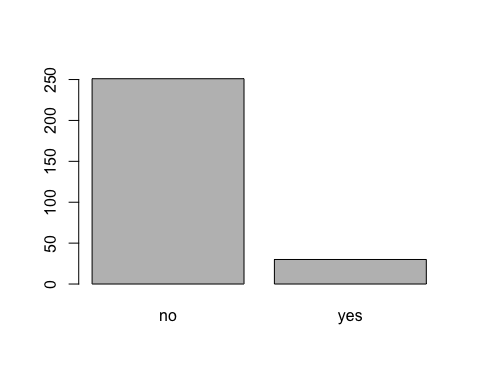


## [1] 82

## [1] 281 102

## NULL

## newInjury  
## no yes   
## 251 30



## Loading required package: pROC  
## Type 'citation("pROC")' for a citation.  
##   
## Attaching package: 'pROC'  
##   
## The following objects are masked from 'package:stats':  
##   
## cov, smooth, var

## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge

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## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge

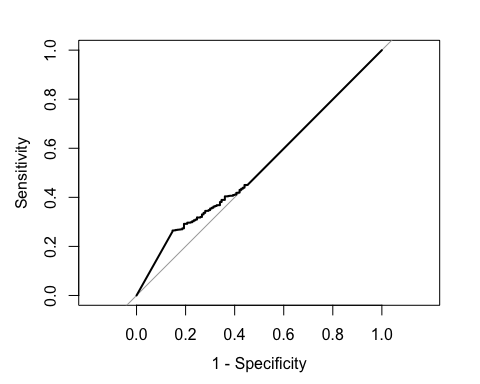
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Generalized Linear Model   
##   
## 225 samples  
## 96 predictor  
## 2 classes: 'no', 'yes'   
##   
## No pre-processing  
## Resampling: Repeated Train/Test Splits Estimated (25 reps, 0.75%)   
##   
## Summary of sample sizes: 169, 169, 169, 169, 169, 169, ...   
##   
## Resampling results  
##   
## ROC Sens Spec ROC SD Sens SD Spec SD   
## 0.5686 0.6552 0.2933333 0.06527662 0.06640281 0.1941267  
##   
##

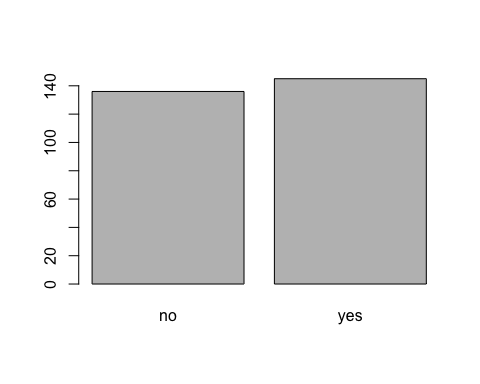
## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction no yes  
## no 819 106  
## yes 431 44  
##   
## Accuracy : 0.6164   
## 95% CI : (0.5904, 0.642)  
## No Information Rate : 0.8929   
## P-Value [Acc > NIR] : 1   
##   
## Kappa : -0.0263   
## Mcnemar's Test P-Value : <2e-16   
##   
## Sensitivity : 0.29333   
## Specificity : 0.65520   
## Pos Pred Value : 0.09263   
## Neg Pred Value : 0.88541   
## Prevalence : 0.10714   
## Detection Rate : 0.03143   
## Detection Prevalence : 0.33929   
## Balanced Accuracy : 0.47427   
##   
## 'Positive' Class : yes   
##



##   
## Call:  
## roc.default(response = lrSevere$pred$obs, predictor = lrSevere$pred$yes, levels = rev(levels(lrSevere$pred$obs)))  
##   
## Data: lrSevere$pred$yes in 150 controls (lrSevere$pred$obs yes) < 1250 cases (lrSevere$pred$obs no).  
## Area under the curve: 0.5235

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction no yes  
## no 39 4  
## yes 11 2  
##   
## Accuracy : 0.7321   
## 95% CI : (0.597, 0.8417)  
## No Information Rate : 0.8929   
## P-Value [Acc > NIR] : 0.9998   
##   
## Kappa : 0.0749   
## Mcnemar's Test P-Value : 0.1213   
##   
## Sensitivity : 0.33333   
## Specificity : 0.78000   
## Pos Pred Value : 0.15385   
## Neg Pred Value : 0.90698   
## Prevalence : 0.10714   
## Detection Rate : 0.03571   
## Detection Prevalence : 0.23214   
## Balanced Accuracy : 0.55667   
##   
## 'Positive' Class : yes   
##

## newInjury  
## no yes   
## 136 145



## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

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## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

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## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge

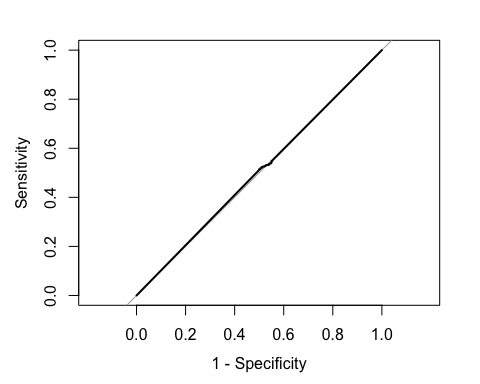
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Generalized Linear Model   
##   
## 225 samples  
## 96 predictor  
## 2 classes: 'no', 'yes'   
##   
## No pre-processing  
## Resampling: Repeated Train/Test Splits Estimated (25 reps, 0.75%)   
##   
## Summary of sample sizes: 169, 169, 169, 169, 169, 169, ...   
##   
## Resampling results  
##   
## ROC Sens Spec ROC SD Sens SD Spec SD   
## 0.5310089 0.4696296 0.5268966 0.04728294 0.08863131 0.1106318  
##   
##

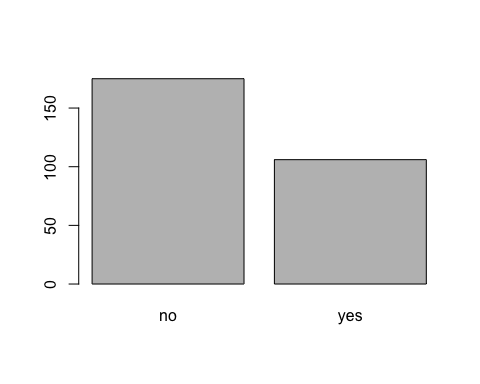
## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction no yes  
## no 317 343  
## yes 358 382  
##   
## Accuracy : 0.4993   
## 95% CI : (0.4728, 0.5258)  
## No Information Rate : 0.5179   
## P-Value [Acc > NIR] : 0.9218   
##   
## Kappa : -0.0035   
## Mcnemar's Test P-Value : 0.5970   
##   
## Sensitivity : 0.5269   
## Specificity : 0.4696   
## Pos Pred Value : 0.5162   
## Neg Pred Value : 0.4803   
## Prevalence : 0.5179   
## Detection Rate : 0.2729   
## Detection Prevalence : 0.5286   
## Balanced Accuracy : 0.4983   
##   
## 'Positive' Class : yes   
##



##   
## Call:  
## roc.default(response = lrMild$pred$obs, predictor = lrMild$pred$yes, levels = rev(levels(lrMild$pred$obs)))  
##   
## Data: lrMild$pred$yes in 725 controls (lrMild$pred$obs yes) < 675 cases (lrMild$pred$obs no).  
## Area under the curve: 0.5023

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction no yes  
## no 14 15  
## yes 13 14  
##   
## Accuracy : 0.5   
## 95% CI : (0.3634, 0.6366)  
## No Information Rate : 0.5179   
## P-Value [Acc > NIR] : 0.6562   
##   
## Kappa : 0.0013   
## Mcnemar's Test P-Value : 0.8501   
##   
## Sensitivity : 0.4828   
## Specificity : 0.5185   
## Pos Pred Value : 0.5185   
## Neg Pred Value : 0.4828   
## Prevalence : 0.5179   
## Detection Rate : 0.2500   
## Detection Prevalence : 0.4821   
## Balanced Accuracy : 0.5006   
##   
## 'Positive' Class : yes   
##

## newInjury  
## no yes   
## 175 106



## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge

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## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

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## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

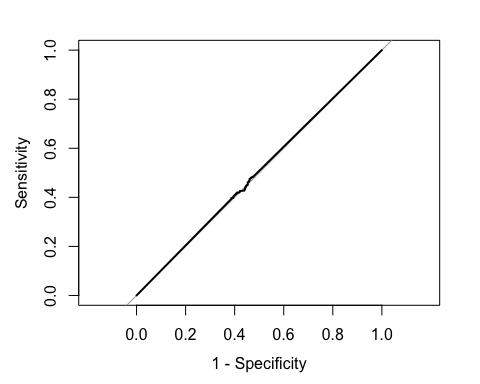
## Warning: glm.fit: algorithm did not converge

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Generalized Linear Model   
##   
## 225 samples  
## 96 predictor  
## 2 classes: 'no', 'yes'   
##   
## No pre-processing  
## Resampling: Repeated Train/Test Splits Estimated (25 reps, 0.75%)   
##   
## Summary of sample sizes: 169, 169, 169, 169, 169, 169, ...   
##   
## Resampling results  
##   
## ROC Sens Spec ROC SD Sens SD Spec SD   
## 0.5411156 0.568 0.44 0.04727119 0.09523333 0.0984383  
##   
##

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction no yes  
## no 497 294  
## yes 378 231  
##   
## Accuracy : 0.52   
## 95% CI : (0.4935, 0.5465)  
## No Information Rate : 0.625   
## P-Value [Acc > NIR] : 1.000000   
##   
## Kappa : 0.0078   
## Mcnemar's Test P-Value : 0.001366   
##   
## Sensitivity : 0.4400   
## Specificity : 0.5680   
## Pos Pred Value : 0.3793   
## Neg Pred Value : 0.6283   
## Prevalence : 0.3750   
## Detection Rate : 0.1650   
## Detection Prevalence : 0.4350   
## Balanced Accuracy : 0.5040   
##   
## 'Positive' Class : yes   
##



##   
## Call:  
## roc.default(response = lrNone$pred$obs, predictor = lrNone$pred$yes, levels = rev(levels(lrNone$pred$obs)))  
##   
## Data: lrNone$pred$yes in 525 controls (lrNone$pred$obs yes) < 875 cases (lrNone$pred$obs no).  
## Area under the curve: 0.5039

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction no yes  
## no 22 14  
## yes 13 7  
##   
## Accuracy : 0.5179   
## 95% CI : (0.3803, 0.6534)  
## No Information Rate : 0.625   
## P-Value [Acc > NIR] : 0.9621   
##   
## Kappa : -0.0385   
## Mcnemar's Test P-Value : 1.0000   
##   
## Sensitivity : 0.3333   
## Specificity : 0.6286   
## Pos Pred Value : 0.3500   
## Neg Pred Value : 0.6111   
## Prevalence : 0.3750   
## Detection Rate : 0.1250   
## Detection Prevalence : 0.3571   
## Balanced Accuracy : 0.4810   
##   
## 'Positive' Class : yes   
##

## Loading required package: MASS  
##   
## Attaching package: 'MASS'  
##   
## The following object is masked \_by\_ '.GlobalEnv':  
##   
## chem

## Warning in train.default(x = trainX, y = trainY, method = "lda2", metric =  
## "kappa"): The metric "kappa" was not in the result set. Accuracy will be  
## used instead.

## Linear Discriminant Analysis   
##   
## 225 samples  
## 96 predictor  
## 2 classes: 'no', 'yes'   
##   
## No pre-processing  
## Resampling: Bootstrapped (25 reps)   
##   
## Summary of sample sizes: 225, 225, 225, 225, 225, 225, ...   
##   
## Resampling results  
##   
## Accuracy Kappa Accuracy SD Kappa SD   
## 0.5341735 0.02950928 0.05461357 0.09590626  
##   
## Tuning parameter 'dimen' was held constant at a value of 1  
##

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction no yes  
## no 25 17  
## yes 10 4  
##   
## Accuracy : 0.5179   
## 95% CI : (0.3803, 0.6534)  
## No Information Rate : 0.625   
## P-Value [Acc > NIR] : 0.9621   
##   
## Kappa : -0.102   
## Mcnemar's Test P-Value : 0.2482   
##   
## Sensitivity : 0.7143   
## Specificity : 0.1905   
## Pos Pred Value : 0.5952   
## Neg Pred Value : 0.2857   
## Prevalence : 0.6250   
## Detection Rate : 0.4464   
## Detection Prevalence : 0.7500   
## Balanced Accuracy : 0.4524   
##   
## 'Positive' Class : no   
##

## Loading required package: pls  
##   
## Attaching package: 'pls'  
##   
## The following object is masked from 'package:caret':  
##   
## R2  
##   
## The following object is masked from 'package:stats':  
##   
## loadings

## Partial Least Squares   
##   
## 225 samples  
## 96 predictor  
## 2 classes: 'no', 'yes'   
##   
## No pre-processing  
## Resampling: Bootstrapped (25 reps)   
##   
## Summary of sample sizes: 225, 225, 225, 225, 225, 225, ...   
##   
## Resampling results across tuning parameters:  
##   
## ncomp Accuracy Kappa Accuracy SD Kappa SD   
## 1 0.6260056 0.11119534 0.03930382 0.06731233  
## 2 0.5869849 0.03893292 0.03702602 0.07544449  
## 3 0.5661295 0.02059708 0.04111498 0.08674908  
## 4 0.5739888 0.05522893 0.04276536 0.09311291  
## 5 0.5543417 0.02020088 0.04328485 0.09583619  
##   
## Accuracy was used to select the optimal model using the largest value.  
## The final value used for the model was ncomp = 1.

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction no yes  
## no 32 20  
## yes 3 1  
##   
## Accuracy : 0.5893   
## 95% CI : (0.4498, 0.719)  
## No Information Rate : 0.625   
## P-Value [Acc > NIR] : 0.7566718   
##   
## Kappa : -0.0455   
## Mcnemar's Test P-Value : 0.0008492   
##   
## Sensitivity : 0.91429   
## Specificity : 0.04762   
## Pos Pred Value : 0.61538   
## Neg Pred Value : 0.25000   
## Prevalence : 0.62500   
## Detection Rate : 0.57143   
## Detection Prevalence : 0.92857   
## Balanced Accuracy : 0.48095   
##   
## 'Positive' Class : no   
##

## Loading required package: glmnet  
## Loading required package: Matrix  
## Loaded glmnet 1.9-8  
##   
##   
## Attaching package: 'glmnet'  
##   
## The following object is masked from 'package:pROC':  
##   
## auc

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction no yes  
## no 32 20  
## yes 3 1  
##   
## Accuracy : 0.5893   
## 95% CI : (0.4498, 0.719)  
## No Information Rate : 0.625   
## P-Value [Acc > NIR] : 0.7566718   
##   
## Kappa : -0.0455   
## Mcnemar's Test P-Value : 0.0008492   
##   
## Sensitivity : 0.91429   
## Specificity : 0.04762   
## Pos Pred Value : 0.61538   
## Neg Pred Value : 0.25000   
## Prevalence : 0.62500   
## Detection Rate : 0.57143   
## Detection Prevalence : 0.92857   
## Balanced Accuracy : 0.48095   
##   
## 'Positive' Class : no   
##

## Loading required package: pamr  
## Loading required package: cluster  
## Loading required package: survival  
## Loading required package: splines  
##   
## Attaching package: 'survival'  
##   
## The following object is masked from 'package:caret':  
##   
## cluster

## 11111111111111111111111111

## Nearest Shrunken Centroids   
##   
## 225 samples  
## 96 predictor  
## 2 classes: 'no', 'yes'   
##   
## No pre-processing  
## Resampling: Bootstrapped (25 reps)   
##   
## Summary of sample sizes: 225, 225, 225, 225, 225, 225, ...   
##   
## Resampling results across tuning parameters:  
##   
## threshold Accuracy Kappa Accuracy SD Kappa SD   
## 0 0.6406434 0.14392785 0.05786667 0.11258868  
## 1 0.6255718 0.01151823 0.04804980 0.03949504  
## 2 0.6315620 0.00000000 0.04484972 0.00000000  
## 3 0.6315620 0.00000000 0.04484972 0.00000000  
## 4 0.6315620 0.00000000 0.04484972 0.00000000  
## 5 0.6315620 0.00000000 0.04484972 0.00000000  
## 6 0.6315620 0.00000000 0.04484972 0.00000000  
## 7 0.6315620 0.00000000 0.04484972 0.00000000  
## 8 0.6315620 0.00000000 0.04484972 0.00000000  
## 9 0.6315620 0.00000000 0.04484972 0.00000000  
## 10 0.6315620 0.00000000 0.04484972 0.00000000  
## 11 0.6315620 0.00000000 0.04484972 0.00000000  
## 12 0.6315620 0.00000000 0.04484972 0.00000000  
## 13 0.6315620 0.00000000 0.04484972 0.00000000  
## 14 0.6315620 0.00000000 0.04484972 0.00000000  
## 15 0.6315620 0.00000000 0.04484972 0.00000000  
## 16 0.6315620 0.00000000 0.04484972 0.00000000  
## 17 0.6315620 0.00000000 0.04484972 0.00000000  
## 18 0.6315620 0.00000000 0.04484972 0.00000000  
## 19 0.6315620 0.00000000 0.04484972 0.00000000  
## 20 0.6315620 0.00000000 0.04484972 0.00000000  
## 21 0.6315620 0.00000000 0.04484972 0.00000000  
## 22 0.6315620 0.00000000 0.04484972 0.00000000  
## 23 0.6315620 0.00000000 0.04484972 0.00000000  
## 24 0.6315620 0.00000000 0.04484972 0.00000000  
## 25 0.6315620 0.00000000 0.04484972 0.00000000  
##   
## Accuracy was used to select the optimal model using the largest value.  
## The final value used for the model was threshold = 0.

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction no yes  
## no 31 17  
## yes 4 4  
##   
## Accuracy : 0.625   
## 95% CI : (0.4855, 0.7508)  
## No Information Rate : 0.625   
## P-Value [Acc > NIR] : 0.559290   
##   
## Kappa : 0.087   
## Mcnemar's Test P-Value : 0.008829   
##   
## Sensitivity : 0.8857   
## Specificity : 0.1905   
## Pos Pred Value : 0.6458   
## Neg Pred Value : 0.5000   
## Prevalence : 0.6250   
## Detection Rate : 0.5536   
## Detection Prevalence : 0.8571   
## Balanced Accuracy : 0.5381   
##   
## 'Positive' Class : no   
##

## pam variable importance  
##   
## only 20 most important variables shown (out of 96)  
##   
## Importance  
## Z116 -0.07896  
## Z145 -0.07472  
## Z42 -0.07128  
## Z34 -0.05848  
## Z125 -0.05800  
## Z134 -0.05690  
## Z111 -0.05465  
## Z158 -0.05461  
## Z181 -0.05429  
## Z35 -0.05160  
## Z68 -0.05081  
## Z180 -0.04943  
## Z64 -0.04705  
## Z152 -0.04596  
## Z71 -0.04587  
## Z153 -0.04382  
## Z10 -0.04349  
## Z19 -0.04336  
## Z52 -0.04280  
## Z174 -0.04254

## [1] 58

## [1] 35 50

## Warning in train.default(x = trainX, y = trainY, method = "lda2", metric =  
## "kappa"): The metric "kappa" was not in the result set. Accuracy will be  
## used instead.

## Warning in lda.default(x, grouping, ...): variables are collinear

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## Warning in lda.default(x, grouping, ...): variables are collinear

## Linear Discriminant Analysis   
##   
## 225 samples  
## 105 predictors  
## 3 classes: 'Mild', 'None', 'Severe'   
##   
## No pre-processing  
## Resampling: Bootstrapped (25 reps)   
##   
## Summary of sample sizes: 225, 225, 225, 225, 225, 225, ...   
##   
## Resampling results across tuning parameters:  
##   
## dimen Accuracy Kappa Accuracy SD Kappa SD   
## 1 0.4212428 0.06163902 0.07051524 0.08759161  
## 2 0.4483270 0.10162105 0.05769354 0.07977096  
##   
## Accuracy was used to select the optimal model using the largest value.  
## The final value used for the model was dimen = 2.

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction Mild None Severe  
## Mild 14 8 3  
## None 11 12 2  
## Severe 4 1 1  
##   
## Overall Statistics  
##   
## Accuracy : 0.4821   
## 95% CI : (0.3466, 0.6197)  
## No Information Rate : 0.5179   
## P-Value [Acc > NIR] : 0.7482   
##   
## Kappa : 0.1222   
## Mcnemar's Test P-Value : 0.8134   
##   
## Statistics by Class:  
##   
## Class: Mild Class: None Class: Severe  
## Sensitivity 0.4828 0.5714 0.16667  
## Specificity 0.5926 0.6286 0.90000  
## Pos Pred Value 0.5600 0.4800 0.16667  
## Neg Pred Value 0.5161 0.7097 0.90000  
## Prevalence 0.5179 0.3750 0.10714  
## Detection Rate 0.2500 0.2143 0.01786  
## Detection Prevalence 0.4464 0.4464 0.10714  
## Balanced Accuracy 0.5377 0.6000 0.53333

## Partial Least Squares   
##   
## 225 samples  
## 105 predictors  
## 3 classes: 'Mild', 'None', 'Severe'   
##   
## No pre-processing  
## Resampling: Bootstrapped (25 reps)   
##   
## Summary of sample sizes: 225, 225, 225, 225, 225, 225, ...   
##   
## Resampling results across tuning parameters:  
##   
## ncomp Accuracy Kappa Accuracy SD Kappa SD   
## 1 0.4667860 0.006246532 0.04762818 0.07876208  
## 2 0.4818337 0.049421093 0.06105541 0.10528385  
## 3 0.4949454 0.073912733 0.05861686 0.10712917  
## 4 0.5043077 0.097059275 0.05717102 0.09502865  
## 5 0.4982241 0.091758126 0.05358005 0.09139657  
##   
## Accuracy was used to select the optimal model using the largest value.  
## The final value used for the model was ncomp = 4.

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction Mild None Severe  
## Mild 18 13 4  
## None 11 8 1  
## Severe 0 0 1  
##   
## Overall Statistics  
##   
## Accuracy : 0.4821   
## 95% CI : (0.3466, 0.6197)  
## No Information Rate : 0.5179   
## P-Value [Acc > NIR] : 0.7482   
##   
## Kappa : 0.0419   
## Mcnemar's Test P-Value : 0.1600   
##   
## Statistics by Class:  
##   
## Class: Mild Class: None Class: Severe  
## Sensitivity 0.6207 0.3810 0.16667  
## Specificity 0.3704 0.6571 1.00000  
## Pos Pred Value 0.5143 0.4000 1.00000  
## Neg Pred Value 0.4762 0.6389 0.90909  
## Prevalence 0.5179 0.3750 0.10714  
## Detection Rate 0.3214 0.1429 0.01786  
## Detection Prevalence 0.6250 0.3571 0.01786  
## Balanced Accuracy 0.4955 0.5190 0.58333

## pls variable importance  
##   
## variables are sorted by maximum importance across the classes  
## only 20 most important variables shown (out of 105)  
##   
## Mild None Severe  
## X38 0.020463 0.023423 0.011845  
## X188 0.017211 0.023318 0.002586  
## X118 0.018976 0.022219 0.008450  
## X130 0.015128 0.018537 0.007773  
## X28 0.013193 0.017621 0.002709  
## X132 0.012186 0.016388 0.005926  
## X71 0.011157 0.015658 0.002865  
## X134 0.011565 0.015319 0.001003  
## X155 0.014989 0.014548 0.012217  
## X154 0.010927 0.014568 0.001455  
## X31 0.012870 0.014334 0.008423  
## X103 0.010223 0.013937 0.003668  
## X191 0.011850 0.013750 0.006270  
## X147 0.011739 0.013546 0.006107  
## X23 0.010663 0.013108 0.005037  
## X37 0.012825 0.011524 0.009454  
## X153 0.009439 0.012028 0.005489  
## X81 0.008120 0.003636 0.012009  
## X83 0.010054 0.011704 0.003940  
## X35 0.008799 0.011586 0.003724

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction Mild None Severe  
## Mild 19 10 5  
## None 9 11 1  
## Severe 1 0 0  
##   
## Overall Statistics  
##   
## Accuracy : 0.5357   
## 95% CI : (0.3974, 0.6701)  
## No Information Rate : 0.5179   
## P-Value [Acc > NIR] : 0.4475   
##   
## Kappa : 0.145   
## Mcnemar's Test P-Value : 0.2934   
##   
## Statistics by Class:  
##   
## Class: Mild Class: None Class: Severe  
## Sensitivity 0.6552 0.5238 0.00000  
## Specificity 0.4444 0.7143 0.98000  
## Pos Pred Value 0.5588 0.5238 0.00000  
## Neg Pred Value 0.5455 0.7143 0.89091  
## Prevalence 0.5179 0.3750 0.10714  
## Detection Rate 0.3393 0.1964 0.00000  
## Detection Prevalence 0.6071 0.3750 0.01786  
## Balanced Accuracy 0.5498 0.6190 0.49000

## 11111111111111111111111111

## Nearest Shrunken Centroids   
##   
## 225 samples  
## 105 predictors  
## 3 classes: 'Mild', 'None', 'Severe'   
##   
## No pre-processing  
## Resampling: Bootstrapped (25 reps)   
##   
## Summary of sample sizes: 225, 225, 225, 225, 225, 225, ...   
##   
## Resampling results across tuning parameters:  
##   
## threshold Accuracy Kappa Accuracy SD Kappa SD   
## 0 0.4555518 0.0262315948 0.05538323 0.086775465  
## 1 0.5012765 0.0147018967 0.06952550 0.058549613  
## 2 0.5024418 -0.0005966587 0.07236993 0.002983294  
## 3 0.5029356 0.0000000000 0.07226298 0.000000000  
## 4 0.5029356 0.0000000000 0.07226298 0.000000000  
## 5 0.5029356 0.0000000000 0.07226298 0.000000000  
## 6 0.5029356 0.0000000000 0.07226298 0.000000000  
## 7 0.5029356 0.0000000000 0.07226298 0.000000000  
## 8 0.5029356 0.0000000000 0.07226298 0.000000000  
## 9 0.5029356 0.0000000000 0.07226298 0.000000000  
## 10 0.5029356 0.0000000000 0.07226298 0.000000000  
## 11 0.5029356 0.0000000000 0.07226298 0.000000000  
## 12 0.5029356 0.0000000000 0.07226298 0.000000000  
## 13 0.5029356 0.0000000000 0.07226298 0.000000000  
## 14 0.5029356 0.0000000000 0.07226298 0.000000000  
## 15 0.5029356 0.0000000000 0.07226298 0.000000000  
## 16 0.5029356 0.0000000000 0.07226298 0.000000000  
## 17 0.5029356 0.0000000000 0.07226298 0.000000000  
## 18 0.5029356 0.0000000000 0.07226298 0.000000000  
## 19 0.5029356 0.0000000000 0.07226298 0.000000000  
## 20 0.5029356 0.0000000000 0.07226298 0.000000000  
## 21 0.5029356 0.0000000000 0.07226298 0.000000000  
## 22 0.5029356 0.0000000000 0.07226298 0.000000000  
## 23 0.5029356 0.0000000000 0.07226298 0.000000000  
## 24 0.5029356 0.0000000000 0.07226298 0.000000000  
## 25 0.5029356 0.0000000000 0.07226298 0.000000000  
##   
## Accuracy was used to select the optimal model using the largest value.  
## The final value used for the model was threshold = 3.

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction Mild None Severe  
## Mild 29 21 6  
## None 0 0 0  
## Severe 0 0 0  
##   
## Overall Statistics  
##   
## Accuracy : 0.5179   
## 95% CI : (0.3803, 0.6534)  
## No Information Rate : 0.5179   
## P-Value [Acc > NIR] : 0.5537   
##   
## Kappa : 0   
## Mcnemar's Test P-Value : NA   
##   
## Statistics by Class:  
##   
## Class: Mild Class: None Class: Severe  
## Sensitivity 1.0000 0.000 0.0000  
## Specificity 0.0000 1.000 1.0000  
## Pos Pred Value 0.5179 NaN NaN  
## Neg Pred Value NaN 0.625 0.8929  
## Prevalence 0.5179 0.375 0.1071  
## Detection Rate 0.5179 0.000 0.0000  
## Detection Prevalence 1.0000 0.000 0.0000  
## Balanced Accuracy 0.5000 0.500 0.5000

## pam variable importance  
##   
## variables are sorted by maximum importance across the classes  
## only 20 most important variables shown (out of 105)  
##   
## Mild None Severe  
## X142 0 0 0  
## X150 0 0 0  
## X38 0 0 0  
## X49 0 0 0  
## X164 0 0 0  
## X36 0 0 0  
## X101 0 0 0  
## X53 0 0 0  
## X88 0 0 0  
## X157 0 0 0  
## X31 0 0 0  
## X127 0 0 0  
## X30 0 0 0  
## X91 0 0 0  
## X89 0 0 0  
## X118 0 0 0  
## X187 0 0 0  
## X47 0 0 0  
## X66 0 0 0  
## X22 0 0 0

## [1] 140

## [1] 132 148 162

## Warning in train.default(x = trainX, y = trainY, method = "lda2", metric =  
## "kappa"): The metric "kappa" was not in the result set. Accuracy will be  
## used instead.

## Warning in lda.default(x, grouping, ...): variables are collinear

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## Warning in lda.default(x, grouping, ...): variables are collinear

## Linear Discriminant Analysis   
##   
## 225 samples  
## 202 predictors  
## 3 classes: 'Mild', 'None', 'Severe'   
##   
## No pre-processing  
## Resampling: Bootstrapped (25 reps)   
##   
## Summary of sample sizes: 225, 225, 225, 225, 225, 225, ...   
##   
## Resampling results across tuning parameters:  
##   
## dimen Accuracy Kappa Accuracy SD Kappa SD   
## 1 0.367000 -0.003551154 0.05785673 0.09443925  
## 2 0.392104 0.024135283 0.05496361 0.08211921  
##   
## Accuracy was used to select the optimal model using the largest value.  
## The final value used for the model was dimen = 2.

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction Mild None Severe  
## Mild 13 9 3  
## None 12 5 1  
## Severe 4 7 2  
##   
## Overall Statistics  
##   
## Accuracy : 0.3571   
## 95% CI : (0.2336, 0.4964)  
## No Information Rate : 0.5179   
## P-Value [Acc > NIR] : 0.9947   
##   
## Kappa : -0.0312   
## Mcnemar's Test P-Value : 0.1666   
##   
## Statistics by Class:  
##   
## Class: Mild Class: None Class: Severe  
## Sensitivity 0.4483 0.23810 0.33333  
## Specificity 0.5556 0.62857 0.78000  
## Pos Pred Value 0.5200 0.27778 0.15385  
## Neg Pred Value 0.4839 0.57895 0.90698  
## Prevalence 0.5179 0.37500 0.10714  
## Detection Rate 0.2321 0.08929 0.03571  
## Detection Prevalence 0.4464 0.32143 0.23214  
## Balanced Accuracy 0.5019 0.43333 0.55667

## Partial Least Squares   
##   
## 225 samples  
## 202 predictors  
## 3 classes: 'Mild', 'None', 'Severe'   
##   
## No pre-processing  
## Resampling: Bootstrapped (25 reps)   
##   
## Summary of sample sizes: 225, 225, 225, 225, 225, 225, ...   
##   
## Resampling results across tuning parameters:  
##   
## ncomp Accuracy Kappa Accuracy SD Kappa SD   
## 1 0.5197525 0.10706943 0.05023272 0.06919989  
## 2 0.4906357 0.06019253 0.04908809 0.08438091  
## 3 0.4755800 0.03926729 0.05366461 0.09530239  
## 4 0.4791307 0.05710993 0.05543676 0.09298740  
## 5 0.4782294 0.06208365 0.05621102 0.09118728  
##   
## Accuracy was used to select the optimal model using the largest value.  
## The final value used for the model was ncomp = 1.

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction Mild None Severe  
## Mild 19 17 6  
## None 10 4 0  
## Severe 0 0 0  
##   
## Overall Statistics  
##   
## Accuracy : 0.4107   
## 95% CI : (0.281, 0.5502)  
## No Information Rate : 0.5179   
## P-Value [Acc > NIR] : 0.9591   
##   
## Kappa : -0.1379   
## Mcnemar's Test P-Value : NA   
##   
## Statistics by Class:  
##   
## Class: Mild Class: None Class: Severe  
## Sensitivity 0.6552 0.19048 0.0000  
## Specificity 0.1481 0.71429 1.0000  
## Pos Pred Value 0.4524 0.28571 NaN  
## Neg Pred Value 0.2857 0.59524 0.8929  
## Prevalence 0.5179 0.37500 0.1071  
## Detection Rate 0.3393 0.07143 0.0000  
## Detection Prevalence 0.7500 0.25000 0.0000  
## Balanced Accuracy 0.4017 0.45238 0.5000

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction Mild None Severe  
## Mild 23 14 6  
## None 6 7 0  
## Severe 0 0 0  
##   
## Overall Statistics  
##   
## Accuracy : 0.5357   
## 95% CI : (0.3974, 0.6701)  
## No Information Rate : 0.5179   
## P-Value [Acc > NIR] : 0.4475   
##   
## Kappa : 0.099   
## Mcnemar's Test P-Value : NA   
##   
## Statistics by Class:  
##   
## Class: Mild Class: None Class: Severe  
## Sensitivity 0.7931 0.3333 0.0000  
## Specificity 0.2593 0.8286 1.0000  
## Pos Pred Value 0.5349 0.5385 NaN  
## Neg Pred Value 0.5385 0.6744 0.8929  
## Prevalence 0.5179 0.3750 0.1071  
## Detection Rate 0.4107 0.1250 0.0000  
## Detection Prevalence 0.7679 0.2321 0.0000  
## Balanced Accuracy 0.5262 0.5810 0.5000

## 11111111111111111111111111

## Nearest Shrunken Centroids   
##   
## 225 samples  
## 202 predictors  
## 3 classes: 'Mild', 'None', 'Severe'   
##   
## No pre-processing  
## Resampling: Bootstrapped (25 reps)   
##   
## Summary of sample sizes: 225, 225, 225, 225, 225, 225, ...   
##   
## Resampling results across tuning parameters:  
##   
## threshold Accuracy Kappa Accuracy SD Kappa SD   
## 0 0.4786374 0.063423291 0.05592982 0.09498197  
## 1 0.5074516 0.063310253 0.05711692 0.07554691  
## 2 0.4991622 -0.002078908 0.07451385 0.01926135  
## 3 0.5029356 0.000000000 0.07226298 0.00000000  
## 4 0.5029356 0.000000000 0.07226298 0.00000000  
## 5 0.5029356 0.000000000 0.07226298 0.00000000  
## 6 0.5029356 0.000000000 0.07226298 0.00000000  
## 7 0.5029356 0.000000000 0.07226298 0.00000000  
## 8 0.5029356 0.000000000 0.07226298 0.00000000  
## 9 0.5029356 0.000000000 0.07226298 0.00000000  
## 10 0.5029356 0.000000000 0.07226298 0.00000000  
## 11 0.5029356 0.000000000 0.07226298 0.00000000  
## 12 0.5029356 0.000000000 0.07226298 0.00000000  
## 13 0.5029356 0.000000000 0.07226298 0.00000000  
## 14 0.5029356 0.000000000 0.07226298 0.00000000  
## 15 0.5029356 0.000000000 0.07226298 0.00000000  
## 16 0.5029356 0.000000000 0.07226298 0.00000000  
## 17 0.5029356 0.000000000 0.07226298 0.00000000  
## 18 0.5029356 0.000000000 0.07226298 0.00000000  
## 19 0.5029356 0.000000000 0.07226298 0.00000000  
## 20 0.5029356 0.000000000 0.07226298 0.00000000  
## 21 0.5029356 0.000000000 0.07226298 0.00000000  
## 22 0.5029356 0.000000000 0.07226298 0.00000000  
## 23 0.5029356 0.000000000 0.07226298 0.00000000  
## 24 0.5029356 0.000000000 0.07226298 0.00000000  
## 25 0.5029356 0.000000000 0.07226298 0.00000000  
##   
## Accuracy was used to select the optimal model using the largest value.  
## The final value used for the model was threshold = 1.

## Confusion Matrix and Statistics  
##   
## Reference  
## Prediction Mild None Severe  
## Mild 26 21 6  
## None 3 0 0  
## Severe 0 0 0  
##   
## Overall Statistics  
##   
## Accuracy : 0.4643   
## 95% CI : (0.3299, 0.6026)  
## No Information Rate : 0.5179   
## P-Value [Acc > NIR] : 0.8254   
##   
## Kappa : -0.0937   
## Mcnemar's Test P-Value : NA   
##   
## Statistics by Class:  
##   
## Class: Mild Class: None Class: Severe  
## Sensitivity 0.8966 0.00000 0.0000  
## Specificity 0.0000 0.91429 1.0000  
## Pos Pred Value 0.4906 0.00000 NaN  
## Neg Pred Value 0.0000 0.60377 0.8929  
## Prevalence 0.5179 0.37500 0.1071  
## Detection Rate 0.4643 0.00000 0.0000  
## Detection Prevalence 0.9464 0.05357 0.0000  
## Balanced Accuracy 0.4483 0.45714 0.5000

## pam variable importance  
##   
## variables are sorted by maximum importance across the classes  
## only 20 most important variables shown (out of 202)  
##   
## Mild None Severe  
## X81 0.000000 0.00000 0.16225  
## X142 0.000000 0.00000 0.08748  
## X103 0.000000 -0.01435 0.08021  
## Z100 0.000000 0.00000 0.06822  
## Z145 -0.012462 0.05661 0.00000  
## Z93 0.000000 0.00000 -0.05335  
## Z111 -0.008122 0.04778 0.00000  
## Z42 0.000000 0.04460 0.00000  
## X172 0.000000 0.00000 0.04131  
## X38 0.038027 -0.04008 0.00000  
## X139 0.000000 0.00000 0.03650  
## Z46 0.000000 0.03190 0.00000  
## X133 0.000000 0.00000 0.02996  
## X132 0.000000 -0.02782 0.00000  
## Z158 0.000000 0.02748 0.00000  
## Z116 -0.024374 0.00000 0.00000  
## Z134 -0.004324 0.02382 0.00000  
## Z44 0.000000 0.00000 0.02230  
## X160 0.000000 0.00000 0.02131  
## Z153 0.000000 0.02110 0.00000