model_evaluation_and_assessment_excercise.R

```
setwd("C:/Users/Seshan/Desktop/sv R related/acadgild/assignments/session19 As
signment")
WLE<- read.csv("WLE.csv",header=T, na.strings=c("","NA"))
data<-WLE
View(data)
training<-data[1:4010,]
testing<-data[4011:4024,]
names(training)
```

```
##   [1] "user_name"                "raw_timestamp_part_1"
##   [3] "raw_timestamp_part_2"     "cvtd_timestamp"
##   [5] "new_window"               "num_window"
##   [7] "roll_belt"                "pitch_belt"
##   [9] "yaw_belt"                 "total_accel_belt"
##  [11] "kurtosis_roll_belt"       "kurtosis_picth_belt"
##  [13] "skewness_roll_belt"       "skewness_roll_belt.1"
##  [15] "max_roll_belt"            "max_picth_belt"
##  [17] "max_yaw_belt"             "min_roll_belt"
##  [19] "min_pitch_belt"           "min_yaw_belt"
##  [21] "amplitude_roll_belt"      "amplitude_pitch_belt"
##  [23] "amplitude_yaw_belt"       "var_total_accel_belt"
##  [25] "avg_roll_belt"            "stddev_roll_belt"
##  [27] "var_roll_belt"            "avg_pitch_belt"
##  [29] "stddev_pitch_belt"        "var_pitch_belt"
##  [31] "avg_yaw_belt"             "stddev_yaw_belt"
##  [33] "var_yaw_belt"             "gyros_belt_x"
##  [35] "gyros_belt_y"             "gyros_belt_z"
##  [37] "accel_belt_x"             "accel_belt_y"
##  [39] "accel_belt_z"             "magnet_belt_x"
##  [41] "magnet_belt_y"            "magnet_belt_z"
##  [43] "roll_arm"                 "pitch_arm"
##  [45] "yaw_arm"                  "total_accel_arm"
##  [47] "var_accel_arm"            "avg_roll_arm"
##  [49] "stddev_roll_arm"          "var_roll_arm"
##  [51] "avg_pitch_arm"            "stddev_pitch_arm"
##  [53] "var_pitch_arm"            "avg_yaw_arm"
##  [55] "stddev_yaw_arm"           "var_yaw_arm"
##  [57] "gyros_arm_x"              "gyros_arm_y"
##  [59] "gyros_arm_z"              "accel_arm_x"
##  [61] "accel_arm_y"              "accel_arm_z"
##  [63] "magnet_arm_x"             "magnet_arm_y"
##  [65] "magnet_arm_z"             "kurtosis_roll_arm"
```

```
##  [67] "kurtosis_picth_arm"       "kurtosis_yaw_arm"
##  [69] "skewness_roll_arm"        "skewness_pitch_arm"
##  [71] "skewness_yaw_arm"         "max_roll_arm"
##  [73] "max_picth_arm"            "max_yaw_arm"
##  [75] "min_roll_arm"             "min_pitch_arm"
##  [77] "min_yaw_arm"              "amplitude_roll_arm"
##  [79] "amplitude_pitch_arm"      "amplitude_yaw_arm"
##  [81] "roll_dumbbell"            "pitch_dumbbell"
##  [83] "yaw_dumbbell"             "kurtosis_roll_dumbbell"
##  [85] "kurtosis_picth_dumbbell"  "skewness_roll_dumbbell"
##  [87] "skewness_pitch_dumbbell"  "max_roll_dumbbell"
##  [89] "max_picth_dumbbell"       "max_yaw_dumbbell"
##  [91] "min_roll_dumbbell"        "min_pitch_dumbbell"
##  [93] "min_yaw_dumbbell"         "amplitude_roll_dumbbell"
##  [95] "amplitude_pitch_dumbbell" "amplitude_yaw_dumbbell"
##  [97] "total_accel_dumbbell"     "var_accel_dumbbell"
##  [99] "avg_roll_dumbbell"        "stddev_roll_dumbbell"
## [101] "var_roll_dumbbell"        "avg_pitch_dumbbell"
## [103] "stddev_pitch_dumbbell"    "var_pitch_dumbbell"
## [105] "avg_yaw_dumbbell"         "stddev_yaw_dumbbell"
## [107] "var_yaw_dumbbell"         "gyros_dumbbell_x"
## [109] "gyros_dumbbell_y"         "gyros_dumbbell_z"
## [111] "accel_dumbbell_x"         "accel_dumbbell_y"
## [113] "accel_dumbbell_z"         "magnet_dumbbell_x"
## [115] "magnet_dumbbell_y"        "magnet_dumbbell_z"
## [117] "roll_forearm"             "pitch_forearm"
## [119] "yaw_forearm"              "kurtosis_roll_forearm"
## [121] "kurtosis_picth_forearm"   "skewness_roll_forearm"
## [123] "skewness_pitch_forearm"   "max_roll_forearm"
## [125] "max_picth_forearm"        "max_yaw_forearm"
## [127] "min_roll_forearm"         "min_pitch_forearm"
## [129] "min_yaw_forearm"          "amplitude_roll_forearm"
## [131] "amplitude_pitch_forearm"  "amplitude_yaw_forearm"
## [133] "total_accel_forearm"      "var_accel_forearm"
## [135] "avg_roll_forearm"         "stddev_roll_forearm"
## [137] "var_roll_forearm"         "avg_pitch_forearm"
## [139] "stddev_pitch_forearm"     "var_pitch_forearm"
## [141] "avg_yaw_forearm"          "stddev_yaw_forearm"
## [143] "var_yaw_forearm"          "gyros_forearm_x"
## [145] "gyros_forearm_y"          "gyros_forearm_z"
## [147] "accel_forearm_x"          "accel_forearm_y"
## [149] "accel_forearm_z"          "magnet_forearm_x"
## [151] "magnet_forearm_y"         "magnet_forearm_z"
## [153] "accel_forearm_y.1"        "accel_forearm_z.1"
## [155] "magnet_forearm_x.1"       "magnet_forearm_y.1"
## [157] "magnet_forearm_z.1"       "classe"
```

```
# logistic regression model:
fit <- glm(classe~.,data = training,family = binomial)
```

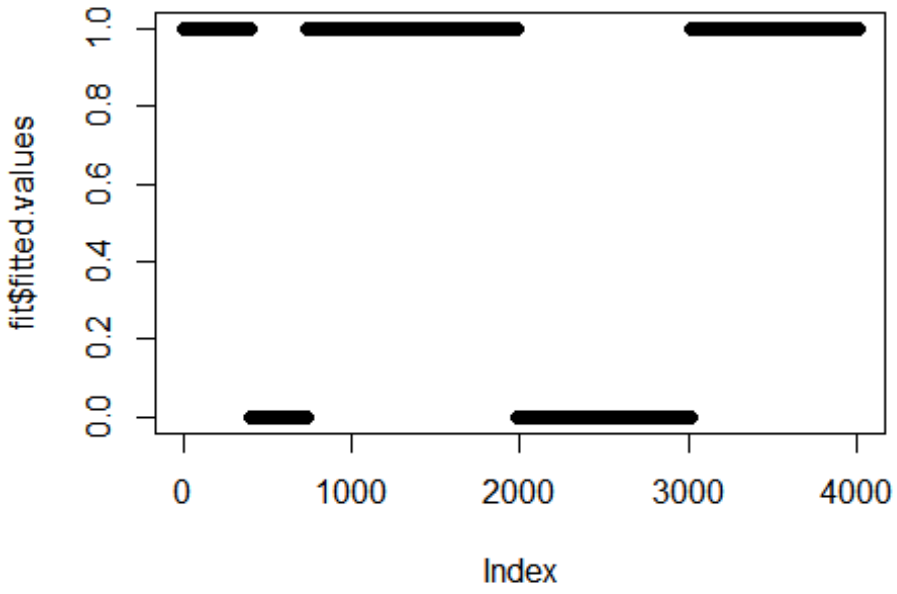
```
## Warning: glm.fit: algorithm did not converge

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

summary(fit)

##
## Call:
## glm(formula = classe ~ ., family = binomial, data = training)
##
## Deviance Residuals:
##        Min          1Q      Median          3Q         Max
## -1.477e-04  -2.100e-08   2.100e-08   2.100e-08   9.859e-05
##
## Coefficients: (18 not defined because of singularities)
##                                Estimate Std. Error z value Pr(>|z|)
## (Intercept)                    3.202e+10  1.709e+13   0.002    0.999
## user_namecarlitos              6.085e+06  3.247e+09   0.002    0.999
## user_nameeurico               -8.308e+06  4.435e+09  -0.002    0.999
## user_namejeremy               -3.867e+06  2.065e+09  -0.002    0.999
## user_namepedro                 6.342e+06  3.385e+09   0.002    0.999
## raw_timestamp_part_1          -2.421e+01  1.292e+04  -0.002    0.999
## raw_timestamp_part_2           1.411e-05  2.360e-02   0.001    1.000
## cvtd_timestamp28/11/2011 14:15         NA         NA      NA       NA
## cvtd_timestamp30/11/2011 17:12         NA         NA      NA       NA
## cvtd_timestamp5/12/2011 11:23  -2.151e+03  1.117e+06  -0.002    0.998
## cvtd_timestamp5/12/2011 11:25          NA         NA      NA       NA
## cvtd_timestamp5/12/2011 14:22  -1.842e+01  8.271e+04   0.000    1.000
## cvtd_timestamp5/12/2011 14:23          NA         NA      NA       NA
## new_windowyes                 -1.196e+04  9.115e+08   0.000    1.000
## num_window                     3.216e+01  1.436e+04   0.002    0.998
## roll_belt                      3.836e+00  8.842e+03   0.000    1.000
## pitch_belt                     3.331e+00  1.228e+04   0.000    1.000
## yaw_belt                      -1.298e-01  5.861e+02   0.000    1.000
## total_accel_belt              -2.160e+00  1.120e+04   0.000    1.000
## kurtosis_roll_belt            -2.413e+02  1.132e+07   0.000    1.000
## kurtosis_picth_belt            2.133e+00  6.052e+04   0.000    1.000
## skewness_roll_belt             1.471e+01  4.592e+05   0.000    1.000
## skewness_roll_belt.1          -1.419e+01  1.658e+05   0.000    1.000
## max_roll_belt                  1.833e+02  2.214e+07   0.000    1.000
## max_picth_belt                 2.699e+01  2.798e+05   0.000    1.000
## max_yaw_belt                   2.329e+02  1.125e+07   0.000    1.000
## min_roll_belt                 -2.742e+02  2.014e+07   0.000    1.000
## min_pitch_belt                -2.265e+01  1.450e+06   0.000    1.000
## min_yaw_belt                           NA         NA      NA       NA
## amplitude_roll_belt           -2.385e+02  2.213e+07   0.000    1.000
## amplitude_pitch_belt                   NA         NA      NA       NA
## amplitude_yaw_belt                     NA         NA      NA       NA
## var_total_accel_belt          -1.510e+01  4.775e+05   0.000    1.000
## avg_roll_belt                  2.785e+00  1.051e+05   0.000    1.000
```

```
## stddev_roll_belt              1.753e+01  1.265e+06   0.000    1.000
## var_roll_belt                -3.117e+00  1.134e+05   0.000    1.000
## avg_pitch_belt               -6.328e+00  1.748e+05   0.000    1.000
## stddev_pitch_belt            -8.170e+01  1.457e+06   0.000    1.000
## var_pitch_belt                1.734e+01  3.934e+05   0.000    1.000
## avg_yaw_belt                  8.784e+01  2.140e+06   0.000    1.000
## stddev_yaw_belt               1.326e+00  4.623e+06   0.000    1.000
## var_yaw_belt                  1.552e-02  1.262e+04   0.000    1.000
## gyros_belt_x                  1.681e+01  1.064e+05   0.000    1.000
## gyros_belt_y                  1.424e+01  3.427e+05   0.000    1.000
## gyros_belt_z                 -6.446e+00  1.389e+05   0.000    1.000
## accel_belt_x                 -1.552e-01  1.451e+03   0.000    1.000
## accel_belt_y                  4.502e-02  1.660e+03   0.000    1.000
## accel_belt_z                  3.158e-01  1.794e+03   0.000    1.000
## magnet_belt_x                 2.267e-01  8.493e+02   0.000    1.000
## magnet_belt_y                 1.765e-01  8.810e+02   0.000    1.000
## magnet_belt_z                 1.660e-01  5.184e+02   0.000    1.000
## roll_arm                     -5.731e-02  1.442e+02   0.000    1.000
## pitch_arm                    -5.222e-01  6.479e+02  -0.001    0.999
## yaw_arm                      -1.016e-01  1.354e+02  -0.001    0.999
## total_accel_arm              -5.238e-01  2.292e+03   0.000    1.000
## var_accel_arm                -4.505e-01  2.112e+04   0.000    1.000
## avg_roll_arm                 -1.565e-01  1.405e+04   0.000    1.000
## stddev_roll_arm               3.474e+00  1.064e+05   0.000    1.000
## var_roll_arm                 -2.031e-02  3.502e+02   0.000    1.000
## avg_pitch_arm                 1.466e+00  1.531e+05   0.000    1.000
## stddev_pitch_arm              1.567e+01  1.588e+05   0.000    1.000
## var_pitch_arm                 1.251e-02  3.281e+03   0.000    1.000
## avg_yaw_arm                   1.020e+00  1.778e+04   0.000    1.000
## stddev_yaw_arm               -6.699e+00  5.032e+04   0.000    1.000
## var_yaw_arm                   2.898e-02  4.722e+02   0.000    1.000
## gyros_arm_x                   1.337e+00  1.778e+04   0.000    1.000
## gyros_arm_y                   6.535e+00  4.083e+04   0.000    1.000
## gyros_arm_z                   4.908e+00  2.287e+04   0.000    1.000
## accel_arm_x                  -1.632e-02  5.067e+02   0.000    1.000
## accel_arm_y                  -3.202e-02  5.528e+02   0.000    1.000
## accel_arm_z                  -1.523e-02  3.129e+02   0.000    1.000
## magnet_arm_x                  7.353e-03  1.451e+02   0.000    1.000
## magnet_arm_y                  1.141e-01  3.629e+02   0.000    1.000
## magnet_arm_z                 -5.990e-02  2.168e+02   0.000    1.000
## kurtosis_roll_arm            -1.279e+00  1.372e+05   0.000    1.000
## kurtosis_picth_arm            2.095e+00  2.848e+05   0.000    1.000
## kurtosis_yaw_arm             -8.336e+00  1.133e+05   0.000    1.000
## skewness_roll_arm             2.048e+01  1.972e+06   0.000    1.000
## skewness_pitch_arm            3.350e+01  1.123e+06   0.000    1.000
## skewness_yaw_arm             -6.954e+00  2.958e+05   0.000    1.000
## max_roll_arm                 -3.085e+01  1.179e+07   0.000    1.000
## max_picth_arm                -1.668e+03  2.989e+07   0.000    1.000
## max_yaw_arm                   3.360e+00  2.645e+05   0.000    1.000
## min_roll_arm                  3.030e+01  1.186e+07   0.000    1.000
```

```
## min_pitch_arm                1.668e+03  2.988e+07   0.000    1.000
## min_yaw_arm                 -5.460e+00  2.966e+05   0.000    1.000
## amplitude_roll_arm           2.402e+01  1.174e+07   0.000    1.000
## amplitude_pitch_arm          1.669e+03  2.985e+07   0.000    1.000
## amplitude_yaw_arm                   NA         NA      NA       NA
## roll_dumbbell                1.295e-01  6.889e+02   0.000    1.000
## pitch_dumbbell              -3.122e-01  1.172e+03   0.000    1.000
## yaw_dumbbell                 1.662e-01  6.861e+02   0.000    1.000
## kurtosis_roll_dumbbell       3.774e+02  1.605e+07   0.000    1.000
## kurtosis_picth_dumbbell     -4.045e+00  4.009e+05   0.000    1.000
## skewness_roll_dumbbell       4.256e+01  3.945e+05   0.000    1.000
## skewness_pitch_dumbbell      2.731e+01  4.182e+05   0.000    1.000
## max_roll_dumbbell            2.581e+02  1.216e+07   0.000    1.000
## max_picth_dumbbell           2.558e+02  1.105e+07   0.000    1.000
## max_yaw_dumbbell            -3.795e+02  1.572e+07   0.000    1.000
## min_roll_dumbbell           -2.594e+02  1.209e+07   0.000    1.000
## min_pitch_dumbbell          -2.567e+02  1.104e+07   0.000    1.000
## min_yaw_dumbbell                    NA         NA      NA       NA
## amplitude_roll_dumbbell     -2.599e+02  1.217e+07   0.000    1.000
## amplitude_pitch_dumbbell    -2.565e+02  1.105e+07   0.000    1.000
## amplitude_yaw_dumbbell              NA         NA      NA       NA
## total_accel_dumbbell         1.707e+00  5.707e+03   0.000    1.000
## var_accel_dumbbell           7.186e-01  4.159e+04   0.000    1.000
## avg_roll_dumbbell           -4.136e-01  1.115e+04   0.000    1.000
## stddev_roll_dumbbell         6.602e-02  9.903e+04   0.000    1.000
## var_roll_dumbbell            1.127e-02  8.361e+02   0.000    1.000
## avg_pitch_dumbbell           2.273e+00  6.363e+04   0.000    1.000
## stddev_pitch_dumbbell       -9.758e-01  5.308e+05   0.000    1.000
## var_pitch_dumbbell           1.958e-02  4.552e+03   0.000    1.000
## avg_yaw_dumbbell             9.768e-01  3.070e+04   0.000    1.000
## stddev_yaw_dumbbell          3.835e+00  1.491e+05   0.000    1.000
## var_yaw_dumbbell            -2.194e-02  1.529e+03   0.000    1.000
## gyros_dumbbell_x             1.089e+01  4.168e+04   0.000    1.000
## gyros_dumbbell_y            -5.854e-01  3.294e+04   0.000    1.000
## gyros_dumbbell_z             5.848e+00  3.567e+04   0.000    1.000
## accel_dumbbell_x             4.649e-01  1.511e+03   0.000    1.000
## accel_dumbbell_y            -1.996e-01  8.743e+02   0.000    1.000
## accel_dumbbell_z            -2.526e-01  1.095e+03   0.000    1.000
## magnet_dumbbell_x           -1.429e-01  4.937e+02   0.000    1.000
## magnet_dumbbell_y            8.417e-02  6.860e+02   0.000    1.000
## magnet_dumbbell_z            5.264e-02  3.787e+02   0.000    1.000
## roll_forearm                 9.560e-03  1.646e+02   0.000    1.000
## pitch_forearm                1.215e-01  1.499e+03   0.000    1.000
## yaw_forearm                 -5.853e-03  1.043e+02   0.000    1.000
## kurtosis_roll_forearm        2.956e+01  9.889e+06   0.000    1.000
## kurtosis_picth_forearm       2.758e+00  1.556e+05   0.000    1.000
## skewness_roll_forearm       -2.087e+00  4.561e+05   0.000    1.000
## skewness_pitch_forearm       2.092e+01  8.209e+05   0.000    1.000
## max_roll_forearm            -5.134e+02  8.853e+06   0.000    1.000
## max_picth_forearm           -1.242e+00  2.123e+04   0.000    1.000
```

```
## max_yaw_forearm               -3.206e+01  9.579e+06   0.000    1.000
## min_roll_forearm               5.123e+02  8.855e+06   0.000    1.000
## min_pitch_forearm              3.160e-02  2.930e+04   0.000    1.000
## min_yaw_forearm                       NA         NA      NA       NA
## amplitude_roll_forearm         5.167e+02  8.817e+06   0.000    1.000
## amplitude_pitch_forearm               NA         NA      NA       NA
## amplitude_yaw_forearm                 NA         NA      NA       NA
## total_accel_forearm            3.209e-01  2.326e+03   0.000    1.000
## var_accel_forearm             -8.244e-01  1.426e+04   0.000    1.000
## avg_roll_forearm              -3.349e-01  1.792e+04   0.000    1.000
## stddev_roll_forearm            3.649e-01  1.261e+05   0.000    1.000
## var_roll_forearm               1.848e-03  7.983e+02   0.000    1.000
## avg_pitch_forearm             -5.398e-01  1.044e+05   0.000    1.000
## stddev_pitch_forearm          -1.688e+01  6.420e+05   0.000    1.000
## var_pitch_forearm              2.086e-01  9.747e+03   0.000    1.000
## avg_yaw_forearm                1.224e+00  3.374e+04   0.000    1.000
## stddev_yaw_forearm             3.636e+00  1.006e+05   0.000    1.000
## var_yaw_forearm               -1.549e-02  8.103e+02   0.000    1.000
## gyros_forearm_x                1.341e+01  2.526e+04   0.001    1.000
## gyros_forearm_y                2.150e-03  1.120e+04   0.000    1.000
## gyros_forearm_z               -1.424e+00  2.607e+04   0.000    1.000
## accel_forearm_x               -8.488e-02  2.285e+02   0.000    1.000
## accel_forearm_y               -7.488e-02  2.917e+02   0.000    1.000
## accel_forearm_z               -1.275e-01  4.796e+02   0.000    1.000
## magnet_forearm_x               4.579e-02  1.750e+02   0.000    1.000
## magnet_forearm_y              -1.938e-02  1.765e+02   0.000    1.000
## magnet_forearm_z               1.386e-01  2.646e+02   0.001    1.000
## accel_forearm_y.1                     NA         NA      NA       NA
## accel_forearm_z.1                     NA         NA      NA       NA
## magnet_forearm_x.1                    NA         NA      NA       NA
## magnet_forearm_y.1                    NA         NA      NA       NA
## magnet_forearm_z.1                    NA         NA      NA       NA
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 5.1432e+03  on 4009  degrees of freedom
## Residual deviance: 1.3222e-07  on 3862  degrees of freedom
## AIC: 296
##
## Number of Fisher Scoring iterations: 25

library(ResourceSelection)

## ResourceSelection 0.3-2   2017-02-28

hoslem.test(training$classe, fitted(fit))

## Warning in Ops.factor(1, y): '-' not meaningful for factors

##
##  Hosmer and Lemeshow goodness of fit (GOF) test
```

```
##
## data:  training$classe, fitted(fit)
## X-squared = 4010, df = 8, p-value < 2.2e-16

#plot the fitted model
plot(fit$fitted.values)
```




```
pred <- predict(fit,newdata = testing,type = 'response')

## Warning in predict.lm(object, newdata, se.fit, scale = 1, type =
## ifelse(type == : prediction from a rank-deficient fit may be misleading

library(caret)

## Loading required package: lattice

## Loading required package: ggplot2

#with default prob cut 0.50
testing$pred_classe <- ifelse(pred<0.7,'yes','no')

table(testing$pred_classe,testing$classe)

##
##       A  B  C  D  E
##   no  0  0 14  0  0
```

```r
#training split of churn classes
round(table(training$classe)/nrow(training),2)*100
```

```
##
##  A  B  C  D  E
## 34 22  2  7 34
```

```r
# test split of churn classes
round(table(testing$classe)/nrow(testing),2)*100
```

```
##
##   A   B   C   D   E
##   0   0 100   0   0
```

```r
#predicted split of churn classes
round(table(testing$pred_classe)/nrow(testing),2)*100
```

```
##
##  no
## 100
```

```r
#create confusion matrix
confusionMatrix(testing$classe,testing$classe)
```

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction  A  B  C  D  E
##          A  0  0  0  0  0
##          B  0  0  0  0  0
##          C  0  0 14  0  0
##          D  0  0  0  0  0
##          E  0  0  0  0  0
##
## Overall Statistics
##
##                Accuracy : 1
##                  95% CI : (0.7684, 1)
##     No Information Rate : 1
##     P-Value [Acc > NIR] : 1
##
##                   Kappa : NaN
##  Mcnemar's Test P-Value : NA
##
## Statistics by Class:
##
##                      Class: A Class: B Class: C Class: D Class: E
## Sensitivity                NA       NA        1       NA       NA
## Specificity                 1        1       NA        1        1
## Pos Pred Value             NA       NA       NA       NA       NA
## Neg Pred Value             NA       NA       NA       NA       NA
```

```
## Prevalence                  0        0        1        0        0
## Detection Rate              0        0        1        0        0
## Detection Prevalence        0        0        1        0        0
## Balanced Accuracy          NA       NA       NA       NA       NA
```

```
# load libraries
library(caret)
library(rpart)


# define training control
#train_control<- trainControl(method="cv", number=10)

# train the model
#model<- train(classe~.,data=training, trControl=train_control, method="glm")



 append predictions
pred<- cbind(testing,predictions)

# summarize results
confusion Matrix<- confusion Matrix(pred$predictions,pred$pred_classe)
```

```
Confusion Matrix and Statistics

          Reference
Prediction  yes   no
       yes   54   48
       no   170 1395

               Accuracy : 0.8692
                 95% CI : (0.8521, 0.8851)
    No Information Rate : 0.8656
    P-Value [Acc > NIR] : 0.3492

                  Kappa : 0.2699
 Mcnemar's Test P-Value : 2.503e-16

            Sensitivity : 0.24107
            Specificity : 0.96674
         Pos Pred Value : 0.52941
         Neg Pred Value : 0.89137
             Prevalence : 0.13437
         Detection Rate : 0.03239
   Detection Prevalence : 0.06119
      Balanced Accuracy : 0.60390

       'Positive' Class : yes
```