# Logistic Regression Modeling (Cleaned_3.csv)

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02/09/2020

**Attributes:**

1: StageName (factor)
2: RecordType.Name 3: RICE_Supported__c
4: Actual_Close_Date__c (factor)
5: Lead_Faculty__c 6: Lead_School__c
7: Parent_Opportunity__c (factor)
8: Industry
9: Industry_Sub_Type__c

10: Business_Type__c
11: Is_External(1)__c (facotr)
12: ParentId (factor)
13: CloseYear
14: CloseMonth

15: CreatedYear
16: CreatedMonth

```
# Reading Data In
data <- read.csv("/Users/ChantelleChiu/Documents/GitHub/Project-90106-G28/Chantelle/clea
                 header = TRUE, stringsAsFactors = T)
names(data) <- c("X1", "X2", "X3", "X4", "X5", "X6", "X7", "X8", "X9", "X10",
                 "X11", "X12", "X13", "X14", "X15", "X16")

#summary(data)
```

Build regression model with 1 predictor ("StageName") and 15 features (X2-X6)

```
mod1 <- glm(factor(X1)~X2+X3+factor(X4)+X5+X6+factor(X7)+X8+X9+X10+factor(X11)+factor(X
            family = "binomial", data = data)
```

```
# 10-fold cross_validation
train_control <- trainControl(method = "cv", number = 10)
```

```r
# train the model on data set
model <- train(factor(X1)~X2+X3+factor(X4)+X5+X6+factor(X7)+X8+X9+X10+factor(X11)+facto
               data = data,
               trControl = train_control,
               method = "glm",
               family="binomial")
```

```r
summary(model)
```

```
##
## Call:
## NULL
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -4.1117  -0.8075  -0.2331   0.8376   3.2370
##
## Coefficients: (17 not defined because of singularities)
##                                                    Estimate Std. Error
## (Intercept)                                      -4.173e+02  1.144e+02
## `X2Competitive Bid`                              -4.011e+00  8.683e-01
## `X2Consultancy (Non-research)`                   -2.242e+00  7.333e-01
## `X2Custom Education (MSPACE Included)`           -2.814e+00  7.316e-01
## X2Grants                                         -2.785e+00  7.361e-01
## X2Internship                                     -2.099e+00  8.288e-01
## X2Panel                                          -2.122e+00  7.889e-01
## `X2Parent Grant`                                  1.044e+01  2.118e+00
## X2Philanthropic                                  -2.154e+00  9.111e-01
## `X2Research Contract`                            -2.394e+00  7.258e-01
## X2Sponsorship                                    -1.686e+00  8.815e-01
## `X2Technology Transfer`                          -1.836e+00  7.385e-01
## `X3RIC RE&D and BD&I`                             2.354e+00  2.371e-01
## `X3RIC-BD&I`                                      1.181e+00  2.211e-01
## `X3RIC-RE&D`                                      9.437e-01  2.969e-01
## `factor(X4)1`                                     1.956e+00  1.138e+00
## X50012e000002ZGfbAAG                             -9.963e-01  8.322e-01
## X50012e000002ZLg7AAG                             -9.597e-01  8.368e-01
## X50012e000002ZLgIAAW                             -1.432e+00  8.326e-01
## X50012e000002ZLgJAAW                             -2.286e+00  9.800e-01
## X50012e000002ZmnxAAC                             -2.342e+00  8.845e-01
## X50012e000002ZmnzAAC                             -2.037e+00  9.768e-01
## X50012e000002Zmo0AAC                              1.446e-01  8.156e-01
## X50012e000002ZmOUAA0                              1.214e+13  2.123e+14
## X50012e000002ZmOZAA0                             -7.869e-01  8.796e-01
## X50012e000002ZNYOAA4                             -2.067e+00  9.535e-01
```

```
## X50012e000002Zt0MAAS                -4.504e+15  3.875e+07
## X50012e000002Zt1iAAC                -7.487e+09  6.711e+07
## X50012e000002Zt1RAAS                -1.719e-01  8.374e-01
## X50012e000002Zt1zAAC                -4.504e+15  6.732e+07
## X5NotGiven                          -4.063e+00  8.571e-01
## X60012e000002YlvyAAC                -7.933e-01  1.193e+00
## X60012e000002Ym9QAAS                -1.693e+00  1.099e+00
## X60012e000002YmBqAAK                -1.918e+00  1.522e+00
## X60012e000002YmMXAA0                -2.502e-01  1.090e+00
## X60012e000002YmNRAA0                -5.571e-01  1.125e+00
## X60012e000002YmVtAAK                -1.032e+00  1.074e+00
## X60012e000002YneJAAS                 4.511e-01  9.945e-01
## X60012e000002YnERAA0                -5.899e-01  1.148e+00
## X60012e000002YnrYAAS                -2.990e+00  1.131e+00
## X60012e000002YoY7AAK                -2.122e+00  1.090e+00
## X60012e000002YoYUAA0                -8.405e-01  8.522e-01
## X60012e000002Z3OuAAK                -2.401e+00  1.263e+00
## X60012e000002Z3p1AAC                -3.743e-01  1.147e+00
## X60012e000002Z3pPAAS                -1.467e+00  1.018e+00
## X60012e000002Z4IxAAK                -1.146e+00  1.234e+00
## X60012e000002Z4JyAAK                -7.236e-01  1.074e+00
## X60012e000002Z4oNAAS                 1.069e+00  1.329e+00
## X60012e000002Z51dAAC                 2.035e-01  1.014e+00
## X60012e000002Z51eAAC                -1.692e+00  1.087e+00
## X60012e000002Z67WAAS                -3.507e-01  1.148e+00
## X60012e000002Z6AWAA0                -1.284e+00  1.041e+00
## X60012e000002ZLgBAAW                -1.908e+00  1.068e+00
## X60012e000002ZLgOAAW                -1.214e+13  2.123e+14
## X60012e000002ZlmBAAS                -3.129e-01  1.473e+00
## X60012e000002Zt0bAAC                -1.494e+00  1.021e+00
## X60012e000002Zt0cAAC                -1.300e+00  1.013e+00
## X60012e000002Zt0gAAC                 4.504e+15  4.746e+07
## X60012e000002Zt0hAAC                 1.941e-01  1.145e+00
## X60012e000002Zt0jAAC                -2.477e+00  1.166e+00
## X60012e000002Zt0mAAC                -1.343e+00  1.010e+00
## X60012e000002Zt0nAAC                -3.505e-01  1.142e+00
## X60012e000002Zt0rAAC                -1.579e+00  1.306e+00
## X60012e000002Zt0XAAS                -1.272e+00  1.149e+00
## X60012e000002Zt0YAAS                 7.970e-01  8.603e-01
## X60012e000002Zt0ZAAS                -4.504e+15  6.713e+07
## X60012e000002Zt10AAC                -7.533e-01  1.017e+00
## X60012e000002Zt1FAAS                -3.361e-01  1.028e+00
## X60012e000002Zt1MAAS                -1.496e+01  7.051e+02
## X60012e000002Zt1PAAS                -1.049e+00  1.092e+00
## X60012e000002Zt1VAAS                 4.135e-01  1.473e+00
```

```
## X60012e000002Zt20AAC                                    -1.021e+00  1.099e+00
## X60012e000002Zt21AAC                                    -1.215e+00  1.153e+00
## X60012e000002Zt25AAC                                    -1.214e+13  2.123e+14
## X60012e000002Zt28AAC                                    -1.214e+13  2.123e+14
## X60012e000003jZXsAAM                                     4.504e+15  6.711e+07
## X6NotGiven                                              -2.103e+00  9.843e-01
## `factor(X7)1`                                           -4.543e-01  1.659e-01
## `X8Agriculture & Horticulture`                          -2.501e+00  1.757e+00
## `X8Aquaculture & Fisheries`                             -1.584e+00  2.149e+00
## `X8Construction & Construction Materials`               -2.029e+00  1.759e+00
## X8Defence                                               -1.151e+00  1.752e+00
## X8Education                                             -8.837e+12  1.451e+13
## `X8Energy & Utilities`                                  -1.837e+00  1.755e+00
## `X8Forestry & Paper`                                    -1.329e+00  2.134e+00
## X8Health                                                -1.537e+00  1.868e+00
## `X8Manufacturing & R&D`                                 -2.556e+00  1.818e+00
## `X8Materials: Chemicals & Industrial Metals`            -3.022e+00  1.801e+00
## `X8Mining & Refining`                                   -2.572e+00  1.777e+00
## `X8Mining Equipment and Technology Services`            -3.322e+00  1.953e+00
## `X8Public Administration`                               -2.273e+00  1.749e+00
## X8Services                                              -8.837e+12  1.451e+13
## `X8Technology: IT & Telephone Services`                 -2.345e+00  1.756e+00
## X8Transportation                                        -8.221e+00  1.294e+01
## `X8Transportation & Logistics`                          -2.474e+00  1.772e+00
## X8Veterinary                                            -1.839e+00  1.796e+00
## X9Aerospace                                              6.625e-01  1.045e+00
## `X9Agriculture & Horticulture`                                  NA         NA
## `X9Aquaculture & Fisheries`                                     NA         NA
## `X9Automobiles, Heavy Vehicles & Industrial Machinery` -1.389e-01  7.158e-01
## `X9Biotechnology (non-Pharma)`                          -1.645e-01  6.974e-01
## `X9Business & Professional`                              8.837e+12  1.451e+13
## X9Community                                              8.837e+12  1.451e+13
## `X9Construction & Construction Materials`                       NA         NA
## `X9Consumer Goods`                                       7.198e-02  8.550e-01
## X9Defence                                                       NA         NA
## X9Diagnostics                                           -9.056e-01  7.490e-01
## X9Education                                              8.837e+12  1.451e+13
## `X9Energy & Utilities`                                          NA         NA
## `X9Engineering and Scientific`                           8.837e+12  1.451e+13
## `X9Entertainment & Creative Industries`                  8.837e+12  1.451e+13
## X9Environmental                                          8.837e+12  1.451e+13
## `X9Financial & Insurance`                                8.837e+12  1.451e+13
## `X9Food & Beverage`                                     -2.318e-01  6.367e-01
## `X9Forestry & Paper`                                            NA         NA
## `X9Hardware, Electronics and Electrical Equipment`              NA         NA
```

```
## `X9Health Care & Healthy Aging`                          -6.153e-01  6.888e-01
## `X9Materials: Chemicals & Industrial Metals`                     NA         NA
## `X9Medical Devices`                                      -5.171e-01  7.698e-01
## `X9Mining & Refining`                                            NA         NA
## `X9Mining Equipment and Technology Services`                     NA         NA
## X9Pharmaceuticals                                        -1.255e+00  6.875e-01
## `X9Public Administration`                                        NA         NA
## `X9Research Tools/Consumables`                                   NA         NA
## `X9Retail, Travel, Hospitality & Leisure`                 8.837e+12  1.451e+13
## X9Services                                                8.837e+12  1.451e+13
## `X9Technology: IT & Telephone Services`                          NA         NA
## X9Transportation                                                 NA         NA
## `X9Transportation & Logistics`                                   NA         NA
## X9Veterinary                                                     NA         NA
## `X10Government: Australia: Federal`                      -2.887e-01  4.451e-01
## `X10Government: Australia: Local & State`                -2.168e-01  4.430e-01
## `X10Government: International`                           -6.140e-01  4.746e-01
## `X10Large Australian Corporate`                          -3.657e-01  4.549e-01
## `X10Multinational / Other Large Corporate`               -8.298e-01  4.462e-01
## `X10Not for profit`                                      -1.832e-01  4.456e-01
## `X10PFRO (Publicly-Funded Research Organisation)`        -2.130e+00  5.880e-01
## `X10RDC (Rural Research and Development Corporations)`   -4.338e-01  6.281e-01
## `X10SME (small to medium enterprise)`                    -5.141e-01  4.428e-01
## X10University                                             4.019e-01  4.710e-01
## `factor(X11)1`                                                   NA         NA
## `factor(X12)1`                                           -3.461e-01  1.105e-01
## X13                                                      -1.807e-01  4.604e-02
## X14                                                      -1.594e-01  1.235e-02
## X15                                                       3.900e-01  4.848e-02
## X16                                                       1.655e-02  1.163e-02
##                                                             z value Pr(>|z|)
## (Intercept)                                              -3.649e+00 0.000263 ***
## `X2Competitive Bid`                                      -4.620e+00 3.84e-06 ***
## `X2Consultancy (Non-research)`                           -3.057e+00 0.002233 **
## `X2Custom Education (MSPACE Included)`                   -3.846e+00 0.000120 ***
## X2Grants                                                 -3.783e+00 0.000155 ***
## X2Internship                                             -2.533e+00 0.011322 *
## X2Panel                                                  -2.690e+00 0.007138 **
## `X2Parent Grant`                                          4.931e+00 8.17e-07 ***
## X2Philanthropic                                          -2.364e+00 0.018090 *
## `X2Research Contract`                                    -3.298e+00 0.000973 ***
## X2Sponsorship                                            -1.913e+00 0.055775 .
## `X2Technology Transfer`                                  -2.486e+00 0.012902 *
## `X3RIC RE&D and BD&I`                                     9.926e+00  < 2e-16 ***
## `X3RIC-BD&I`                                              5.339e+00 9.33e-08 ***
```

```
## `X3RIC-RE&D`                                3.179e+00 0.001480 **
## `factor(X4)1`                               1.719e+00 0.085653 .
## X50012e000002ZGfbAAG                       -1.197e+00 0.231238
## X50012e000002ZLg7AAG                       -1.147e+00 0.251468
## X50012e000002ZLgIAAW                       -1.719e+00 0.085534 .
## X50012e000002ZLgJAAW                       -2.333e+00 0.019666 *
## X50012e000002ZmnxAAC                       -2.648e+00 0.008088 **
## X50012e000002ZmnzAAC                       -2.085e+00 0.037024 *
## X50012e000002Zmo0AAC                        1.770e-01 0.859249
## X50012e000002ZmOUAA0                        5.700e-02 0.954418
## X50012e000002ZmOZAA0                       -8.950e-01 0.371023
## X50012e000002ZNYOAA4                       -2.168e+00 0.030139 *
## X50012e000002Zt0MAAS                       -1.162e+08  < 2e-16 ***
## X50012e000002Zt1iAAC                       -1.116e+02  < 2e-16 ***
## X50012e000002Zt1RAAS                       -2.050e-01 0.837362
## X50012e000002Zt1zAAC                       -6.690e+07  < 2e-16 ***
## X5NotGiven                                 -4.740e+00 2.13e-06 ***
## X60012e000002YlvyAAC                       -6.650e-01 0.505910
## X60012e000002Ym9QAAS                       -1.541e+00 0.123431
## X60012e000002YmBqAAK                       -1.260e+00 0.207545
## X60012e000002YmMXAA0                       -2.300e-01 0.818399
## X60012e000002YmNRAA0                       -4.950e-01 0.620602
## X60012e000002YmVtAAK                       -9.610e-01 0.336559
## X60012e000002YneJAAS                        4.540e-01 0.650124
## X60012e000002YnERAA0                       -5.140e-01 0.607371
## X60012e000002YnrYAAS                       -2.644e+00 0.008194 **
## X60012e000002YoY7AAK                       -1.947e+00 0.051475 .
## X60012e000002YoYUAA0                       -9.860e-01 0.324051
## X60012e000002Z3OuAAK                       -1.901e+00 0.057295 .
## X60012e000002Z3p1AAC                       -3.260e-01 0.744130
## X60012e000002Z3pPAAS                       -1.440e+00 0.149857
## X60012e000002Z4IxAAK                       -9.290e-01 0.352662
## X60012e000002Z4JyAAK                       -6.730e-01 0.500651
## X60012e000002Z4oNAAS                        8.040e-01 0.421222
## X60012e000002Z51dAAC                        2.010e-01 0.840967
## X60012e000002Z51eAAC                       -1.556e+00 0.119617
## X60012e000002Z67WAAS                       -3.050e-01 0.760008
## X60012e000002Z6AWAA0                       -1.233e+00 0.217489
## X60012e000002ZLgBAAW                       -1.787e+00 0.074016 .
## X60012e000002ZLgOAAW                       -5.700e-02 0.954418
## X60012e000002ZlmBAAS                       -2.120e-01 0.831813
## X60012e000002Zt0bAAC                       -1.463e+00 0.143487
## X60012e000002Zt0cAAC                       -1.284e+00 0.199023
## X60012e000002Zt0gAAC                        9.490e+07  < 2e-16 ***
## X60012e000002Zt0hAAC                        1.690e-01 0.865436
```

```
## X60012e000002Zt0jAAC                                    -2.124e+00 0.033688 *
## X60012e000002Zt0mAAC                                    -1.330e+00 0.183588
## X60012e000002Zt0nAAC                                    -3.070e-01 0.758963
## X60012e000002Zt0rAAC                                    -1.210e+00 0.226460
## X60012e000002Zt0XAAS                                    -1.107e+00 0.268352
## X60012e000002Zt0YAAS                                     9.260e-01 0.354204
## X60012e000002Zt0ZAAS                                    -6.709e+07  < 2e-16 ***
## X60012e000002Zt10AAC                                    -7.410e-01 0.458943
## X60012e000002Zt1FAAS                                    -3.270e-01 0.743767
## X60012e000002Zt1MAAS                                    -2.100e-02 0.983076
## X60012e000002Zt1PAAS                                    -9.610e-01 0.336718
## X60012e000002Zt1VAAS                                     2.810e-01 0.778963
## X60012e000002Zt20AAC                                    -9.280e-01 0.353205
## X60012e000002Zt21AAC                                    -1.053e+00 0.292216
## X60012e000002Zt25AAC                                    -5.700e-02 0.954418
## X60012e000002Zt28AAC                                    -5.700e-02 0.954418
## X60012e000003jZXsAAM                                     6.711e+07  < 2e-16 ***
## X6NotGiven                                              -2.137e+00 0.032625 *
## `factor(X7)1`                                           -2.738e+00 0.006185 **
## `X8Agriculture & Horticulture`                          -1.424e+00 0.154489
## `X8Aquaculture & Fisheries`                             -7.370e-01 0.460861
## `X8Construction & Construction Materials`               -1.153e+00 0.248860
## X8Defence                                               -6.570e-01 0.511192
## X8Education                                             -6.090e-01 0.542565
## `X8Energy & Utilities`                                  -1.047e+00 0.295113
## `X8Forestry & Paper`                                    -6.230e-01 0.533571
## X8Health                                                -8.230e-01 0.410577
## `X8Manufacturing & R&D`                                 -1.406e+00 0.159748
## `X8Materials: Chemicals & Industrial Metals`            -1.678e+00 0.093368 .
## `X8Mining & Refining`                                   -1.447e+00 0.147802
## `X8Mining Equipment and Technology Services`            -1.702e+00 0.088840 .
## `X8Public Administration`                               -1.299e+00 0.193865
## X8Services                                              -6.090e-01 0.542565
## `X8Technology: IT & Telephone Services`                 -1.335e+00 0.181753
## X8Transportation                                        -6.350e-01 0.525113
## `X8Transportation & Logistics`                          -1.397e+00 0.162560
## X8Veterinary                                            -1.024e+00 0.305793
## X9Aerospace                                              6.340e-01 0.525972
## `X9Agriculture & Horticulture`                                  NA       NA
## `X9Aquaculture & Fisheries`                                     NA       NA
## `X9Automobiles, Heavy Vehicles & Industrial Machinery`  -1.940e-01 0.846088
## `X9Biotechnology (non-Pharma)`                          -2.360e-01 0.813487
## `X9Business & Professional`                              6.090e-01 0.542565
## X9Community                                              6.090e-01 0.542565
## `X9Construction & Construction Materials`                       NA       NA
```

```
## `X9Consumer Goods`                                      8.400e-02 0.932904
## X9Defence                                                      NA       NA
## X9Diagnostics                                          -1.209e+00 0.226637
## X9Education                                             6.090e-01 0.542565
## `X9Energy & Utilities`                                         NA       NA
## `X9Engineering and Scientific`                          6.090e-01 0.542565
## `X9Entertainment & Creative Industries`                 6.090e-01 0.542565
## X9Environmental                                         6.090e-01 0.542565
## `X9Financial & Insurance`                               6.090e-01 0.542565
## `X9Food & Beverage`                                    -3.640e-01 0.715774
## `X9Forestry & Paper`                                           NA       NA
## `X9Hardware, Electronics and Electrical Equipment`             NA       NA
## `X9Health Care & Healthy Aging`                        -8.930e-01 0.371693
## `X9Materials: Chemicals & Industrial Metals`                   NA       NA
## `X9Medical Devices`                                    -6.720e-01 0.501732
## `X9Mining & Refining`                                          NA       NA
## `X9Mining Equipment and Technology Services`                   NA       NA
## X9Pharmaceuticals                                      -1.826e+00 0.067914 .
## `X9Public Administration`                                      NA       NA
## `X9Research Tools/Consumables`                                 NA       NA
## `X9Retail, Travel, Hospitality & Leisure`               6.090e-01 0.542565
## X9Services                                              6.090e-01 0.542565
## `X9Technology: IT & Telephone Services`                        NA       NA
## X9Transportation                                               NA       NA
## `X9Transportation & Logistics`                                 NA       NA
## X9Veterinary                                                   NA       NA
## `X10Government: Australia: Federal`                    -6.490e-01 0.516554
## `X10Government: Australia: Local & State`              -4.890e-01 0.624572
## `X10Government: International`                         -1.294e+00 0.195753
## `X10Large Australian Corporate`                        -8.040e-01 0.421497
## `X10Multinational / Other Large Corporate`             -1.860e+00 0.062918 .
## `X10Not for profit`                                    -4.110e-01 0.680980
## `X10PFRO (Publicly-Funded Research Organisation)`      -3.622e+00 0.000292 ***
## `X10RDC (Rural Research and Development Corporations)` -6.910e-01 0.489807
## `X10SME (small to medium enterprise)`                  -1.161e+00 0.245552
## X10University                                           8.530e-01 0.393434
## `factor(X11)1`                                                 NA       NA
## `factor(X12)1`                                         -3.133e+00 0.001729 **
## X13                                                    -3.925e+00 8.69e-05 ***
## X14                                                    -1.291e+01  < 2e-16 ***
## X15                                                     8.044e+00 8.72e-16 ***
## X16                                                     1.422e+00 0.154915
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 7148.3  on 5407  degrees of freedom
## Residual deviance: 5146.5  on 5279  degrees of freedom
## AIC: 5404.5
##
## Number of Fisher Scoring iterations: 25
```

## Conclusion:

**Recall the attributes:**

1: StageName (factor)
2: RecordType.Name 3: RICE_Supported__c
4: Actual_Close_Date__c (factor)
5: Lead_Faculty__c 6: Lead_School__c
7: Parent_Opportunity__c (factor)
8: Industry
9: Industry_Sub_Type__c

10: Business_Type__c
11: Is_External(1)__c (facotr)
12: ParentId (factor)
13: CloseYear
14: CloseMonth

15: CreatedYear
16: CreatedMonth

**Significant Attributes:**

**Very significant (p-value $<$ 0.001):**

*Intercept X2: X2Competitive Bid* X2Custom Education (MSPACE Included) *X2Grants* X2Research Contract X3: X3RIC RE&D and BD&I X3RIC-BD&I X5 *X50012e000002Zt0MAAS X50012e000002Zt1iAAC* X50012e000002Zt1zAAC *X5NotGiven X6* X60012e000002Zt0gAAC *X60012e000002Zt0ZAAS* X60012e000003jZXsAAM X10 *X10PFRO (Publicly-Funded Research Organisation) X13 X14 X15

**Significant (0,001 $<$ p-value $<$ 0.01)**

X2: *X2Consultancy (Non-research)* X2Panel X3: X3RIC-RE&D X5: X50012e000002ZmnxAAC X6: X60012e000002YnrYAAS X7: *factor(X7)1 X8: factor(X12)1

**Somehow significant (0.01 < p-value < 0.05)**

X2: *X2Internship X2Philanthropic* X2Technology Transfer X5: *X50012e000002ZNYOAA4 X6:* X60012e000002Zt0jAAC *X6NotGiven

```
print(model)
```

```
## Generalized Linear Model
##
## 5408 samples
##   15 predictor
##    2 classes: '0', '1'
##
## No pre-processing
## Resampling: Cross-Validated (10 fold)
## Summary of sample sizes: 4867, 4867, 4867, 4867, 4868, 4867, ...
## Resampling results:
##
##   Accuracy   Kappa
##   0.7368767  0.4352821
```

## Conclusion

1. Accuracy drops from 99% to around 73%.
   2. Since we have about 2:1 split for classes 0 and 1 of the "stageName", which is sort of imbalance, we might also want to look at the Kappa accuracy which is nearly 38%. According to the guideline for Kappa score, 38% is a high "fair".

## Note

from website https://machinelearningmastery.com/machine-learning-evaluation-metrics-in-r/

### Accuracy

is the percentage of correctly classifies instances out of all instances. It is more useful on a binary classification than multi-class classification problems because it can be less clear exactly how the accuracy breaks down across those classes.

### Kappa or Cohen's Kappa

is like classification accuracy, except that it is normalized at the baseline of random chance on your dataset. It is a more useful measure to use on problems that have an imbalance in the classes (e.g. 70-30 split for classes 0 and 1 and you can achieve 70% accuracy by predicting all instances are for class 0).

**Suggested guidelines for Kappa:**

values <= 0 as indicating no agreement
0.01–0.20 as none to slight
0.21–0.40 as fair, 0.41– 0.60 as moderate,
0.61–0.80 as substantial
0.81–1.00 as almost perfect agreement.