# other_models_using_Python

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We found the following methods on this website: https://machinelearningmastery.com/bagging-and-random-forest-for-imbalanced-classification/

[1]:
```
import numpy as np
import pandas as pd
from numpy import mean
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.metrics import confusion_matrix
from sklearn.datasets import make_classification
from sklearn.model_selection import cross_val_score
from sklearn.model_selection import RepeatedStratifiedKFold
from sklearn.metrics import f1_score
from sklearn.metrics import matthews_corrcoef
```

[2]:
```
train = pd.read_csv("traindata.csv").iloc[:,1:]
test = pd.read_csv("testdata.csv").iloc[:,1:]
```

[3]:
```
train1 = pd.get_dummies(train,drop_first=True,columns=['Sex','Race',␣
↪'Insurance', 'SEER.Registry', 'Subsite', 'AJCC.7.Stage', 'Chemotherapy',␣
↪'follow'])
```

[4]:
```
test1 = pd.get_dummies(test,drop_first=True,columns=['Sex','Race', 'Insurance',␣
↪'SEER.Registry', 'Subsite', 'AJCC.7.Stage', 'Chemotherapy', 'follow'])
```

[5]:
```
X = train1.iloc[:,:-1]
y = train1['follow_1']
```

[6]:
```
test_X = test1.iloc[:,:-1]
test_y = test1['follow_1']
```

[7]:
```
cv = RepeatedStratifiedKFold(n_splits=10, n_repeats=3, random_state=1)
```

[8]:
```
def getResult(mod):
    fit = mod.fit(X,y)
    pred = mod.predict(test_X)
    scores = cross_val_score(mod, X, y, scoring='roc_auc', cv=cv, n_jobs=-1)
    print('Mean ROC AUC: %.3f' %mean(scores))
```

```
    print('F1-score: %.3f' %f1_score(test_y, pred))
    print('MCC: %.3f' %matthews_corrcoef(test_y, pred))
    mat = confusion_matrix(pred, test_y)
    mat
    sns.heatmap(mat, square=True, annot=True, cbar=False, fmt='g')
    plt.xlabel("Actual Result")
    plt.ylabel("Predicted Result")
    a, b = plt.ylim()
    a += 0.5
    b -= 0.5
    plt.ylim(a, b)
    plt.show()
```

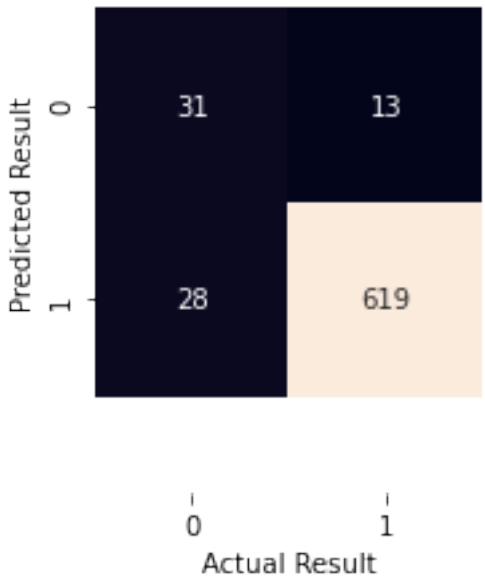
# 1 Bagging for Imbalanced Classification

### 1.0.1 Standard Bagging

[9]:
```
from sklearn.ensemble import BaggingClassifier
```

[10]:
```
%%time
getResult(BaggingClassifier())
```

```
Mean ROC AUC: 0.800
F1-score: 0.968
MCC: 0.578
```



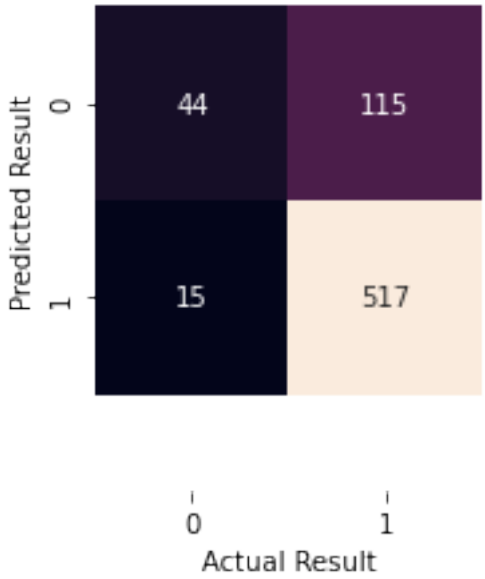
```
CPU times: user 241 ms, sys: 86.3 ms, total: 327 ms
Wall time: 4.69 s
```

### 1.0.2 Bagging With Random Undersampling

[11]:
```
from imblearn.ensemble import BalancedBaggingClassifier
```

[12]:
```
%%time
getResult(BalancedBaggingClassifier())
```

```
Mean ROC AUC: 0.834
F1-score: 0.888
MCC: 0.374
```




```
CPU times: user 169 ms, sys: 17.3 ms, total: 186 ms
Wall time: 801 ms
```

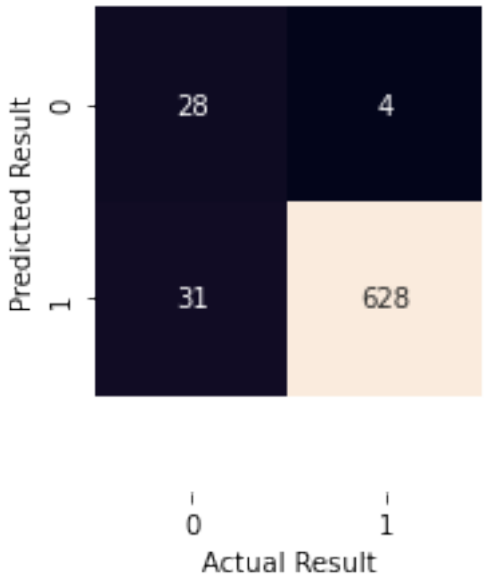
# 2 Random Forest for Imbalanced Classification

### 2.0.1 Standard Random Forest

[13]:
```
from sklearn.ensemble import RandomForestClassifier
```

[14]:
```
%%time
getResult(RandomForestClassifier(n_estimators=10))
```

```
Mean ROC AUC: 0.802
F1-score: 0.973
MCC: 0.623
```

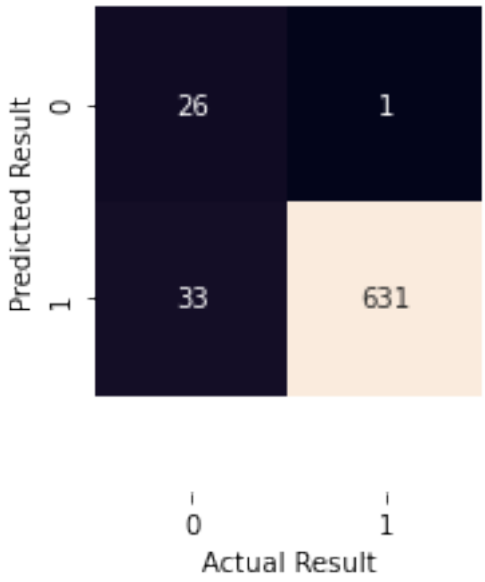



```
CPU times: user 143 ms, sys: 14.9 ms, total: 158 ms
Wall time: 470 ms
```

### 2.0.2 Random Forest With Class Weighting

[15]:
```
%%time
getResult(RandomForestClassifier(n_estimators=10, class_weight='balanced'))
```

```
Mean ROC AUC: 0.787
F1-score: 0.974
MCC: 0.633
```

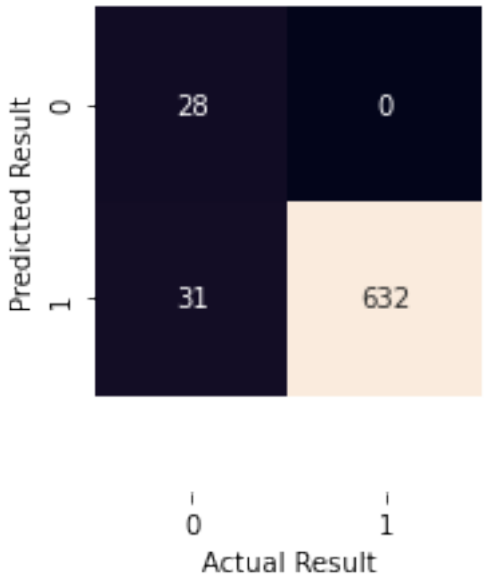



```
CPU times: user 211 ms, sys: 21.3 ms, total: 232 ms
Wall time: 517 ms
```

### 2.0.3 Random Forest With Bootstrap Class Weighting

[16]:
```
%%time
getResult(RandomForestClassifier(n_estimators=10,␣
 ↪class_weight='balanced_subsample'))
```

```
Mean ROC AUC: 0.789
F1-score: 0.976
MCC: 0.673
```



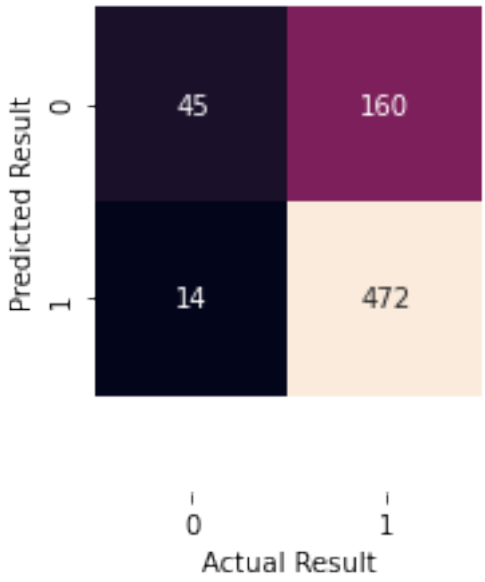

```
CPU times: user 152 ms, sys: 14.2 ms, total: 166 ms
Wall time: 526 ms
```

### 2.0.4 Random Forest With Random Undersampling

[17]:
```
from imblearn.ensemble import BalancedRandomForestClassifier
```

[18]:
```
%%time
getResult(BalancedRandomForestClassifier(n_estimators=10))
```

```
Mean ROC AUC: 0.809
F1-score: 0.844
MCC: 0.312
```




```
CPU times: user 149 ms, sys: 14 ms, total: 163 ms
Wall time: 685 ms
```

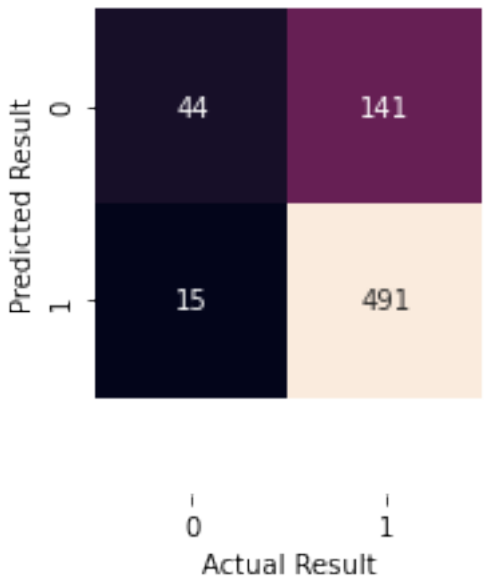
# 3 Easy Ensemble for Imbalanced Classification

### 3.0.1 Easy Ensemble

[19]:
```
from imblearn.ensemble import EasyEnsembleClassifier
```

[20]:
```
%%time
getResult(EasyEnsembleClassifier(n_estimators=10))
```

```
Mean ROC AUC: 0.834
F1-score: 0.863
MCC: 0.330
```




```
CPU times: user 886 ms, sys: 26.7 ms, total: 913 ms
Wall time: 10.1 s
```