RandomForest

May 9, 2017

In [12]:
```
import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
from subprocess import check_output
from sklearn.ensemble import RandomForestClassifier
#from sklearn.linear_model import LogisticRegression
from sklearn.grid_search import GridSearchCV
import matplotlib.pyplot as plt
```

In [13]:
```
# Load the datasets
train = pd.read_csv("/Users/jyothi/Desktop/santender/train.csv")
test = pd.read_csv("/Users/jyothi/Desktop/santender/test.csv")
```

In [14]:
```
train_y = train['TARGET']
train_x = train
train_x.drop(['ID', 'TARGET'], axis=1, inplace=True)
test_id = test['ID']
del test['ID']
```

In [15]:
```
# Fixing the outliers in column 'var3'
train_x['var3'].replace(-999999,0, inplace=True)
test['var3'].replace(-999999,0, inplace=True)

# Remove all the columns which have constant values.
# These columns have zero std deviation.
rm_col=[]
for col in train_x.columns:
    if train_x[col].std()==0:
        rm_col.append(col)

train_x.drop(rm_col, axis=1, inplace=True)
test.drop(rm_col, axis=1, inplace=True)
```

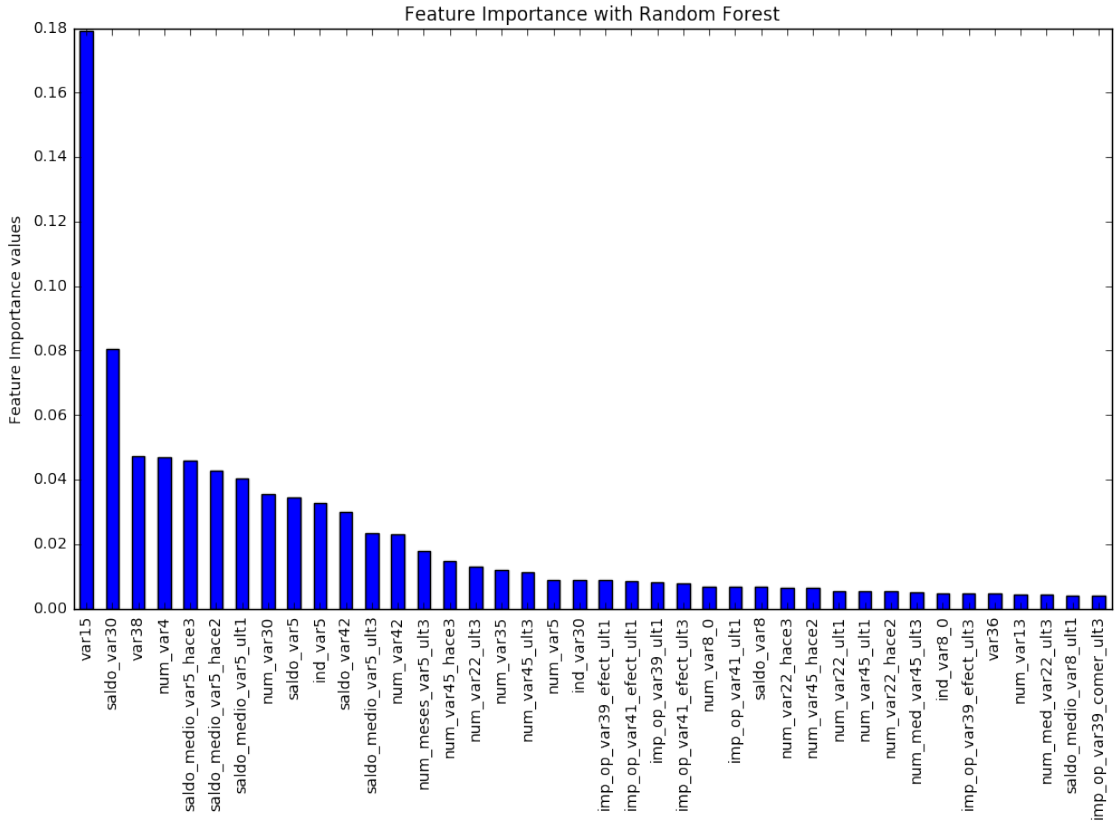
In [16]:
```
# Remove the duplicate columns.
# Here we have columns with different name but exactly same values for eac
# We will compare each columns with all other columns
dups_col = []
for ii in range(len(train_x.columns)-1):
    for jj in range(ii+1,len(train_x.columns)):
```

```
                col1=train_x.columns[ii]
                col2=train_x.columns[jj]
                # take the columns as arrays adn then compare the values.
                if np.array_equal(train_x[col1].values, train_x[col2].values) and
                    dups_col.append(col2)

        train_x.drop(dups_col, axis=1, inplace=True)
        test.drop(dups_col, axis=1, inplace=True)
```

In [17]:
```
        # Define a classifier
        rf_clf = RandomForestClassifier(max_depth=15,n_estimators=70, min_samples_
                                        min_samples_split=100, random_state=10)

        # Train the model
        rf_clf.fit(train_x,train_y)
```

Out[17]:
```
RandomForestClassifier(bootstrap=True, class_weight=None, criterion='gini'
            max_depth=15, max_features='auto', max_leaf_nodes=None,
            min_impurity_split=1e-07, min_samples_leaf=50,
            min_samples_split=100, min_weight_fraction_leaf=0.0,
            n_estimators=70, n_jobs=1, oob_score=False, random_state=10,
            verbose=0, warm_start=False)
```

In [18]:
```
        # Plot the top 40 important features
        imp_feat_rf = pd.Series(rf_clf.feature_importances_, index=train_x.columns
        imp_feat_rf[:40].plot(kind='bar', title='Feature Importance with Random Fo
        plt.ylabel('Feature Importance values')
        plt.subplots_adjust(bottom=0.25)
        plt.savefig('FeatImportance.png')
        plt.show()
```



In [20]:
```
# Save indexes of the important features in descending order of their impo
indices = np.argsort(rf_clf.feature_importances_)[::-1]
```

In [21]:
```
# list the names of the names of top 40 selected features adn remove the u
select_base =[str(s) for s in train_x.columns[indices][:50]]

# Make the subsets with 40 features only
train_x_sub = train_x[select_base]
test_sub = test[select_base]

#### We will use GridSearch package with cross validation to find best est
# Define a new Random Forest Classifier
select_rf_clf = RandomForestClassifier(random_state=10)

param_grid = {

            'n_estimators': [50, 80, 100],
            'max_depth': [5,10, 15]
}
```

In [24]:
```
# we will 10-fold cross-validation
grid_clf = GridSearchCV(select_rf_clf,param_grid,cv=5)
```

```
grid_clf.fit(train_x_sub,train_y)

# Take the best model
best_rf_clf = grid_clf.best_estimator_

# Make prediction with test data
predicted_proba = best_rf_clf.predict_proba(train_x_sub)
```

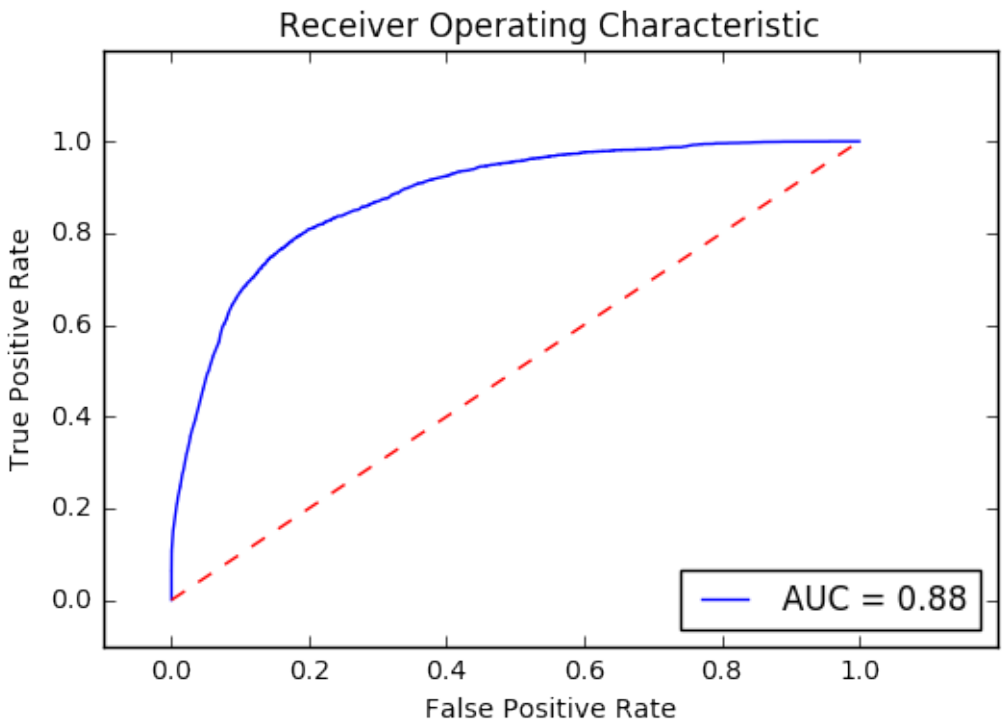
In [32]:
```
import numpy as np
import pandas as pd
import matplotlib

import matplotlib.pyplot as plt


from sklearn import cross_validation
import sklearn
from  sklearn.metrics import roc_cur
from sklearn.metrics import roc_auc_score
```

In [29]:
```
print('Overall AUC:', roc_auc_score(train_y, predicted_proba[:,1]))
```

```
Overall AUC: 0.882347253413
```

In [36]:
```
from sklearn.metrics import roc_auc_score
false_positive_rate, true_positive_rate, thresholds = sklearn.metrics.roc_
roc_auc = sklearn.metrics.auc(false_positive_rate, true_positive_rate)
```

In [37]:
```
plt.title('Receiver Operating Characteristic')
plt.plot(false_positive_rate, true_positive_rate, 'b',
label='AUC = %0.2f'% roc_auc)
plt.legend(loc='lower right')
plt.plot([0,1],[0,1],'r--')
plt.xlim([-0.1,1.2])
plt.ylim([-0.1,1.2])
plt.ylabel('True Positive Rate')
plt.xlabel('False Positive Rate')
plt.show()
```


Receiver Operating Characteristic
True Positive Rate
False Positive Rate
0.0
0.2
0.4
0.6
0.8
1.0
AUC = 0.88

In [ ]: