detect the fake profiles in online social networks using Neural Network

In [1]:
```
import sys
import csv
import os
import datetime
import math
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from datetime import datetime
import sexmachine.detector as gender
from sklearn.preprocessing import Imputer
from sklearn.model_selection import cross_validate
from sklearn import metrics
from pybrain3.structure import SigmoidLayer
from pybrain3.datasets import ClassificationDataSet
from pybrain3.utilities import percentError
from pybrain3.tools.shortcuts import buildNetwork
from pybrain3.supervised.trainers import BackpropTrainer
from pybrain3.structure.modules import SoftmaxLayer
from pybrain3.tools.xml.networkwriter import NetworkWriter
from pybrain3.tools.xml.networkreader import NetworkReader
from sklearn import preprocessing
from sklearn.linear_model import LinearRegression
from sklearn.ensemble import RandomForestClassifier
from sklearn.decomposition import PCA
```

```
%matplotlib inline
```

function for reading dataset from csv files

In [2]:
```
def read_datasets():
    """ Reads users profile from csv files """
    genuine_users = pd.read_csv("data/users.csv")
    fake_users = pd.read_csv("data/fusers.csv")
    x=pd.concat([genuine_users,fake_users])
    y=len(fake_users)*[0] + len(genuine_users)*[1]
    return x,y
```

function for predicting sex using name of person

In [3]:
```
def predict_sex(name):
    #    sex_predictor = gender.Detector(case_sensitive=False,unknown_value=u"unknown")
    first_name= name.str.split(' ').str.get(0)
    #    sex_predictor = gender.Detector()
    #    sex = sex_predictor.get_gender(first_name)
    #    sex= first_name.apply(sex_predictor.get_gender)
    #    sex = 'unknown'
    #    sex_dict={'female': -2, 'mostly_female': -1,'unknown':0,'mostly_male':1, 'male': 2}
    sex_code = 0
    #    sex.map(sex_dict).astype(int)
    return sex_code
```

```
    x.loc[:,'lang_code'] = x['lang'].map( lambda x: lang_dict[x]).astype(int)
    x.loc[:,'sex_code']=predict_sex(x['name'])
    feature_columns_to_use = ['statuses_count','followers_count','friends_count','favourites_count','listed_count','sex
    x=x.loc[:,feature_columns_to_use]
    return x
```

function for plotting confusion matrix

In [5]:
```
def plot_confusion_matrix(cm, title='Confusion matrix', cmap=plt.cm.Blues):
    target_names=['Fake','Genuine']
    plt.imshow(cm, interpolation='nearest', cmap=cmap)
    plt.title(title)
    plt.colorbar()
    tick_marks = np.arange(len(target_names))
    plt.xticks(tick_marks, target_names, rotation=45)
    plt.yticks(tick_marks, target_names)
    plt.tight_layout()
    plt.ylabel('True label')
    plt.xlabel('Predicted label')
```

function for plotting ROC curve

In [6]:
```
def plot_roc_curve(y_test, y_pred):
    false_positive_rate, true_positive_rate, thresholds = roc_curve(y_test, y_pred)

    print("False Positive rate: ",false_positive_rate)
    print("True Positive rate: ",true_positive_rate)
```

```
    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()
```

Function for training data using Neural Network

In [7]:
```
def train(X,y):
    """ Trains and predicts dataset with a Neural Network classifier """

    ds = ClassificationDataSet( len(X.columns), 1,nb_classes=2)
    for k in range(len(X)):
        ds.addSample(X.iloc[k],sp.array(y[k]))
    tstdata, trndata = ds.splitWithProportion( 0.20 )
    trndata._convertToOneOfMany( )
    tstdata._convertToOneOfMany( )
    input_size=len(X.columns)
    target_size=1
    hidden_size = 5
    fnn=None
    if  os.path.isfile('fnn.xml'):
        fnn = NetworkReader.readFrom('fnn.xml')
    else:
        fnn = buildNetwork( trndata.indim, hidden_size , trndata.outdim, outclass=SoftmaxLayer )
    trainer = BackpropTrainer( fnn, dataset=trndata,momentum=0.05, learningrate=0.1 , verbose=False, weightdecay=0.01)
```

In [8]:
```
print('reading datasets.....\n')
x,y=read_datasets()
x.describe()
```

```
reading datasets.....
```

Out[8]:

	id	statuses_count	followers_count	friends_count	favourites_count	listed_count	default_profile	default_profile_image	geo_enabled	profile_u
count	2.818000e+03	2818.000000	2818.000000	2818.000000	2818.000000	2818.000000	1728.0	8.0	721.0	
mean	5.374889e+08	1672.198368	371.105039	395.363023	234.541164	2.818666	1.0	1.0	1.0	
std	2.977005e+08	4884.669157	8022.631339	465.694322	1445.847248	23.480430	0.0	0.0	0.0	
min	3.610311e+06	0.000000	0.000000	0.000000	0.000000	0.000000	1.0	1.0	1.0	
25%	3.620867e+08	35.000000	17.000000	168.000000	0.000000	0.000000	1.0	1.0	1.0	
50%	6.162253e+08	77.000000	26.000000	306.000000	0.000000	0.000000	1.0	1.0	1.0	
75%	6.177673e+08	1087.750000	111.000000	519.000000	37.000000	1.000000	1.0	1.0	1.0	
max	1.391998e+09	79876.000000	4083720.000000	12773.000000	44349.000000	744.000000	1.0	1.0	1.0	

In [9]:
```
print("extracting features.....\n");
x=extract_features(x);
print(x.columns)
print(x.describe())
```

```
extracting features.....

Index(['statuses_count', 'followers_count', 'friends_count',
       'favourites_count', 'listed_count', 'sex_code', 'lang_code'],
```

```
50%       77.000000        26.000000      306.000000         0.000000
75%     1087.750000       111.000000      519.000000        37.000000
max    79876.000000   4083720.000000    12773.000000     44349.000000

       listed_count  sex_code    lang_code
count   2818.000000    2818.0  2818.000000
mean       2.818666       0.0     2.851313
std       23.480430       0.0     1.992950
min        0.000000       0.0     0.000000
25%        0.000000       0.0     1.000000
50%        0.000000       0.0     1.000000
75%        1.000000       0.0     5.000000
max      744.000000       0.0     7.000000
```

In [10]:
```
print("training datasets.....\n")
y_test,y_pred =train(x,y)
```

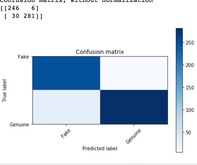
```
training datasets.....

FeedForwardNetwork-8
   Modules:
     [<BiasUnit 'bias'>, <LinearLayer 'in'>, <SigmoidLayer 'hidden0'>, <SoftmaxLayer 'out'>]
   Connections:
     [<FullConnection 'FullConnection-4': 'hidden0' -> 'out'>, <FullConnection 'FullConnection-5': 'in' -> 'hidden0'>,
<FullConnection 'FullConnection-6': 'bias' -> 'out'>, <FullConnection 'FullConnection-7': 'bias' -> 'hidden0'>]
```

In [11]:
```
print('Classification Accuracy on Test dataset: ',accuracy_score(y_test, y_pred))
```

```
Classification Accuracy on Test dataset:  0.9360568383658969
```

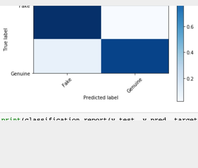
```
print('Confusion matrix, without normalization')
print(cm)
plot_confusion_matrix(cm)
```

```
Confusion matrix, without normalization
[[246   6]
 [ 30 281]]
```



In [14]:
```
cm_normalized = cm.astype('float') / cm.sum(axis=1)[:, np.newaxis]
print('Normalized confusion matrix')
print(cm_normalized)
plot_confusion_matrix(cm_normalized, title='Normalized confusion matrix')
```

```
Normalized confusion matrix
```



In [15]:
```
print(classification_report(y_test, y_pred, target_names=['Fake', 'Genuine']))
```

```
             precision    recall  f1-score   support

    accuracy                         0.94       563
   macro avg       0.94      0.94      0.94       563
weighted avg       0.94      0.94      0.94       563
```

In [16]:
```
a=roc_auc_score(y_test, y_pred)
print('roc_auc_score : ',a)
```

```
roc_auc_score :  0.9398637268412189
```

In [17]:
```
plot_roc_curve(y_test, y_pred)
```

```
False Positive rate:  [0.         0.02380952 1.        ]
True Positive rate:  [0.         0.90353698 1.        ]
```