In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.linear_model import LogisticRegression
from sklearn.preprocessing import StandardScaler
```

In [2]:
```
from sklearn.linear_model import LogisticRegression
```

In [3]:
```
df=pd.read_csv("detection.csv").dropna()
df
```

Out[3]:

	User ID	Username	Tweet	Retweet Count	Mention Count	Follower Count	Verified	Bot Label	Loc
1	289683	hinesstephanie	Authority research natural life material staff...	55	5	9617	True	0	Sande
2	779715	roberttran	Manage whose quickly especially foot none to g...	6	2	4363	True	0	Harris
3	696168	pmason	Just cover eight opportunity strong policy which.	54	5	2242	True	1	Martine
4	704441	noah87	Animal sign six data good or.	26	3	8438	False	1	Camach
5	570928	james00	See wonder travel this suffer less yard office...	41	4	3792	True	1	Che
...	...	...	...	...	...	...	...	...	
49995	491196	uberg	Want but put card direction know miss former h...	64	0	9911	True	1	Kimberly
49996	739297	jessicamunoz	Provide whole maybe agree church respond most ...	18	5	9900	False	1	Gree
49997	674475	lynncunningham	Bring different everyone international capital...	43	3	6313	True	1	Debor
49998	167081	richardthompson	Than about single generation itself seek sell ...	45	1	6343	False	0	Stephe
49999	311204	daniel29	Here morning class various room human true bec...	91	4	4006	False	0	Nova

41659 rows × 11 columns

In [4]:
```
df.head()
```

Out[4]:

	User ID	Username	Tweet	Retweet Count	Mention Count	Follower Count	Verified	Bot Label	Location	
1	289683	hinesstephanie	Authority research natural life material staff...	55	5	9617	True	0	Sanderston	
2	779715	roberttran	Manage whose quickly especially foot none to g...	6	2	4363	True	0	Harrisonfurt	
3	696168	pmason	Just cover eight opportunity strong policy which.	54	5	2242	True	1	Martinezberg	
4	704441	noah87	Animal sign six data good or.	26	3	8438	False	1	Camachoville	
5	570928	james00	See wonder travel this suffer less yard office...	41	4	3792	True	1	West Cheyenne	

In [5]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 41659 entries, 1 to 49999
Data columns (total 11 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   User ID         41659 non-null  int64
 1   Username        41659 non-null  object
 2   Tweet           41659 non-null  object
 3   Retweet Count   41659 non-null  int64
 4   Mention Count   41659 non-null  int64
 5   Follower Count  41659 non-null  int64
 6   Verified        41659 non-null  bool
 7   Bot Label       41659 non-null  int64
 8   Location        41659 non-null  object
 9   Created At      41659 non-null  object
 10  Hashtags        41659 non-null  object
dtypes: bool(1), int64(5), object(5)
memory usage: 3.5+ MB
```

In [6]:
```
df.describe()
```

Out[6]:

	User ID	Retweet Count	Mention Count	Follower Count	Bot Label
count	41659.000000	41659.000000	41659.000000	41659.000000	41659.000000
mean	548640.613097	49.950911	2.515207	4990.867928	0.500204
std	259990.806985	29.195286	1.709249	2880.947193	0.500006
min	100025.000000	0.000000	0.000000	0.000000	0.000000
25%	321829.500000	25.000000	1.000000	2493.500000	0.000000
50%	548396.000000	50.000000	3.000000	4997.000000	1.000000
75%	772751.500000	75.000000	4.000000	7475.500000	1.000000
max	999995.000000	100.000000	5.000000	10000.000000	1.000000

In [7]:
```
df.columns
```

Out[7]:
```
Index(['User ID', 'Username', 'Tweet', 'Retweet Count', 'Mention Count',
       'Follower Count', 'Verified', 'Bot Label', 'Location', 'Created At',
       'Hashtags'],
      dtype='object')
```

In [8]:
```
feature_matrix = df[['User ID','Retweet Count','Mention Count','Follower Count'
target_vector = df[["Verified"]]
```

In [9]:
```
fs=StandardScaler().fit_transform(feature_matrix)
logr=LogisticRegression()
logr.fit(fs,target_vector)
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py:63: Da
taConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples, ), for example using ravel().
  return f(*args, **kwargs)
```

Out[9]:
```
LogisticRegression()
```

In [10]:
```
observation=[[1,2,3,4,5]]
```

In [11]:
```
prediction=logr.predict(observation)
print(prediction)
```

```
[False]
```

In [12]:
```
logr.classes_
```

Out[12]:
```
array([False,  True])
```

In [13]:
```
logr.predict_proba(observation)[0][0]
```

Out[13]:
```
0.504915130281248
```

In [14]:
```
logr.predict_proba(observation)[0][1]
```

Out[14]:
```
0.49508486971875193
```

Random Forest

In [15]:
```
df['Verified'].value_counts()
```

Out[15]:
```
True     20845
False    20814
Name: Verified, dtype: int64
```

In [16]:
```
x=df[['User ID','Retweet Count','Mention Count','Follower Count','Bot Label']]
y=df['Verified']
```

In [17]:
```
g1={'Verified':{'True':1, "False":2}}
df=df.replace(g1)
df
```

Out[17]:

	User ID	Username	Tweet	Retweet Count	Mention Count	Follower Count	Verified	Bot Label	Loc
1	289683	hinesstephanie	Authority research natural life material staff...	55	5	9617	True	0	Sande
2	779715	roberttran	Manage whose quickly especially foot none to g...	6	2	4363	True	0	Harris
3	696168	pmason	Just cover eight opportunity strong policy which.	54	5	2242	True	1	Martine
4	704441	noah87	Animal sign six data good or.	26	3	8438	False	1	Camach
5	570928	james00	See wonder travel this suffer less yard office...	41	4	3792	True	1	Che
...	...	...	...	...	...	...	...	...	
49995	491196	uberg	Want but put card direction know miss former h...	64	0	9911	True	1	Kimberly
49996	739297	jessicamunoz	Provide whole maybe agree church respond most ...	18	5	9900	False	1	Gree
49997	674475	lynncunningham	Bring different everyone international capital...	43	3	6313	True	1	Debor
49998	167081	richardthompson	Than about single generation itself seek sell ...	45	1	6343	False	0	Stephe
49999	311204	daniel29	Here morning class various room human true bec...	91	4	4006	False	0	Nova

41659 rows × 11 columns

In [18]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,train_size=0.70)
```

In [19]:
```
from sklearn.ensemble import RandomForestClassifier
rfc = RandomForestClassifier()
rfc.fit(x_train,y_train)
```

Out[19]:
```
RandomForestClassifier()
```

In [20]:
```
parameters = {'max_depth':[1,2,3,4,5],'min_samples_leaf':[5,10,15,20,25],
              'n_estimators': [10,20,30,40,50]
              }
```

In [21]:
```
from sklearn.model_selection import GridSearchCV
grid_search = GridSearchCV(estimator=rfc,param_grid=parameters,cv=2,scoring="ac
grid_search.fit(x_train,y_train)
```

Out[21]:
```
GridSearchCV(cv=2, estimator=RandomForestClassifier(),
             param_grid={'max_depth': [1, 2, 3, 4, 5],
                         'min_samples_leaf': [5, 10, 15, 20, 25],
                         'n_estimators': [10, 20, 30, 40, 50]},
             scoring='accuracy')
```

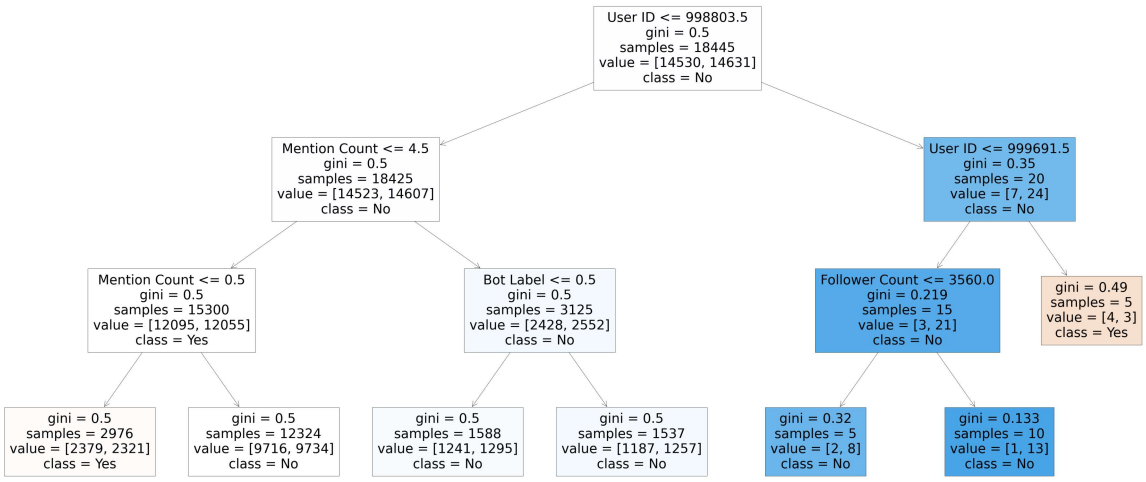
In [22]:
```
grid_search.best_score_
```

Out[22]:
```
0.5045781034548127
```

In [23]:
```
rfc_best = grid_search.best_estimator_
```

In [24]:
```
from sklearn.tree import plot_tree
plt.figure(figsize=(89,40))
plot_tree(rfc_best.estimators_[5], feature_names=x.columns, class_names=['Yes',
```

Out[24]:
```
[Text(2865.1153846153848, 1902.6000000000001, 'User ID <= 998803.5\ngini = 0.
5\nsamples = 18445\nvalue = [14530, 14631]\nclass = No'),
 Text(1528.0615384615385, 1359.0, 'Mention Count <= 4.5\ngini = 0.5\nsamples
= 18425\nvalue = [14523, 14607]\nclass = No'),
 Text(764.0307692307692, 815.4000000000001, 'Mention Count <= 0.5\ngini = 0.5
\nsamples = 15300\nvalue = [12095, 12055]\nclass = Yes'),
 Text(382.0153846153846, 271.79999999999995, 'gini = 0.5\nsamples = 2976\nval
ue = [2379, 2321]\nclass = Yes'),
 Text(1146.0461538461539, 271.79999999999995, 'gini = 0.5\nsamples = 12324\nv
alue = [9716, 9734]\nclass = No'),
 Text(2292.0923076923077, 815.4000000000001, 'Bot Label <= 0.5\ngini = 0.5\ns
amples = 3125\nvalue = [2428, 2552]\nclass = No'),
 Text(1910.076923076923, 271.79999999999995, 'gini = 0.5\nsamples = 1588\nval
ue = [1241, 1295]\nclass = No'),
 Text(2674.1076923076926, 271.79999999999995, 'gini = 0.5\nsamples = 1537\nva
lue = [1187, 1257]\nclass = No'),
 Text(4202.169230769231, 1359.0, 'User ID <= 999691.5\ngini = 0.35\nsamples =
20\nvalue = [7, 24]\nclass = No'),
 Text(3820.153846153846, 815.4000000000001, 'Follower Count <= 3560.0\ngini =
0.219\nsamples = 15\nvalue = [3, 21]\nclass = No'),
 Text(3438.1384615384613, 271.79999999999995, 'gini = 0.32\nsamples = 5\nvalu
e = [2, 8]\nclass = No'),
 Text(4202.169230769231, 271.79999999999995, 'gini = 0.133\nsamples = 10\nval
ue = [1, 13]\nclass = No'),
 Text(4584.184615384615, 815.4000000000001, 'gini = 0.49\nsamples = 5\nvalue
= [4, 3]\nclass = Yes')]
```



In [ ]:
```
```