In [26]:

```
import pandas as pd
import seaborn as sns
import numpy as np
from sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import KFold, cross_val_score
from sklearn.model_selection import train_test_split
from imblearn.under_sampling import RandomUnderSampler
from sklearn.metrics import RocCurveDisplay, confusion_matrix, roc_auc_score, classificatio

from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.ensemble import RandomForestClassifier
from sklearn.ensemble import AdaBoostClassifier
```

In [27]:

```
date_columns = ["Timestamp"]
df = pd.read_csv("ddos_dataset.csv", parse_dates=date_columns,index_col=None)
df.head()
```

```
C:\Users\ADMIN\AppData\Local\Temp\ipykernel_7616\3645980268.py:2: UserWarnin
g: Could not infer format, so each element will be parsed individually, fall
ing back to `dateutil`. To ensure parsing is consistent and as-expected, ple
ase specify a format.
  df = pd.read_csv("ddos_dataset.csv", parse_dates=date_columns,index_col=No
ne)
```

Out[27]:

	Flow ID	Timestamp	Fwd Pkt Len Mean	Fwd Seg Size Avg	Init Fwd Win Byts	Init Bwd Win Byts	Fwd Seg Size Min	Label
0	172.31.69.28-18.216.200.189-80-52169-6	2018-02-22 00:27:57	233.750000	233.750000	-1	32768	0	ddos
1	172.31.69.25-18.219.193.20-80-44588-6	2018-02-16 23:18:14	0.000000	0.000000	-1	225	0	ddos
2	172.31.69.25-18.219.193.20-80-43832-6	2018-02-16 23:23:20	114.333333	114.333333	-1	219	0	ddos
3	172.31.69.25-18.219.193.20-80-53346-6	2018-02-16 23:22:41	233.750000	233.750000	-1	211	0	ddos
4	172.31.69.28-18.218.55.126-80-57856-6	2018-02-21 23:49:25	233.750000	233.750000	-1	32768	0	ddos

In [28]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 500000 entries, 0 to 499999
Data columns (total 8 columns):
 #   Column             Non-Null Count   Dtype
---  ------             --------------   -----
 0   Flow ID            500000 non-null  object
 1   Timestamp          500000 non-null  datetime64[ns]
 2   Fwd Pkt Len Mean   500000 non-null  float64
 3   Fwd Seg Size Avg   500000 non-null  float64
 4   Init Fwd Win Byts  500000 non-null  int64
 5   Init Bwd Win Byts  500000 non-null  int64
 6   Fwd Seg Size Min   500000 non-null  int64
 7   Label              500000 non-null  object
dtypes: datetime64[ns](1), float64(2), int64(3), object(2)
memory usage: 30.5+ MB
```

In [29]:

```
df[['Source', 'Destination', 'Source Port', 'Dest Port', 'Other']] = df['Flow ID'].str.spli
df.head()
```

Out[29]:

	Flow ID	Timestamp	Fwd Pkt Len Mean	Fwd Seg Size Avg	Init Fwd Win Byts	Init Bwd Win Byts	Fwd Seg Size Min	Label	Source
0	172.31.69.28-18.216.200.189-80-52169-6	2018-02-22 00:27:57	233.750000	233.750000	-1	32768	0	ddos	172.31.69.28
1	172.31.69.25-18.219.193.20-80-44588-6	2018-02-16 23:18:14	0.000000	0.000000	-1	225	0	ddos	172.31.69.25
2	172.31.69.25-18.219.193.20-80-43832-6	2018-02-16 23:23:20	114.333333	114.333333	-1	219	0	ddos	172.31.69.25
3	172.31.69.25-18.219.193.20-80-53346-6	2018-02-16 23:22:41	233.750000	233.750000	-1	211	0	ddos	172.31.69.25
4	172.31.69.28-18.218.55.126-80-57856-6	2018-02-21 23:49:25	233.750000	233.750000	-1	32768	0	ddos	172.31.69.28

In [30]:

```
df = df.sort_values("Timestamp")
```

In [31]:

```
# Dropping Timestamp and ports (not sure about the data for ports hence deleting for safety
df = df.drop(columns=["Timestamp", "Source Port", "Dest Port", "Other"])
df.head()
```

Out[31]:

	Flow ID	Fwd Pkt Len Mean	Fwd Seg Size Avg	Init Fwd Win Byts	Init Bwd Win Byts	Fwd Seg Size Min	Label	Source	Destinatic
13318	192.168.1.104-203.73.24.75-19754-80-6	0.000000	0.000000	-1	17520	0	ddos	192.168.1.104	203.73.24.7
21539	192.168.1.104-203.73.24.75-19817-80-6	45.500000	45.500000	-1	5840	0	ddos	192.168.1.104	203.73.24.7
87259	192.168.1.104-203.73.24.75-19824-80-6	0.000000	0.000000	-1	17520	0	ddos	192.168.1.104	203.73.24.7
61071	192.168.1.104-203.73.24.75-19830-80-6	0.000000	0.000000	-1	17520	0	ddos	192.168.1.104	203.73.24.7
5143	192.168.1.104-203.73.24.75-19881-80-6	39.333333	39.333333	-1	5840	0	ddos	192.168.1.104	203.73.24.7

In [32]:

```
df[['SourceIP_1', 'SourceIP_2', 'SourceIP_3', 'SourceIP_4']] = df.Source.str.split('.', exp
df[['DestinationIP_1', 'DestinationIP_2', 'DestinationIP_3', 'DestinationIP_4']] = df.Desti
df = df.drop(columns=["Source", "Destination", "Flow ID"])
df.head()
```

Out[32]:

	Fwd Pkt Len Mean	Fwd Seg Size Avg	Init Fwd Win Byts	Init Bwd Win Byts	Fwd Seg Size Min	Label	SourceIP_1	SourceIP_2	SourceIP_3	S
13318	0.000000	0.000000	-1	17520	0	ddos	192	168	1	
21539	45.500000	45.500000	-1	5840	0	ddos	192	168	1	
87259	0.000000	0.000000	-1	17520	0	ddos	192	168	1	
61071	0.000000	0.000000	-1	17520	0	ddos	192	168	1	
5143	39.333333	39.333333	-1	5840	0	ddos	192	168	1	

In [33]:

```
df.isna().sum()
```

Out[33]:

```
Fwd Pkt Len Mean      0
Fwd Seg Size Avg      0
Init Fwd Win Byts     0
Init Bwd Win Byts     0
Fwd Seg Size Min      0
Label                 0
SourceIP_1            0
SourceIP_2            0
SourceIP_3            0
SourceIP_4            0
DestinationIP_1       0
DestinationIP_2       0
DestinationIP_3       0
DestinationIP_4       0
dtype: int64
```

In [34]:

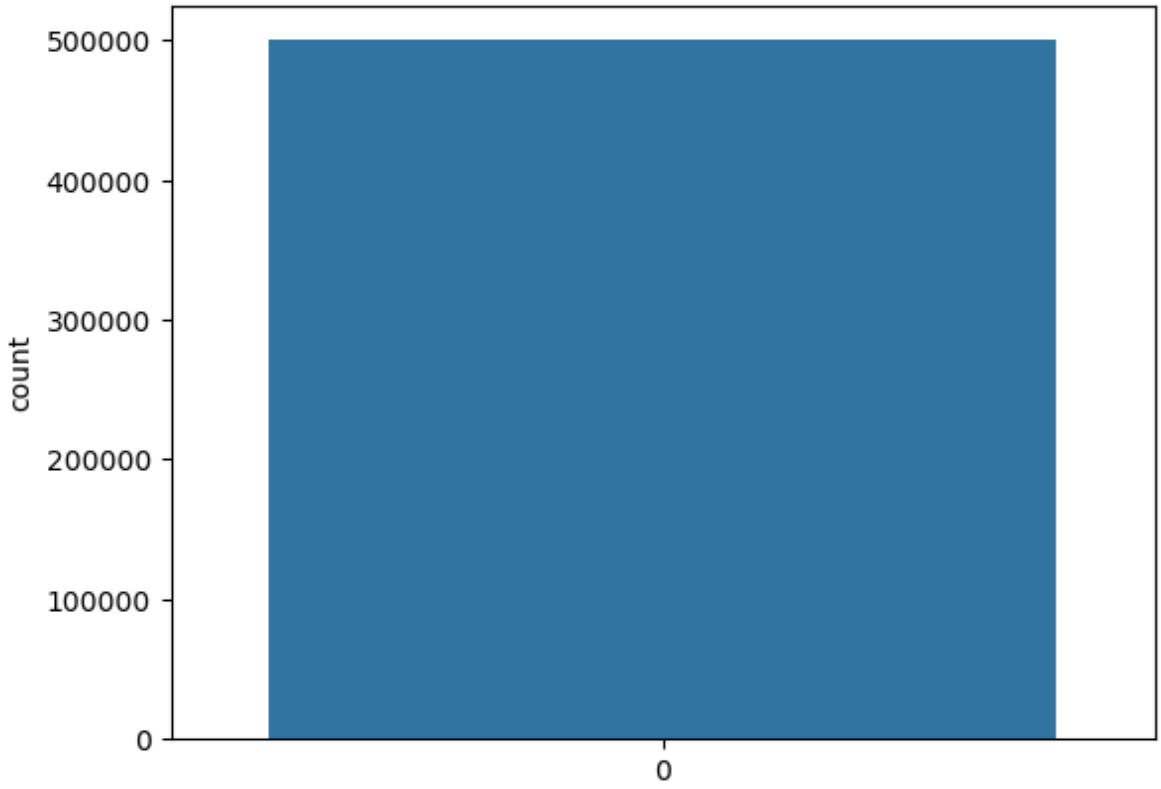
```
le = LabelEncoder()
df['Label'] = le.fit_transform(df['Label'])
df.head()
```

Out[34]:

	Fwd Pkt Len Mean	Fwd Seg Size Avg	Init Fwd Win Byts	Init Bwd Win Byts	Fwd Seg Size Min	Label	SourceIP_1	SourceIP_2	SourceIP_3	S
13318	0.000000	0.000000	-1	17520	0	1	192	168	1	
21539	45.500000	45.500000	-1	5840	0	1	192	168	1	
87259	0.000000	0.000000	-1	17520	0	1	192	168	1	
61071	0.000000	0.000000	-1	17520	0	1	192	168	1	
5143	39.333333	39.333333	-1	5840	0	1	192	168	1	

In [35]:

```
sns.countplot(df['Label']);
```



In [36]:

```
X = df.drop('Label' , axis = 1)
y = df['Label']
RUS = RandomUnderSampler(random_state=42)
X_rus, y_rus = RUS.fit_resample(X,y)
```

In [37]:

```
X_train, X_test, y_train, y_test = train_test_split(X_rus, y_rus, test_size=0.3, random_sta
```

In [38]:

```
models = {"Logistic Regression": LogisticRegression(), "Random Forest": RandomForestClassif
          "KNN": KNeighborsClassifier(), "AdaBoost": AdaBoostClassifier()}

cv = KFold(n_splits=10)
import time

def fit_and_score(models, X_train, X_test, y_train, y_test):
    model_scores = {}
    model_roc_auc_scores = {}
    model_time = {}
    for name, model in models.items():
        start = time.process_time()
        model.fit(X_train, y_train)
        model_time[name] = time.process_time() - start
        scores = cross_val_score(model, X_train, y_train, scoring='roc_auc', cv=cv, n_jobs=
        model_roc_auc_scores[name] = roc_auc_score(y_test, model.predict_proba(X_test)[:,1]
        model_scores[name] = model.score(X_test, y_test)
    return model_scores, model_roc_auc_scores, model_time
```

In [39]:

```
model_scores, model_roc_auc_scores, model_time = fit_and_score(models, X_train, X_test, y_t
print("ACCURACIES : ")
model_scores
```

```
C:\Users\ADMIN\anaconda3\Lib\site-packages\sklearn\linear_model\_logistic.p
y:458: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html (https://scik
it-learn.org/stable/modules/preprocessing.html)
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regre
ssion (https://scikit-learn.org/stable/modules/linear_model.html#logistic-re
gression)
  n_iter_i = _check_optimize_result(

ACCURACIES :
```

Out[39]:

```
{'Logistic Regression': 0.95815,
 'Random Forest': 0.9999666666666667,
 'KNN': 0.9987833333333334,
 'AdaBoost': 0.9997}
```

In [40]:

```
print("ROC AUC SCORES : ")
model_roc_auc_scores
```

```
ROC AUC SCORES :
```

Out[40]:

```
{'Logistic Regression': 0.990470871604245,
 'Random Forest': 0.9999999299982733,
 'KNN': 0.9996129115624995,
 'AdaBoost': 0.9999994033186146}
```

In [41]:

```
print("Time : ")
model_time
```

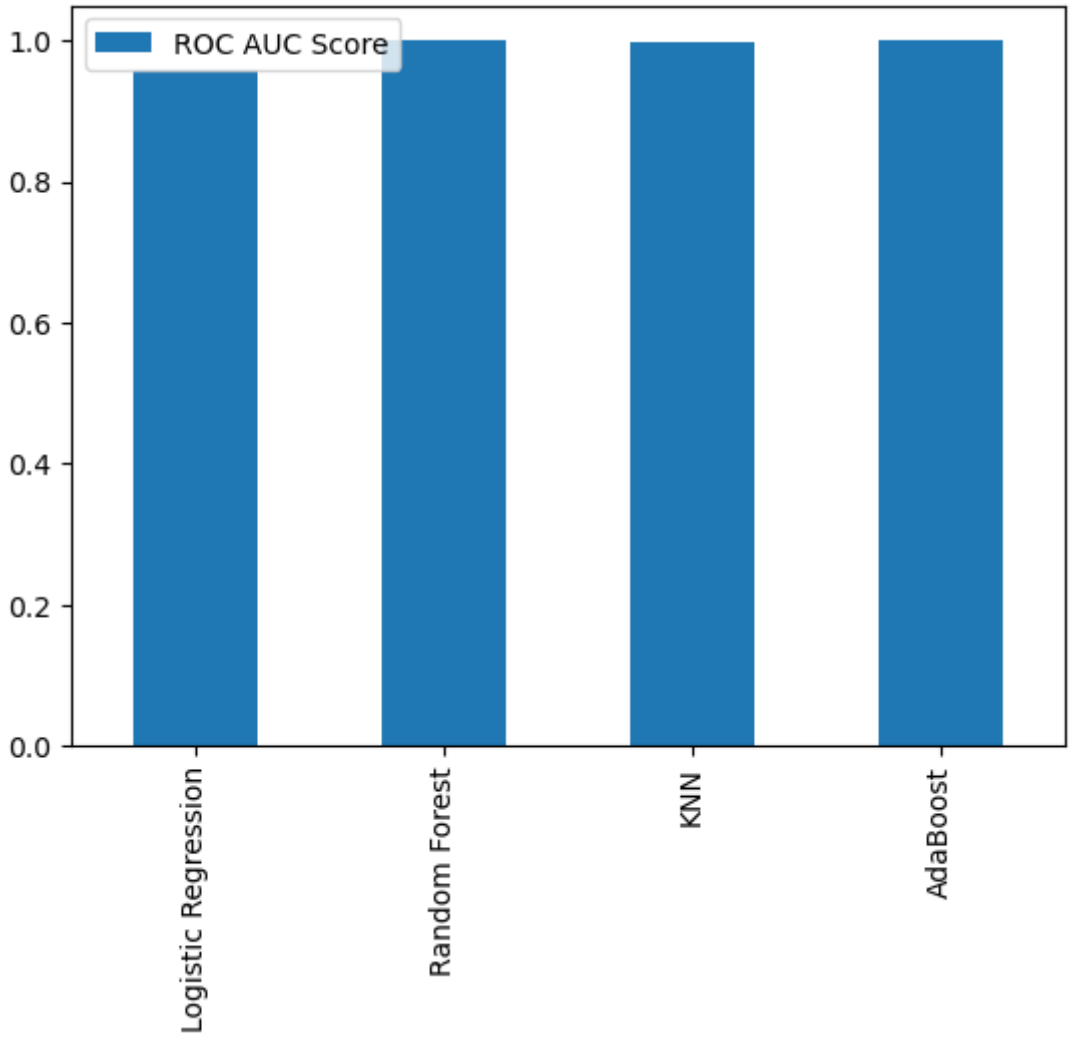
```
Time :
```

Out[41]:

```
{'Logistic Regression': 3.859375,
 'Random Forest': 4.078125,
 'KNN': 0.421875,
 'AdaBoost': 19.125}
```

In [42]:

```
model_compare = pd.DataFrame(model_scores, index=['ROC AUC Score'])
model_compare.T.plot.bar();
```



In [43]:

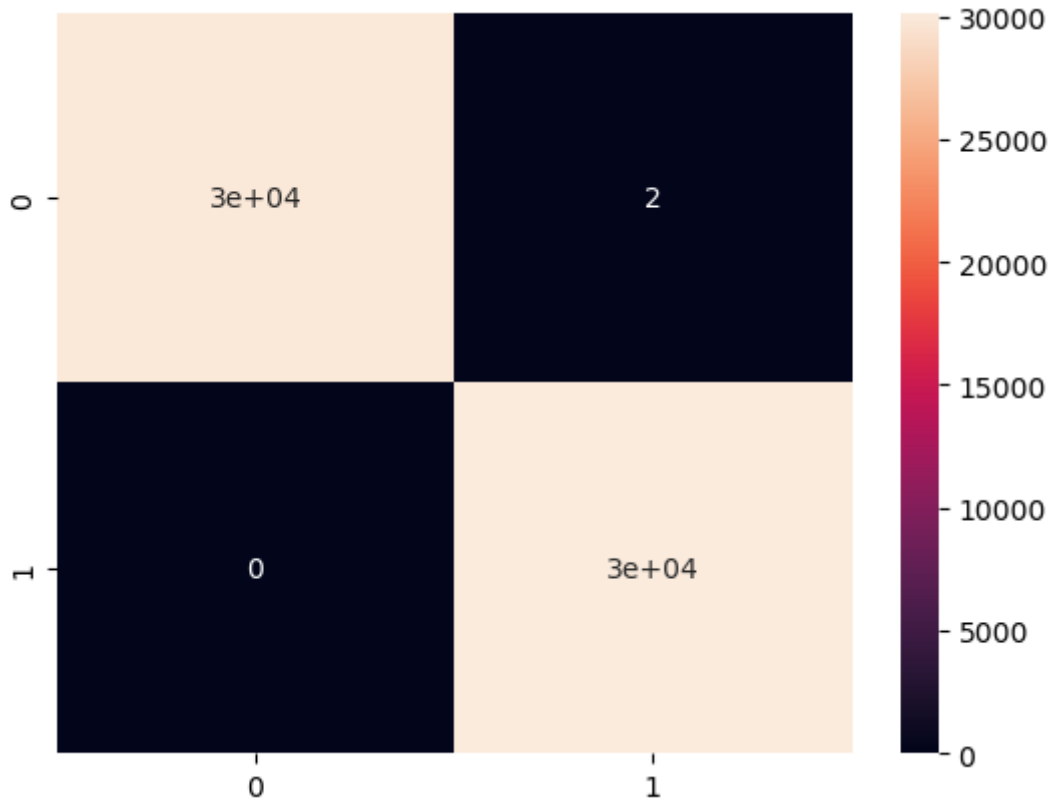
```
clf = RandomForestClassifier()
clf.fit(X_train, y_train)
clf.score(X_test, y_test)
```

Out[43]:

```
0.9999666666666667
```

In [47]:

```
y_preds = clf.predict(X_test)
conf_mat = confusion_matrix(y_test, y_preds)
sns.heatmap(conf_mat, annot=True);
```



In [48]:

```
print(classification_report(y_test, y_preds))
```

```
              precision    recall  f1-score   support

           0       1.00      1.00      1.00     29851
           1       1.00      1.00      1.00     30149

    accuracy                           1.00     60000
   macro avg       1.00      1.00      1.00     60000
weighted avg       1.00      1.00      1.00     60000
```

In [49]:

```
average_precision = average_precision_score(y_test, clf.predict_proba(X_test)[:,1])
print('Average precision-recall score: {0:0.2f}'.format(average_precision))
```

```
Average precision-recall score: 1.00
```

In [ ]:

```

```