Random forest Model For Conformation Time Predection

1.Mount the drive and import the data into dataframe

```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import numpy as np
from decimal import Decimal
from google.colab import drive
drive.mount('/content/drive')
path = "/content/drive/MyDrive/Colab Notebooks/Data.txt"

df = pd.read_csv(path)
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.r
```

2.Dropping the Pre-written Indexes in the dataframes and dropping transaction containing the null values

```
df=df.dropna()
df=df.reset_index()
df=df.drop(['index'], axis=1)
```

3.Printing the dataframe and storing a copy

```
df.columns.tolist()
store=df
store
```

	Hash	Burnt	
0	0xecf53982503900a9c58b54fd52af689b50f8875bbbd0...	🔥 Burnt: 0.000264438397062 Ether ($0.43)	0.
1	0xc6056646b7516f1a8eafe7d2ef9df34b2c3a4e8979d8...	🔥 Burnt: 0.000264438397062 Ether ($0.43)	0.
2	0xd1bfaf9de496033c90210804a972739496efb607c2a3...	🔥 Burnt: 0.000264438397062 Ether ($0.43)	0.
3	0xf669b9cabc2548ab34a06255f543db1908ae1653983c...	🔥 Burnt: 0.000264438397062 Ether ($0.43)	0.
4	0x3bec3ba36551a97476011d7580d6a9c35101c3fb6644...	🔥 Burnt: 0.000264438397062 Ether ($0.43)	0.
...	...	...	
171540	0x91b64c0577287f7404ae09eb80346607a10862e39933...	🔥 Burnt: 0.00156784370232847 Ether ($2.48)	0.006
171541	0x45df92ef835515ffabf7c4f5f8993655344b8ac49715...	🔥 Burnt: 0.00316174796686610 Ether ($2.83)	0.003

4.Extracting exact ether values into floating points with slicing and type casting also getting time data into seconds

```
def isfloat(num):
    if num is None:
       return False
    try:
        float(num)
        return True
    except ValueError:
        return False

def getBurntval(value):
    list= (str(value)).split()
    return 1000000*Decimal(list[2].replace(',', ""))


def getg(value):
    list= (str(value)).split()
    return Decimal(list[-2].replace(',', ""))



def getEthval(value):
    list= (str(value)).split()
    return 1000000*Decimal(list[0].replace(',', ""))
```

```
def getonlytheval(value):
    list= (str(value)).split()
    return Decimal((list[0].replace(',', "")).replace('$', ""))


def getBurns(values):
    output = np.empty(len(values))
    for i in range(len(values)):
         output[i] = getBurntval(values[i])
    return output



def getgweis(values):
    output = np.empty(len(values))
    for i in range(len(values)):
         output[i] = getg(values[i])
    return output



def getVals(values):
    output = np.empty(len(values))
    for i in range(len(values)):
         output[i] = getEthval(values[i])
    return output


def getonlyval(values):
    output = np.empty(len(values))
    for i in range(len(values)):
         output[i] = getonlytheval(values[i])
    return output


def Str2sec(value):
    list=(value).split()
    if len(list)==5:
        if list[-1]=='secs':
            return int(list[-2])

        elif list[-1]=='min':
            return 60*int(list[-2])

    elif len(list)==6 :
        return 60*int(list[-3]) + int(list[-2][list[-2].find(':')+1:])

    elif len(list)==7:
        return 60*60*int(list[-4]) + 60*int(list[-3][list[-3].find(':')+1:]) + int(list[-2

    elif len(list)==9:
        return 24*60*60*int(list[-6]) + 60*60*int(list[-4]) +60*int(list[-3][list[-3].find
```

```
def absolute(x):
  return abs(x)%15

def getTS(values):
    output = np.empty(len(values),object)
    for i in range(len(values)):
        st=values[i]
        output[i]=st[(st.find("("))+1 : st.find("+")]
    return output




def Cnvrt2Sec(values):
    output = np.empty(len(values))
    for i in range(len(values)):
      if(isfloat(Str2sec(str(values[i])))):
         output[i]=Str2sec(str(values[i]))
      else:
         output[i]=np.nan
    return output


df['TxnFees']=getVals(df['TxnFees'])
df['Burnt']=getBurns(df['Burnt'])
df['CompletionTime'] = Cnvrt2Sec(df['CompletionTime'])
df['Gasprice']=getVals(df['Gasprice'])
df['Gaslimit']=getonlyval(df['Gaslimit'])
df['Etherprice']=getonlyval(df['Etherprice'])
df['Gasusage']=getonlyval(df['Gasusage'])
df['Basefees']=getgweis(df['Basefees'])
df['Txnval']=getVals(df['Txnval'])

df['Tip']=getgweis(df['Tip'])
df['Maxfees/gas']=getgweis(df['Maxfees/gas'])

df
```

	Hash	Burnt	TxnFees	E
0	0xecf53982503900a9c58b54fd52af689b50f8875bbbd0...	264.438397	285.438397	1:
1	0xc6056646b7516f1a8eafe7d2ef9df34b2c3a4e8979d8...	264.438397	285.438397	1:
2	0xd1bfaf9de496033c90210804a972739496efb607c2a3...	264.438397	285.438397	1:
3	0xf669b9cabc2548ab34a06255f543db1908ae1653983c...	264.438397	285.438397	1:

5.The columns which were not convertable to float64 are dropped and describe the dataframe

```
df=df.dropna()
df=df.reset_index()
df=df.drop(['index'], axis=1)

df.describe()
```

	Burnt	TxnFees	Basefees	Maxfees/gas	Tip	
count	169640.000000	169640.000000	169640.000000	169640.000000	1.696400e+05	1.696
mean	2158.995118	2405.615680	23.275697	61.842330	4.161447e+00	7.743
std	6316.328288	7497.975568	14.458988	137.840335	1.773473e+01	1.439
min	222.452353	243.452353	10.592969	11.729721	1.000000e-09	0.000
25%	426.856879	508.529824	13.648389	21.889210	1.500000e+00	0.000
50%	966.104940	1067.116515	16.364887	30.436435	2.000000e+00	9.346
75%	2371.691715	2666.508583	27.866903	53.034337	2.000000e+00	4.900
max	752080.564151	972549.858649	83.325786	3500.000000	1.145495e+03	1.334

6.Hash value is dropped as it doesn't effect conformation time

```
df=df.drop(columns =['Hash'])
df
```

	Burnt	TxnFees	Basefees	Maxfees/gas	Tip	Txnval	Ga
0	264.438397	285.438397	12.592305	14.879581	1.000000	200436.370433	2
1	264.438397	285.438397	12.592305	14.879581	1.000000	204233.648804	2
2	264.438397	285.438397	12.592305	14.900956	1.000000	205514.906823	2
3	264.438397	285.438397	12.592305	14.900956	1.000000	205740.509933	2
4	264.438397	285.438397	12.592305	16.164679	1.000000	54000.000000	

7.Correlation is calculated in order to understand the features relation with the conformation time

```
corrM = df.corr()
corrM
```

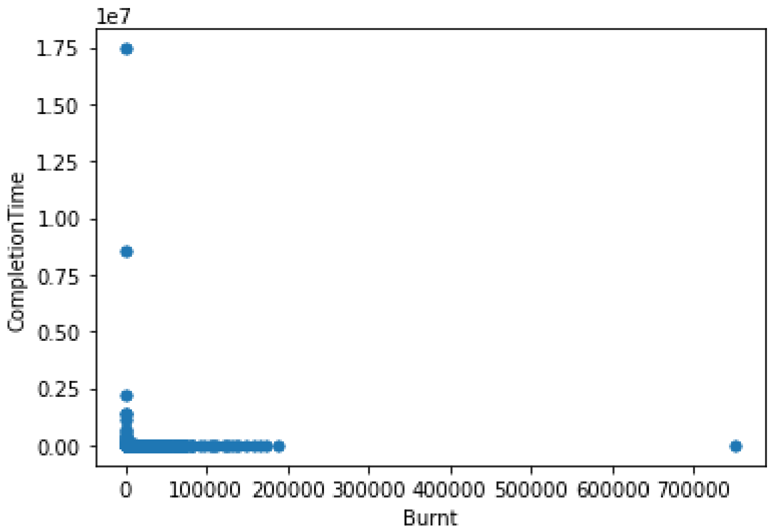
	Burnt	TxnFees	Basefees	Maxfees/gas	Tip	Txnval	Gasu
Burnt	1.000000	0.978018	0.193905	0.000526	-0.001141	0.000380	0.86
TxnFees	0.978018	1.000000	0.166249	0.026674	0.125622	0.000353	0.83
Basefees	0.193905	0.166249	1.000000	0.187726	0.010814	-0.003035	-0.00
Maxfees/gas	0.000526	0.026674	0.187726	1.000000	0.175209	0.044324	-0.04
Tip	-0.001141	0.125622	0.010814	0.175209	1.000000	-0.001594	-0.01
Txnval	0.000380	0.000353	-0.003035	0.044324	-0.001594	1.000000	-0.00
Gasusage	0.862988	0.839198	-0.005291	-0.042998	-0.014272	-0.000893	1.00
Gaslimit	0.776196	0.761819	0.027212	-0.016777	0.015941	-0.002778	0.86
Gasprice	0.123570	0.203945	0.661085	0.274426	0.726577	-0.002313	-0.01
Etherprice	-0.151968	-0.132060	-0.750068	-0.145782	-0.023841	0.002426	0.00
CompletionTime	-0.002558	-0.002436	-0.001416	0.000459	-0.001642	-0.000580	-0.00

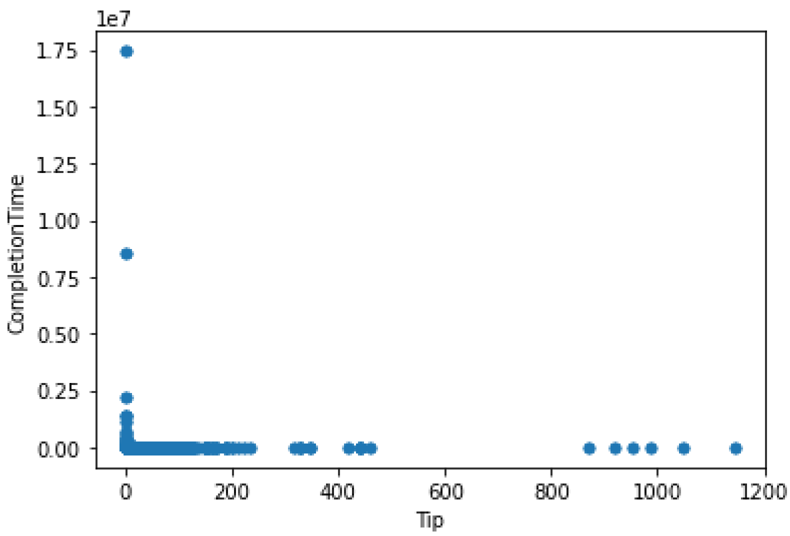
8.Plotting the relations

```
df.plot(y='CompletionTime',x='Burnt',kind='scatter')
df.plot(y='CompletionTime',x='Tip',kind='scatter')
df.plot(y='CompletionTime',x='TxnFees',kind='scatter')
df
```

	Burnt	TxnFees	Basefees	Maxfees/gas	Tip	Txnval	Ga
0	264.438397	285.438397	12.592305	14.879581	1.000000	200436.370433	2
1	264.438397	285.438397	12.592305	14.879581	1.000000	204233.648804	2
2	264.438397	285.438397	12.592305	14.900956	1.000000	205514.906823	2
3	264.438397	285.438397	12.592305	14.900956	1.000000	205740.509933	2
4	264.438397	285.438397	12.592305	16.164679	1.000000	54000.000000	2
...	...	...	...	...	...	...	
169635	1567.843702	6176.277158	12.132478	47.794015	47.794015	0.000000	12
169636	3161.747967	3552.650967	12.132478	16.989050	1.500000	0.000000	26
169637	1785.075716	1785.075716	12.132478	12.132478	12.132478	0.000000	14
169638	1197.014520	6698.528038	12.132478	168.761220	55.761220	0.000000	9
169639	1747.889672	5349.564672	12.132478	60.000000	25.000000	190000.000000	14

169640 rows × 11 columns





9 Normalization Standardization using the MinMaxScalar


```
from sklearn.preprocessing import MinMaxScaler
scaler = MinMaxScaler()

scaled = scaler.fit_transform(df)
scaled=pd.DataFrame(scaled,columns=['Burnt','TxnFees','Basefees','Maxfees/gas','Tip','Txnv
scaled
```

	Burnt	TxnFees	Basefees	Maxfees/gas	Tip	Txnval	Gasusage	Gasli
0	0.000056	0.000043	0.027489	0.000903	0.000873	0.000150	0.000000	0.000
1	0.000056	0.000043	0.027489	0.000903	0.000873	0.000153	0.000000	0.000
2	0.000056	0.000043	0.027489	0.000909	0.000873	0.000154	0.000000	0.000
3	0.000056	0.000043	0.027489	0.000909	0.000873	0.000154	0.000000	0.000
4	0.000056	0.000043	0.027489	0.001271	0.000873	0.000040	0.000000	0.000
...	...	...	...	...	...	...	...	
169635	0.001789	0.006102	0.021167	0.010339	0.041723	0.000000	0.006093	0.009
169636	0.003909	0.003403	0.021167	0.001508	0.001309	0.000000	0.013489	0.014
169637	0.002078	0.001586	0.021167	0.000115	0.010591	0.000000	0.007101	0.009
169638	0.001296	0.006639	0.021167	0.045017	0.048679	0.000000	0.004372	0.006
169639	0.002029	0.005252	0.021167	0.013838	0.021825	0.000142	0.006928	0.008

169640 rows × 11 columns

```
scaled.describe()
```

	Burnt	TxnFees	Basefees	Maxfees/gas	Tip	
count	169640.000000	169640.000000	169640.000000	169640.000000	169640.000000	1.69
mean	0.002576	0.002224	0.174374	0.014366	0.003633	5.80
std	0.008401	0.007712	0.198796	0.039515	0.015482	1.07
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.00
25%	0.000272	0.000273	0.042009	0.002912	0.001309	0.00
50%	0.000989	0.000847	0.079358	0.005363	0.001746	7.00
75%	0.002859	0.002492	0.237498	0.011841	0.001746	3.67
max	1.000000	1.000000	1.000000	1.000000	1.000000	1.00

10. **Test Train Split**

```
y = df[ 'CompletionTime']

x = df.drop(['CompletionTime'], axis = 1)

from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(x, y, test_size=0.20, random_state=101
print (f'x_train : {X_train.shape}')
print (f'y_train : {y_train.shape}')
print (f'x_test: {X_test.shape}')
print (f'y_test: {y_test.shape}')
```

```
x_train : (135712, 10)
y_train : (135712,)
x_test: (33928, 10)
y_test: (33928,)
```

11.**Random Search CV to get best parameters for our RandomForest**

```
from sklearn.model_selection import RandomizedSearchCV
# Number of trees in random forest
n_estimators = [int(x) for x in np.linspace(start = 20, stop = 500, num = 50)]
# Number of features to consider at every split
max_features = ['auto', 'sqrt']
# Maximum number of levels in tree
max_depth = [int(x) for x in np.linspace(10, 1100, num = 20)]
max_depth.append(None)
# Minimum number of samples required to split a node
min_samples_split = [2, 5, 10]
# Minimum number of samples required at each leaf node
min_samples_leaf = [1, 2, 4]
# Method of selecting samples for training each tree
bootstrap = [True, False]
# Create the random grid
random_grid = {'n_estimators': n_estimators,
               'max_features': max_features,
               'max_depth': max_depth,
               'min_samples_split': min_samples_split,
               'min_samples_leaf': min_samples_leaf,
               'bootstrap': bootstrap}
print(random_grid)
```

```
{'n_estimators': [20, 29, 39, 49, 59, 68, 78, 88, 98, 108, 117, 127, 137, 147, 157, 1
```

```
from sklearn.ensemble import RandomForestRegressor
rf = RandomForestRegressor()
```

```
from sklearn.model_selection import RandomizedSearchCV
rf_random = RandomizedSearchCV(estimator= rf, param_distributions = random_grid, n_iter =
```

```
rf_random.fit(X_train, y_train)
```

```
Fitting 3 folds for each of 100 candidates, totalling 300 fits
/usr/local/lib/python3.7/dist-packages/joblib/externals/loky/process_executor.py:705
  "timeout or by a memory leak.", UserWarning
RandomizedSearchCV(cv=3, estimator=RandomForestRegressor(), n_iter=100,
                   n_jobs=40,
                   param_distributions={'bootstrap': [True, False],
                                        'max_depth': [10, 67, 124, 182, 239,
                                                      296, 354, 411, 468, 526,
                                                      583, 641, 698, 755, 813,
                                                      870, 927, 985, 1042, 1100,
                                                      None],
                                        'max_features': ['auto', 'sqrt'],
                                        'min_samples_leaf': [1, 2, 4],
                                        'min_samples_split': [2, 5, 10],
                                        'n_estimators': [20, 29, 39, 49, 59, 68,
                                                         78, 88, 98, 108, 117,
                                                         127, 137, 147, 157,
                                                         166, 176, 186, 196,
                                                         206, 215, 225, 235,
                                                         245, 255, 264, 274,
                                                         284, 294, 304, ...]},
                   random_state=42, verbose=2)
```

12.**Best parameter for our model**

```
rf_random.best_params_
```

```
{'n_estimators': 353,
 'min_samples_split': 2,
 'min_samples_leaf': 1,
 'max_features': 'sqrt',
 'max_depth': 698,
 'bootstrap': True}
```

13.**Evaluate the hence trained model on Test and Train data and calculate accuracy**

```
def evaluate(model, test_features, test_labels):
    predictions = model.predict(test_features)
    errors = absolute(predictions - test_labels)
    mape = 100 * np.mean(errors / test_labels)
    accuracy = 100 - mape
    print('Model Performance')
```

```
    print('Average Error: {:0.4f} degrees.'.format(np.mean(errors)))
    print('Accuracy = {:0.2f}%.'.format(accuracy))

    return accuracy


rf_random.fit(X_train, y_train)


best_random = rf_random
print("On Train Data")
random_accuracy = evaluate(best_random, X_train, y_train)
print("On Test Data")
random_accuracy = evaluate(best_random, X_test, y_test)
```

```
On Train Data
Model Performance
Average Error: 3.0692 degrees.
Accuracy = 77.18%.
On Test Data
Model Performance
Average Error: 4.2754 degrees.
Accuracy = 70.75%.
```