```
import numpy as np
import pandas as pd
import seaborn as sns
import plotly.express as px
import matplotlib.pyplot as plt
from sklearn.model_selection import cross_val_score

from sklearn import metrics
from collections import Counter
```

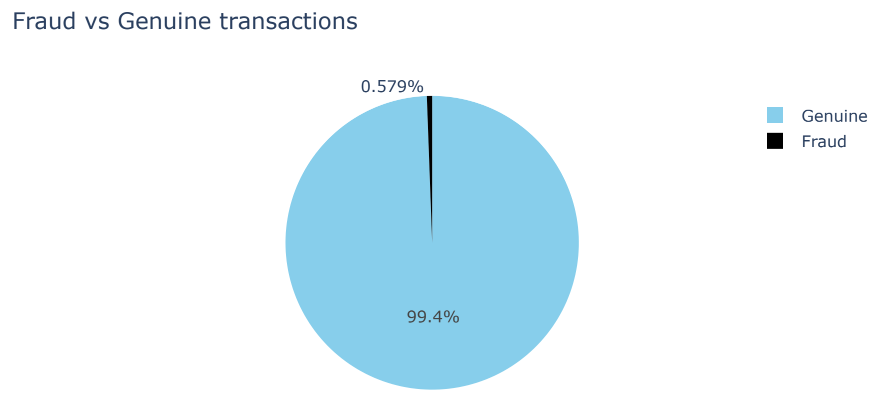
```
train_df = pd.read_csv('/content/fraudTrain.csv')
test_df = pd.read_csv('/content/fraudTest.csv')
```

```
train_df.head()
```

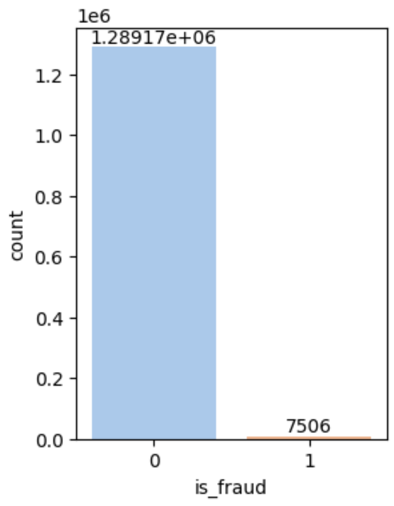
	Unnamed: 0	trans_date_trans_time	cc_num	merchant	category	amt
0	0	2019-01-01 00:00:18	2703186189652095	fraud_Rippin, Kub and Mann	misc_net	4.97
1	1	2019-01-01 00:00:44	630423337322	fraud_Heller, Gutmann and Zieme	grocery_pos	107.23
2	2	2019-01-01 00:00:51	38859492057661	fraud_Lind-Buckridge	entertainment	220.11
3	3	2019-01-01 00:01:16	3534093764340240	fraud_Kutch, Hermiston and Farrell	gas_transport	45.00
4	4	2019-01-01 00:03:06	375534208663984	fraud_Keeling-Crist	misc_pos	41.96

5 rows × 23 columns

```
fig = px.pie(values=train_df['is_fraud'].value_counts(), names=["Genuine","Fraud"] , width=700, height=400, color_discrete_sequence=["skyblue
             ,title="Fraud vs Genuine transactions")
fig.show()
```



```
plt.figure(figsize=(3,4))
ax = sns.countplot(x='is_fraud',data=train_df,palette="pastel")
for i in ax.containers:
    ax.bar_label(i,)
```



```
print('Genuine:', round(train_df['is_fraud'].value_counts()[0]/len(train_df) * 100,2), '% of the dataset')
print('Frauds:', round(train_df['is_fraud'].value_counts()[1]/len(train_df) * 100,2), '% of the dataset')
```

```
Genuine: 99.42 % of the dataset
Frauds: 0.58 % of the dataset
```

```
train_df.info(),test_df.info()
```

```
 #   Column                 Non-Null Count    Dtype  
---  ------                 --------------    -----  
 0   Unnamed: 0             1296675 non-null  int64  
 1   trans_date_trans_time  1296675 non-null  object 
 2   cc_num                 1296675 non-null  int64  
 3   merchant               1296675 non-null  object 
 4   category               1296675 non-null  object 
 5   amt                    1296675 non-null  float64
 6   first                  1296675 non-null  object 
 7   last                   1296675 non-null  object 
 8   gender                 1296675 non-null  object 
 9   street                 1296675 non-null  object 
 10  city                   1296675 non-null  object 
 11  state                  1296675 non-null  object 
 12  zip                    1296675 non-null  int64  
 13  lat                    1296675 non-null  float64
 14  long                   1296675 non-null  float64
 15  city_pop               1296675 non-null  int64  
 16  job                    1296675 non-null  object 
 17  dob                    1296675 non-null  object 
 18  trans_num              1296675 non-null  object 
 19  unix_time              1296675 non-null  int64  
 20  merch_lat              1296675 non-null  float64
 21  merch_long             1296675 non-null  float64
 22  is_fraud               1296675 non-null  int64  
dtypes: float64(5), int64(6), object(12)
memory usage: 227.5+ MB
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 555719 entries, 0 to 555718
Data columns (total 23 columns):
 #   Column                 Non-Null Count   Dtype  
---  ------                 --------------   -----  
 0   Unnamed: 0             555719 non-null  int64  
 1   trans_date_trans_time  555719 non-null  object 
 2   cc_num                 555719 non-null  int64  
 3   merchant               555719 non-null  object 
 4   category               555719 non-null  object 
 5   amt                    555719 non-null  float64
 6   first                  555719 non-null  object 
 7   last                   555719 non-null  object 
 8   gender                 555719 non-null  object 
 9   street                 555719 non-null  object 
 10  city                   555719 non-null  object 
 11  state                  555719 non-null  object 
 12  zip                    555719 non-null  int64  
 13  lat                    555719 non-null  float64
 17  dob                    555719 non-null  object
 18  trans_num              555719 non-null  object
 19  unix_time              555719 non-null  int64
 20  merch_lat              555719 non-null  float64
 21  merch_long             555719 non-null  float64
 22  is_fraud               555719 non-null  int64
dtypes: float64(5), int64(6), object(12)
memory usage: 97.5+ MB
(None, None)
```

```
train_df.isnull().sum(),test_df.isnull().sum()
```

```
(Unnamed: 0               0
 trans_date_trans_time    0
 cc_num                   0
 merchant                 0
 category                 0
 amt                      0
 first                    0
 last                     0
 gender                   0
 street                   0
 city                     0
 state                    0
 zip                      0
 lat                      0
 long                     0
 city_pop                 0
 job                      0
 dob                      0
 trans_num                0
 unix_time                0
 merch_lat                0
 merch_long               0
 is_fraud                 0
 dtype: int64,
 Unnamed: 0               0
 trans_date_trans_time    0
 cc_num                   0
 merchant                 0
 category                 0
 amt                      0
 first                    0
 last                     0
 gender                   0
 street                   0
 city                     0
 state                    0
 zip                      0
 lat                      0
 long                     0
 city_pop                 0
 job                      0
 dob                      0
 trans_num                0
 unix_time                0
 merch_lat                0
 merch_long               0
 is_fraud                 0
 dtype: int64)
```

```
drop_columns = ['Unnamed: 0','cc_num','merchant','trans_num','unix_time','first','last','street','zip']
train_df.drop(columns=drop_columns,inplace=True)
test_df.drop(columns=drop_columns,inplace=True)
```

```
print(train_df.shape)
print(test_df.shape)
```

```
(1296675, 14)
(555719, 14)
```

```
train_df['trans_date_trans_time']=pd.to_datetime(train_df['trans_date_trans_time'])
train_df['trans_date']=train_df['trans_date_trans_time'].dt.strftime('%Y-%m-%d')
train_df['trans_date']=pd.to_datetime(train_df['trans_date'])
train_df['dob']=pd.to_datetime(train_df['dob'])

test_df['trans_date_trans_time']=pd.to_datetime(test_df['trans_date_trans_time'])
test_df['trans_date']=test_df['trans_date_trans_time'].dt.strftime('%Y-%m-%d')
test_df['trans_date']=pd.to_datetime(test_df['trans_date'])
test_df['dob']=pd.to_datetime(test_df['dob'])
```

```
train_df["age"] = train_df["trans_date"]-train_df["dob"]
train_df["age"]=train_df["age"].astype('timedelta64[Y]')

test_df["age"] = test_df["trans_date"]-test_df["dob"]
test_df["age"]=test_df["age"].astype('timedelta64[Y]')
```

```
train_df['Trans_month'] = pd.DatetimeIndex(train_df['trans_date']).month
train_df['Trans_year'] = pd.DatetimeIndex(train_df['trans_date']).year
```

```
train_df['Latitudinal_Distance'] = abs(round(train_df['merch_lat']-train_df['lat'],3))
train_df['Longitudinal_Distance'] = abs(round(train_df['merch_long']-train_df['long'],3))

test_df['Latitudinal_Distance'] = abs(round(test_df['merch_lat']-test_df['lat'],3))
test_df['Longitudinal_Distance'] = abs(round(test_df['merch_long']-test_df['long'],3))
```

```
drop_columns = ['trans_date_trans_time','city','lat','long','job','dob','merch_lat','merch_long','trans_date','state']
train_df.drop(columns=drop_columns,inplace=True)
test_df.drop(columns=drop_columns,inplace=True)
```

```
train_df.gender=train_df.gender.apply(lambda x: 1 if x=="M" else 0)
test_df.gender=test_df.gender.apply(lambda x: 1 if x=="M" else 0)
```

```
train_df = pd.get_dummies(train_df, columns=['category'], prefix='category')
test_df = pd.get_dummies(test_df, columns=['category'], prefix='category')

test_df = test_df.reindex(columns=train_df.columns, fill_value=0)
```

```
train_df.head()
```

	amt	gender	city_pop	is_fraud	age	Trans_month	Trans_year	Latitudinal_Distanc
0	4.97	0	3495	0	30.0	1	2019	0.06
1	107.23	0	149	0	40.0	1	2019	0.27
2	220.11	1	4154	0	56.0	1	2019	0.97
3	45.00	1	1939	0	51.0	1	2019	0.80
4	41.96	1	99	0	32.0	1	2019	0.25

5 rows × 23 columns

```
test_df.head()
```

	amt	gender	city_pop	is_fraud	age	Trans_month	Trans_year	Latitudinal_Distance
0	2.86	1	333497	0	52.0	0	0	0.020
1	29.84	0	302	0	30.0	0	0	0.870
2	41.28	0	34496	0	49.0	0	0	0.177
3	60.05	1	54767	0	32.0	0	0	0.243
4	3.19	1	1126	0	64.0	0	0	0.706

5 rows × 23 columns

```
X_train = train_df.drop('is_fraud', axis=1)
y_train = train_df['is_fraud']
X_test = test_df.drop('is_fraud', axis=1)
y_test = test_df['is_fraud']
```

```
from imblearn.over_sampling import SMOTE

smote = SMOTE(random_state=42)

X_train, y_train = smote.fit_resample(X_train, y_train)
```

```
from sklearn.preprocessing import StandardScaler


scaler = StandardScaler()
scaler.fit(X_train)

X_train = scaler.transform(X_train)
X_test = scaler.transform(X_test)


from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import classification_report

clf = DecisionTreeClassifier(random_state=42)
clf.fit(X_train, y_train)
y_pred = clf.predict(X_test)
report = classification_report(y_test, y_pred)
print(report)
```

```
              precision    recall  f1-score   support

           0       1.00      0.99      1.00    553574
           1       0.33      0.72      0.45      2145

    accuracy                           0.99    555719
   macro avg       0.67      0.86      0.73    555719
weighted avg       1.00      0.99      0.99    555719
```