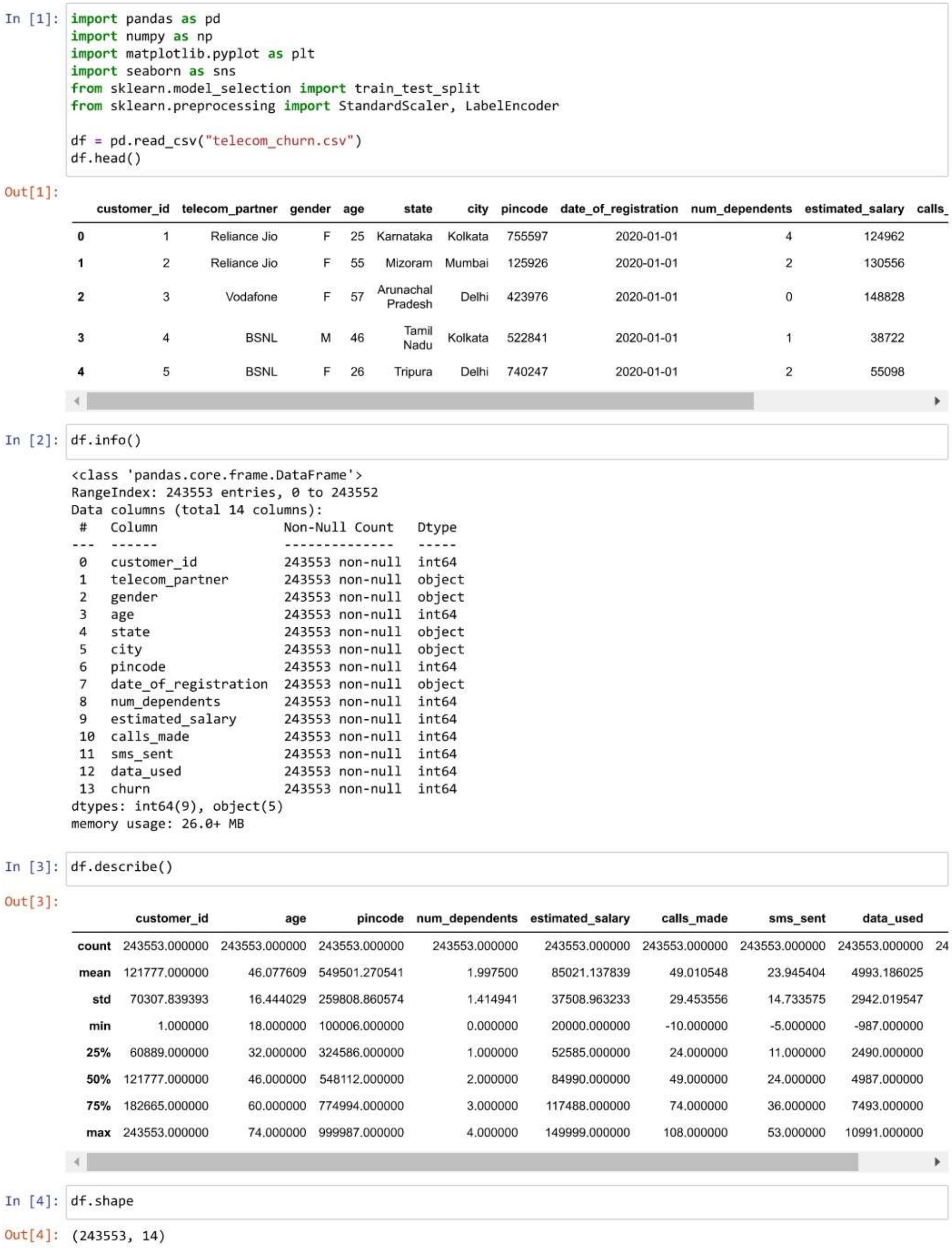


In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler, LabelEncoder

df = pd.read_csv("telecom_churn.csv")
df.head()
```

Out[1]:

	customer_id	telecom_partner	gender	age	state	city	pincode	date_of_registration	num_dependents	estimated_salary	calls_
0	1	Reliance Jio	F	25	Karnataka	Kolkata	755597	2020-01-01	4	124962	
1	2	Reliance Jio	F	55	Mizoram	Mumbai	125926	2020-01-01	2	130556	
2	3	Vodafone	F	57	Arunachal Pradesh	Delhi	423976	2020-01-01	0	148828	
3	4	BSNL	M	46	Tamil Nadu	Kolkata	522841	2020-01-01	1	38722	
4	5	BSNL	F	26	Tripura	Delhi	740247	2020-01-01	2	55098	

In [2]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 243553 entries, 0 to 243552
Data columns (total 14 columns):
 #   Column                Non-Null Count   Dtype 
---  ------                --------------   ----- 
 0   customer_id           243553 non-null  int64 
 1   telecom_partner       243553 non-null  object
 2   gender                243553 non-null  object
 3   age                   243553 non-null  int64 
 4   state                 243553 non-null  object
 5   city                  243553 non-null  object
 6   pincode               243553 non-null  int64 
 7   date_of_registration  243553 non-null  object
 8   num_dependents        243553 non-null  int64 
 9   estimated_salary      243553 non-null  int64 
 10  calls_made            243553 non-null  int64 
 11  sms_sent              243553 non-null  int64 
 12  data_used             243553 non-null  int64 
 13  churn                 243553 non-null  int64 
dtypes: int64(9), object(5)
memory usage: 26.0+ MB
```

In [3]:

```
df.describe()
```

Out[3]:

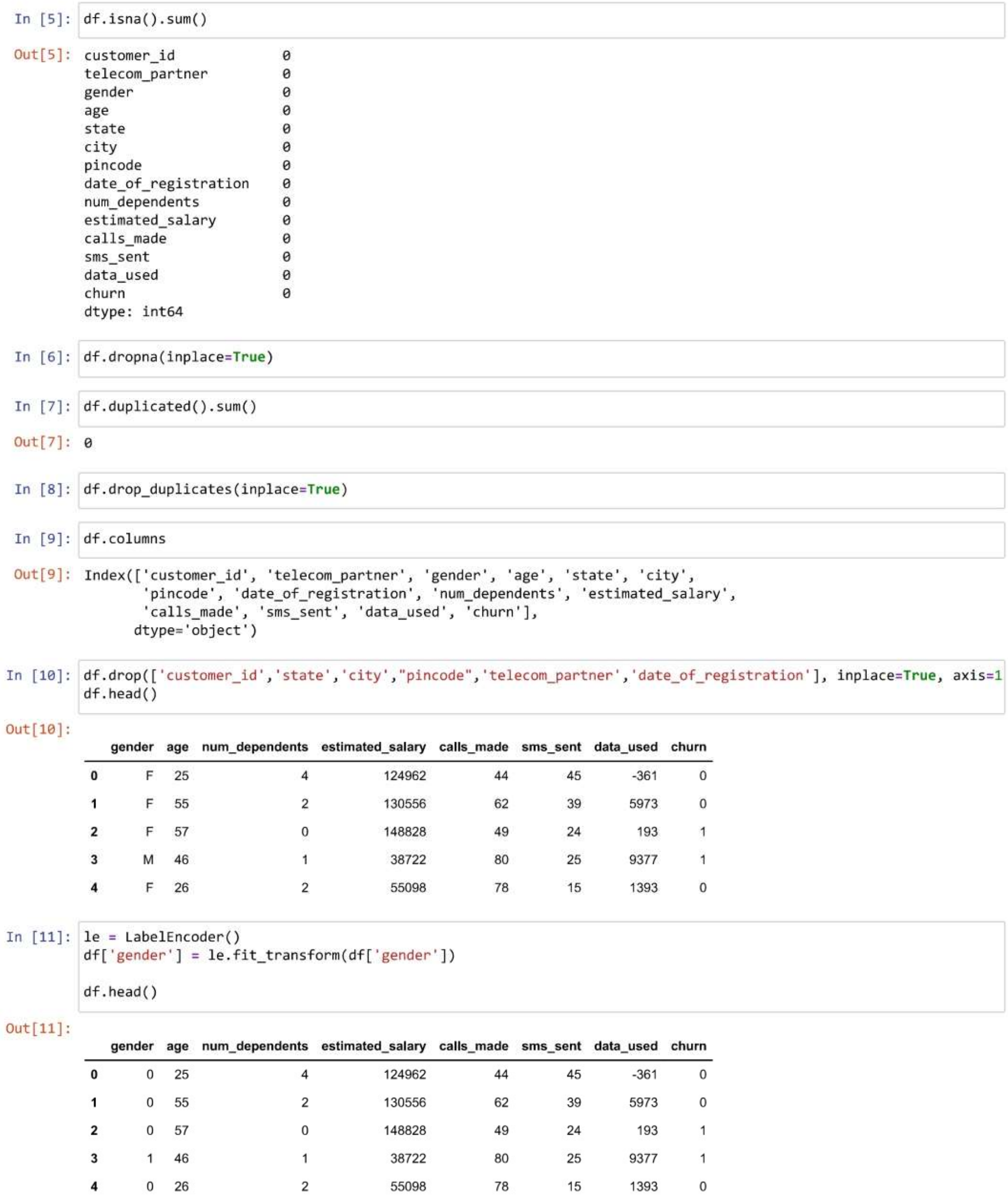
	customer_id	age	pincode	num_dependents	estimated_salary	calls_made	sms_sent	data_used	
count	243553.000000	243553.000000	243553.000000	243553.000000	243553.000000	243553.000000	243553.000000	243553.000000	24
mean	121777.000000	46.077609	549501.270541	1.997500	85021.137839	49.010548	23.945404	4993.186025	
std	70307.839393	16.444029	259808.860574	1.414941	37508.963233	29.453556	14.733575	2942.019547	
min	1.000000	18.000000	100006.000000	0.000000	20000.000000	-10.000000	-5.000000	-987.000000	
25%	60889.000000	32.000000	324586.000000	1.000000	52585.000000	24.000000	11.000000	2490.000000	
50%	121777.000000	46.000000	548112.000000	2.000000	84990.000000	49.000000	24.000000	4987.000000	
75%	182665.000000	60.000000	774994.000000	3.000000	117488.000000	74.000000	36.000000	7493.000000	
max	243553.000000	74.000000	999987.000000	4.000000	149999.000000	108.000000	53.000000	10991.000000	

In [4]:

```
df.shape
```

Out[4]:

```
(243553, 14)
```



```
In [5]: df.isna().sum()

Out[5]: customer_id            0
        telecom_partner        0
        gender                 0
        age                    0
        state                  0
        city                   0
        pincode                0
        date_of_registration   0
        num_dependents         0
        estimated_salary       0
        calls_made             0
        sms_sent               0
        data_used              0
        churn                  0
        dtype: int64
```

```
In [6]: df.dropna(inplace=True)
```

```
In [7]: df.duplicated().sum()

Out[7]: 0
```

```
In [8]: df.drop_duplicates(inplace=True)
```

```
In [9]: df.columns

Out[9]: Index(['customer_id', 'telecom_partner', 'gender', 'age', 'state', 'city',
               'pincode', 'date_of_registration', 'num_dependents', 'estimated_salary',
               'calls_made', 'sms_sent', 'data_used', 'churn'],
              dtype='object')
```

```
In [10]: df.drop(['customer_id','state','city',"pincode",'telecom_partner','date_of_registration'], inplace=True, axis=1
         df.head()
```

Out[10]:

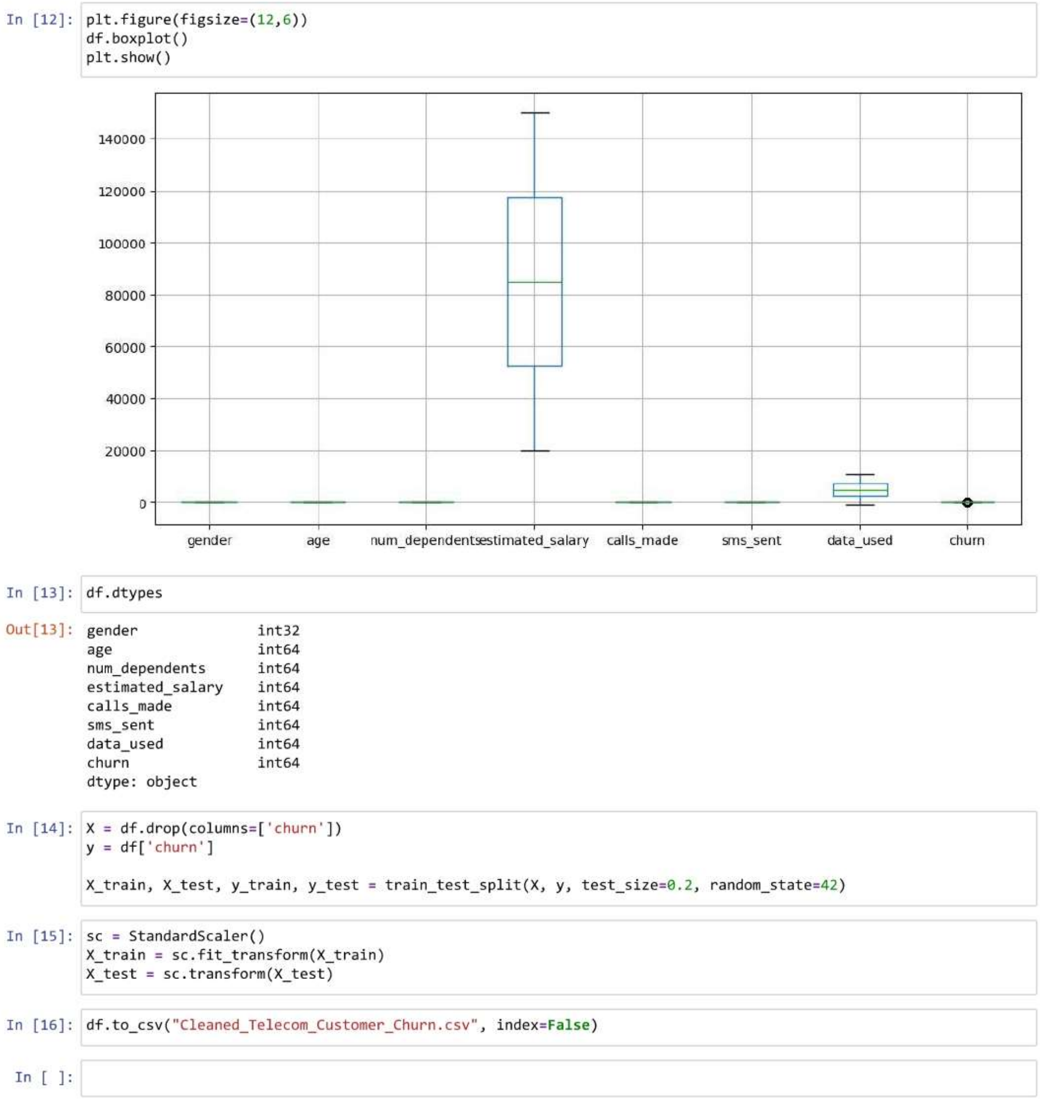
	gender	age	num_dependents	estimated_salary	calls_made	sms_sent	data_used	churn
0	F	25	4	124962	44	45	-361	0
1	F	55	2	130556	62	39	5973	0
2	F	57	0	148828	49	24	193	1
3	M	46	1	38722	80	25	9377	1
4	F	26	2	55098	78	15	1393	0

```
In [11]: le = LabelEncoder()
         df['gender'] = le.fit_transform(df['gender'])

         df.head()
```

Out[11]:

	gender	age	num_dependents	estimated_salary	calls_made	sms_sent	data_used	churn
0	0	25	4	124962	44	45	-361	0
1	0	55	2	130556	62	39	5973	0
2	0	57	0	148828	49	24	193	1
3	1	46	1	38722	80	25	9377	1
4	0	26	2	55098	78	15	1393	0



```
In [12]: plt.figure(figsize=(12,6))
         df.boxplot()
         plt.show()
```

```
In [13]: df.dtypes

Out[13]: gender              int32
         age                 int64
         num_dependents      int64
         estimated_salary    int64
         calls_made          int64
         sms_sent            int64
         data_used           int64
         churn               int64
         dtype: object
```

```
In [14]: X = df.drop(columns=['churn'])
         y = df['churn']

         X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

```
In [15]: sc = StandardScaler()
         X_train = sc.fit_transform(X_train)
         X_test = sc.transform(X_test)
```

```
In [16]: df.to_csv("Cleaned_Telecom_Customer_Churn.csv", index=False)
```

```
In [ ]:
```