task4

April 30, 2024

[1]:

```
# Import all the required Libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

1 Load The Data

[4]:

```
data = pd.read_csv(r"C:\Users\aakas\OneDrive\Desktop\Rprog\car_details_v3 (1).
 ↪csv")

# Check the first few rows of the DataFrame
print(data.head())
```

```
                           name  year  selling_price  km_driven    fuel  \
0        Maruti Swift Dzire VDI  2014         450000     145500  Diesel
1  Skoda Rapid 1.5 TDI Ambition  2014         370000     120000  Diesel
2      Honda City 2017-2020 EXi  2006         158000     140000  Petrol
3     Hyundai i20 Sportz Diesel  2010         225000     127000  Diesel
4        Maruti Swift VXI BSIII  2007         130000     120000  Petrol

  seller_type transmission         owner     mileage   engine   max_power  \
0  Individual       Manual   First Owner   23.4 kmpl  1248 CC      74 bhp
1  Individual       Manual  Second Owner  21.14 kmpl  1498 CC  103.52 bhp
2  Individual       Manual   Third Owner   17.7 kmpl  1497 CC      78 bhp
3  Individual       Manual   First Owner   23.0 kmpl  1396 CC      90 bhp
4  Individual       Manual   First Owner   16.1 kmpl  1298 CC    88.2 bhp

                     torque  seats
0            190Nm@ 2000rpm    5.0
1       250Nm@ 1500-2500rpm    5.0
2     12.7@ 2,700(kgm@ rpm)    5.0
3  22.4 kgm at 1750-2750rpm    5.0
4     11.5@ 4,500(kgm@ rpm)    5.0
```

[5]:

```
data.shape
```

```
[5]: (8128, 13)
```

```
[6]: data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8128 entries, 0 to 8127
Data columns (total 13 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   name           8128 non-null   object
 1   year           8128 non-null   int64
 2   selling_price  8128 non-null   int64
 3   km_driven      8128 non-null   int64
 4   fuel           8128 non-null   object
 5   seller_type    8128 non-null   object
 6   transmission   8128 non-null   object
 7   owner          8128 non-null   object
 8   mileage        7907 non-null   object
 9   engine         7907 non-null   object
 10  max_power      7913 non-null   object
 11  torque         7906 non-null   object
 12  seats          7907 non-null   float64
dtypes: float64(1), int64(3), object(9)
memory usage: 825.6+ KB
```

```
[7]: data.describe()
```

```
[7]:              year  selling_price     km_driven        seats
     count  8128.000000   8.128000e+03  8.128000e+03  7907.000000
     mean   2013.804011   6.382718e+05  6.981951e+04     5.416719
     std       4.044249   8.062534e+05  5.655055e+04     0.959588
     min    1983.000000   2.999900e+04  1.000000e+00     2.000000
     25%    2011.000000   2.549990e+05  3.500000e+04     5.000000
     50%    2015.000000   4.500000e+05  6.000000e+04     5.000000
     75%    2017.000000   6.750000e+05  9.800000e+04     5.000000
     max    2020.000000   1.000000e+07  2.360457e+06    14.000000
```

```
[8]: data.dtypes
```

```
[8]: name              object
     year               int64
     selling_price      int64
     km_driven          int64
     fuel              object
     seller_type       object
     transmission      object
     owner             object
     mileage           object
```

```
engine              object
max_power           object
torque              object
seats              float64
dtype: object
```

```
[9]: data.dropna(inplace=True)
     data.isnull().sum()
```

```
[9]: name             0
     year             0
     selling_price    0
     km_driven        0
     fuel             0
     seller_type      0
     transmission     0
     owner            0
     mileage          0
     engine           0
     max_power        0
     torque           0
     seats            0
     dtype: int64
```

2 Data Pre-processing

3 Convert Engine Column from Character to Integer Vector

```
[10]: data.engine
```

```
[10]: 0        1248 CC
      1        1498 CC
      2        1497 CC
      3        1396 CC
      4        1298 CC
                 …
      8123     1197 CC
      8124     1493 CC
      8125     1248 CC
      8126     1396 CC
      8127     1396 CC
      Name: engine, Length: 7906, dtype: object
```

```
[15]: # Remove rows with NaN values in the 'engine' column
      data = data.dropna(subset=['engine'])
```

```
# Extract numeric part of the string and convert it to integer
data['engine'] = data['engine'].str.split(' ').str[0].astype(int)

# Check the first few rows of the DataFrame
print(data.head())
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
Input In [15], in <cell line: 5>()
      2 data = data.dropna(subset=['engine'])
      4 # Extract numeric part of the string and convert it to integer
----> 5 data['engine'] = data['engine'].str.split(' ').str[0].astype(int)
      7 # Check the first few rows of the DataFrame
      8 print(data.head())

File ~\anaconda3\lib\site-packages\pandas\core\generic.py:5575, in NDFrame.
 ↪__getattr__(self, name)
   5568 if (
   5569     name not in self._internal_names_set
   5570     and name not in self._metadata
   5571     and name not in self._accessors
   5572     and self._info_axis._can_hold_identifiers_and_holds_name(name)
   5573 ):
   5574     return self[name]
-> 5575 return object.__getattribute__(self, name)

File ~\anaconda3\lib\site-packages\pandas\core\accessor.py:182, in␣
 ↪CachedAccessor.__get__(self, obj, cls)
    179 if obj is None:
    180     # we're accessing the attribute of the class, i.e., Dataset.geo
    181     return self._accessor
--> 182 accessor_obj = self._accessor(obj)
    183 # Replace the property with the accessor object. Inspired by:
    184 # https://www.pydanny.com/cached-property.html
    185 # We need to use object.__setattr__ because we overwrite __setattr__ on
    186 # NDFrame
    187 object.__setattr__(obj, self._name, accessor_obj)

File ~\anaconda3\lib\site-packages\pandas\core\strings\accessor.py:177, in␣
 ↪StringMethods.__init__(self, data)
    174 def __init__(self, data):
    175     from pandas.core.arrays.string_ import StringDtype
--> 177     self._inferred_dtype = self._validate(data)
    178     self._is_categorical = is_categorical_dtype(data.dtype)
    179     self._is_string = isinstance(data.dtype, StringDtype)
```

```
File ~\anaconda3\lib\site-packages\pandas\core\strings\accessor.py:231, in␣
 ↪StringMethods._validate(data)
    228 inferred_dtype = lib.infer_dtype(values, skipna=True)
    230 if inferred_dtype not in allowed_types:
--> 231     raise AttributeError("Can only use .str accessor with string values
 ↪")
    232 return inferred_dtype

AttributeError: Can only use .str accessor with string values!
```

[12]:
```
data['engine'].dtype
data.engine
```

[12]:
```
0       1248
1       1498
2       1497
3       1396
4       1298
        …
8123    1197
8124    1493
8125    1248
8126    1396
8127    1396
Name: engine, Length: 7906, dtype: int32
```

4 Convert Mileage Column from Character to Numeric Vector

[16]:
```
data['mileage']
```

[16]:
```
0        23.4 kmpl
1       21.14 kmpl
2        17.7 kmpl
3        23.0 kmpl
4        16.1 kmpl
           …
8123     18.5 kmpl
8124     16.8 kmpl
8125     19.3 kmpl
8126    23.57 kmpl
8127    23.57 kmpl
Name: mileage, Length: 7906, dtype: object
```

[17]:
```
# Extract numeric part of the string and convert it to integer
data['mileage'] = data['mileage'].str.split(' ').str[0].astype(float)
data['mileage']
```

[17]:

```
0       23.40
1       21.14
2       17.70
3       23.00
4       16.10
        …
8123    18.50
8124    16.80
8125    19.30
8126    23.57
8127    23.57
Name: mileage, Length: 7906, dtype: float64
```

5 Convert Max Power Column from Character to Numeric Vector

[18]:

```
data['max_power']
```

[18]:

```
0           74 bhp
1       103.52 bhp
2           78 bhp
3           90 bhp
4         88.2 bhp
           …
8123     82.85 bhp
8124       110 bhp
8125      73.9 bhp
8126        70 bhp
8127        70 bhp
Name: max_power, Length: 7906, dtype: object
```

[19]:

```
# Extract numeric part of the string before 'bhp'
data['max_power'] = data['max_power'].str.extract(r'(\d+\.?\d*)').astype(float)
data['max_power']
```

[19]:

```
0        74.00
1       103.52
2        78.00
3        90.00
4        88.20
         …
8123     82.85
8124    110.00
8125     73.90
8126     70.00
8127     70.00
Name: max_power, Length: 7906, dtype: float64
```

6 Convert Fuel Types to Binary

[21]:
```
data['fuel'].value_counts()
```

[21]:
```
Diesel    4299
Petrol    3520
CNG         52
LPG         35
Name: fuel, dtype: int64
```

[22]:
```
# Remove rows where 'fuel' column contains 'CNG' or 'LPG'
fuel_data = data[~data['fuel'].str.strip().isin(['CNG', 'LPG'])]

# Count occurrences of each fuel type
fuel_counts = fuel_data['fuel'].value_counts()

print(fuel_counts)
```

```
Diesel    4299
Petrol    3520
Name: fuel, dtype: int64
```

[23]:
```
# Create an empty list to store fuel_type values
fuel_type = []

for fuel_data in data['fuel']:
    if fuel_data == "Petrol":
        fuel_type.append(1)
    else:
        fuel_type.append(0)

data['fuel_type'] = fuel_type

data.drop(columns=['fuel'], inplace=True)
data['fuel_type'].value_counts()
```

[23]:
```
0    4386
1    3520
Name: fuel_type, dtype: int64
```

7 Convert Transmission Types to Binary

[24]:
```
data['transmission'].value_counts()
```

[24]:
```
Manual       6865
Automatic    1041
```

```
Name: transmission, dtype: int64
```

[25]:

```
transmission_type = []

for transmission in data['transmission']:
    if transmission == "Manual":
        transmission_type.append(1)
    else:
        transmission_type.append(0)

data['transmission_type'] = transmission_type

data.drop(columns=['transmission'], inplace=True)
data['transmission_type'].value_counts()
```

[25]:

```
1    6865
0    1041
Name: transmission_type, dtype: int64
```

8 Convert Seller Types to Binary

[26]:

```
data['seller_type'].value_counts()
```

[26]:

```
Individual          6563
Dealer              1107
Trustmark Dealer     236
Name: seller_type, dtype: int64
```

[27]:

```
# Remove rows where 'seller_type' column contains 'Trustmark Dealer'
seller_data = data[~data['seller_type'].str.strip().isin(['Trustmark Dealer'])]

# Count occurrences of each fuel type
seller_counts = seller_data['seller_type'].value_counts()

print(seller_counts)
```

```
Individual    6563
Dealer        1107
Name: seller_type, dtype: int64
```

[28]:

```
# Create an empty list to store fuel_type values
seller = []

for seller_data in data['seller_type']:
    if seller_data == "Individual":
        seller.append(1)
    else:
        seller.append(0)

data['seller'] = seller

data.drop(columns=['seller_type'], inplace=True)
data['seller'].value_counts()
```

[28]:
```
1    6563
0    1343
Name: seller, dtype: int64
```

9 Convert Owner Types to Binary

[29]:
```
data['owner'].value_counts()
```

[29]:
```
First Owner             5215
Second Owner            2016
Third Owner              510
Fourth & Above Owner     160
Test Drive Car             5
Name: owner, dtype: int64
```

[30]:
```
# Iterate over each row in 'owner' column
for index, row in data.iterrows():
    # Remove leading and trailing whitespaces
    temp_val = row['owner'].strip()

    # Check if 'owner' value matches specific categories and remove␣
 ↪corresponding rows
    if temp_val in ["Fourth & Above Owner", "Third Owner", "Test Drive Car"]:
        data.drop(index, inplace=True)

# Count occurrences of each 'owner' category
owner_counts = data['owner'].value_counts()

print(owner_counts)
```

```
First Owner     5215
Second Owner    2016
Name: owner, dtype: int64
```

[31]:
```
# Create an empty list to store fuel_type values
owner_type = []

for owner in data['owner']:
    if owner == "First Owner":
        owner_type.append(1)
    else:
        owner_type.append(0)

data['owner_type'] = owner_type

data.drop(columns=['owner'], inplace=True)
data['owner_type'].value_counts()
```

[31]:

```
1    5215
0    2016
Name: owner_type, dtype: int64
```

[32]:

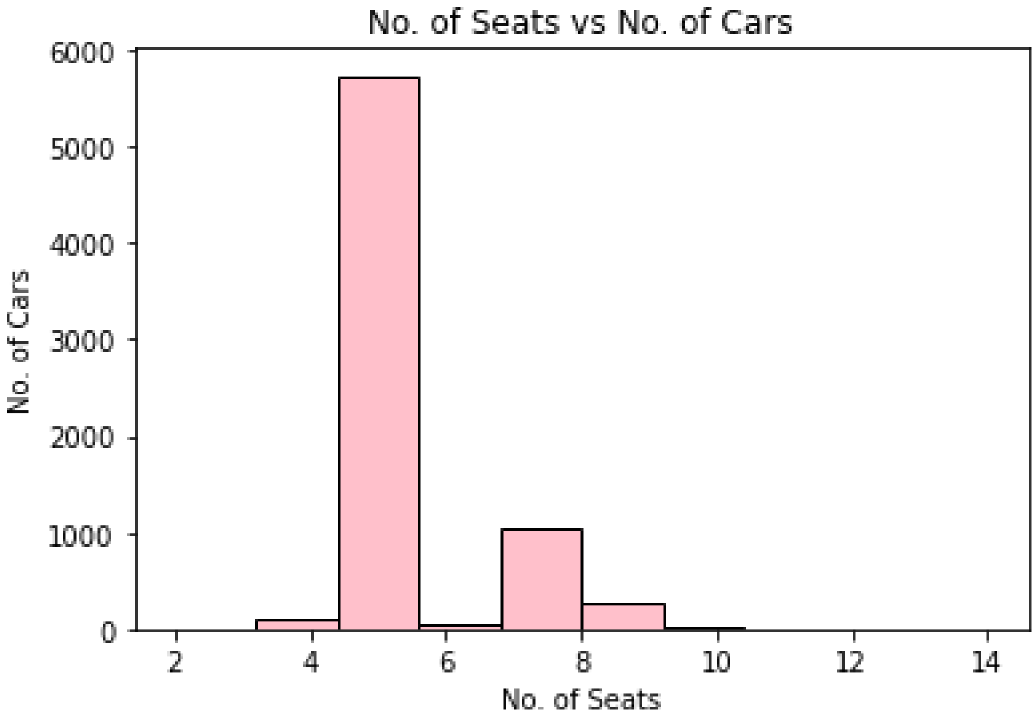
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 7231 entries, 0 to 8127
Data columns (total 13 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   name               7231 non-null   object
 1   year               7231 non-null   int64
 2   selling_price      7231 non-null   int64
 3   km_driven          7231 non-null   int64
 4   mileage            7231 non-null   float64
 5   engine             7231 non-null   int32
 6   max_power          7231 non-null   float64
 7   torque             7231 non-null   object
 8   seats              7231 non-null   float64
 9   fuel_type          7231 non-null   int64
 10  transmission_type  7231 non-null   int64
 11  seller             7231 non-null   int64
 12  owner_type         7231 non-null   int64
dtypes: float64(3), int32(1), int64(7), object(2)
memory usage: 762.6+ KB
```

10 Exploratory Data Analysis

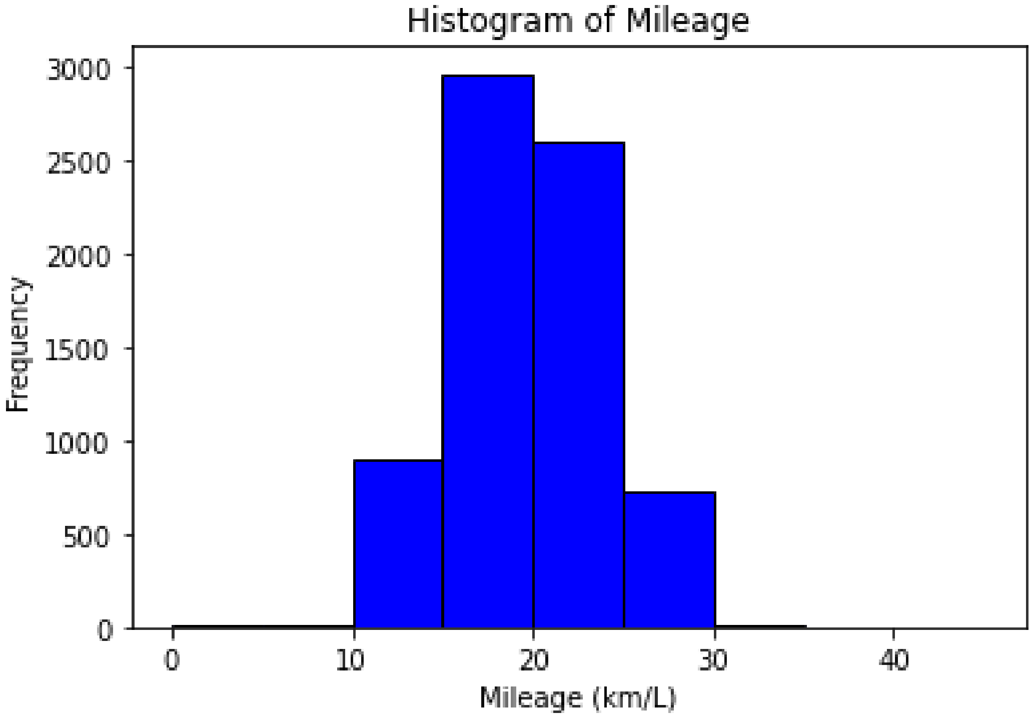
[33]:

```
plt.hist(data['seats'], color='pink', edgecolor='black')

plt.title('No. of Seats vs No. of Cars')
plt.xlabel('No. of Seats')
plt.ylabel('No. of Cars')

plt.show()
```



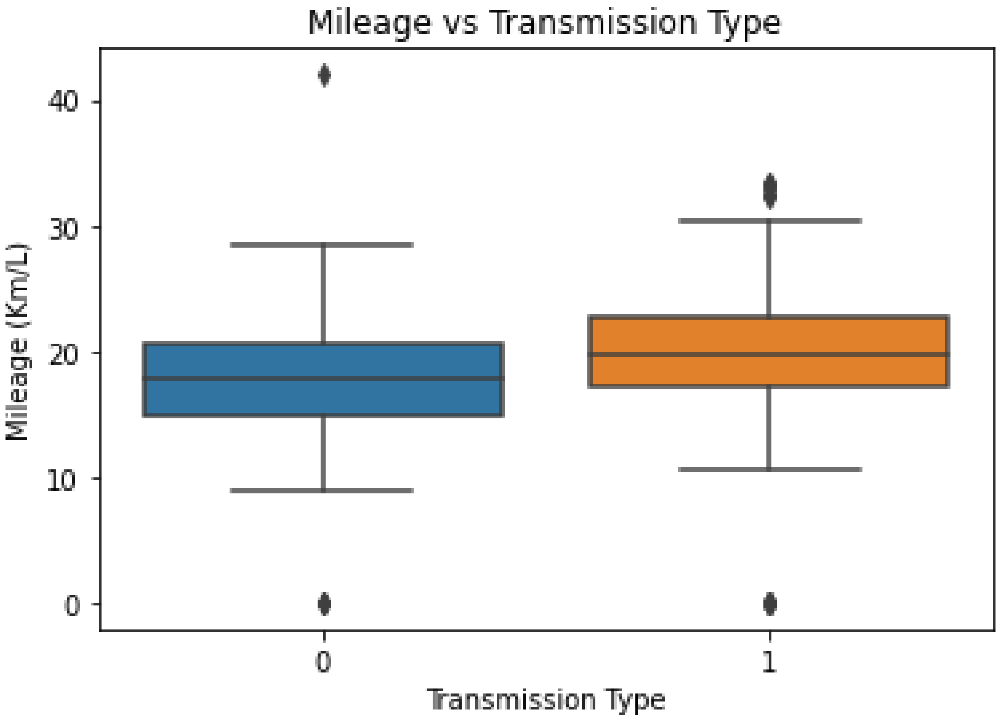
[34]:

```
# Define the bin width and range
binwidth = 5
bins = range(int(min(data['mileage'])), int(max(data['mileage'])) + binwidth,␣
  ↪binwidth)

plt.hist(data['mileage'], bins=bins, color='blue', edgecolor='black')

plt.title('Histogram of Mileage')
plt.xlabel('Mileage (km/L)')
plt.ylabel('Frequency')

plt.show()
```



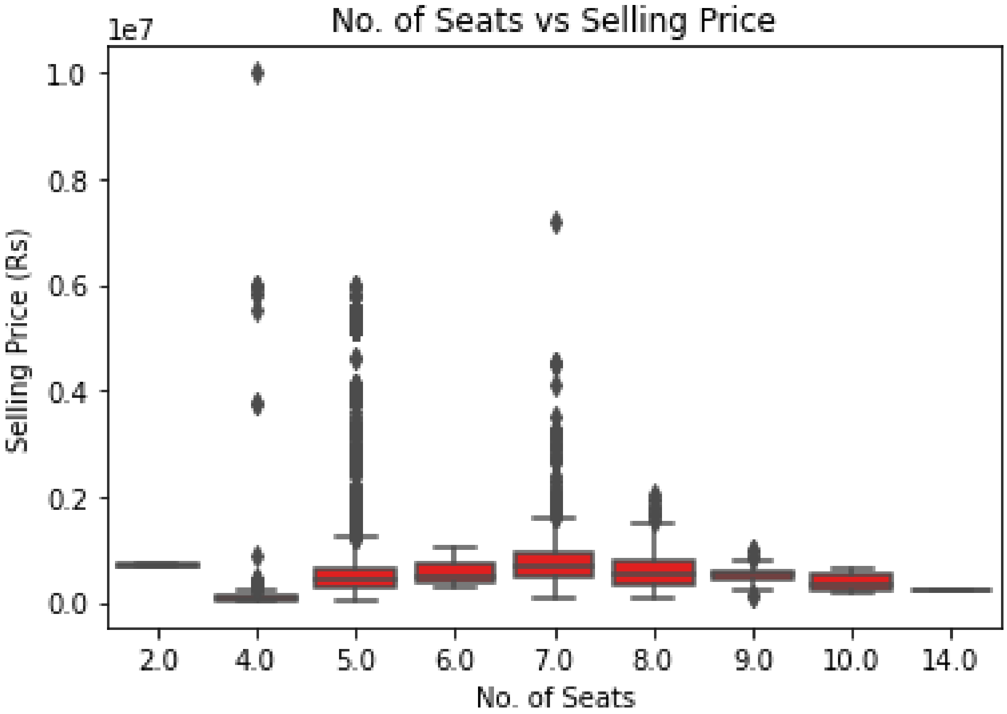
[35]:

```
# Create a boxplot
sns.boxplot(x=data['transmission_type'], y=data['mileage'], data=data)

# Add title and labels
plt.title('Mileage vs Transmission Type')
plt.xlabel('Transmission Type')
plt.ylabel('Mileage (Km/L)')

# Display the plot
plt.show()
```

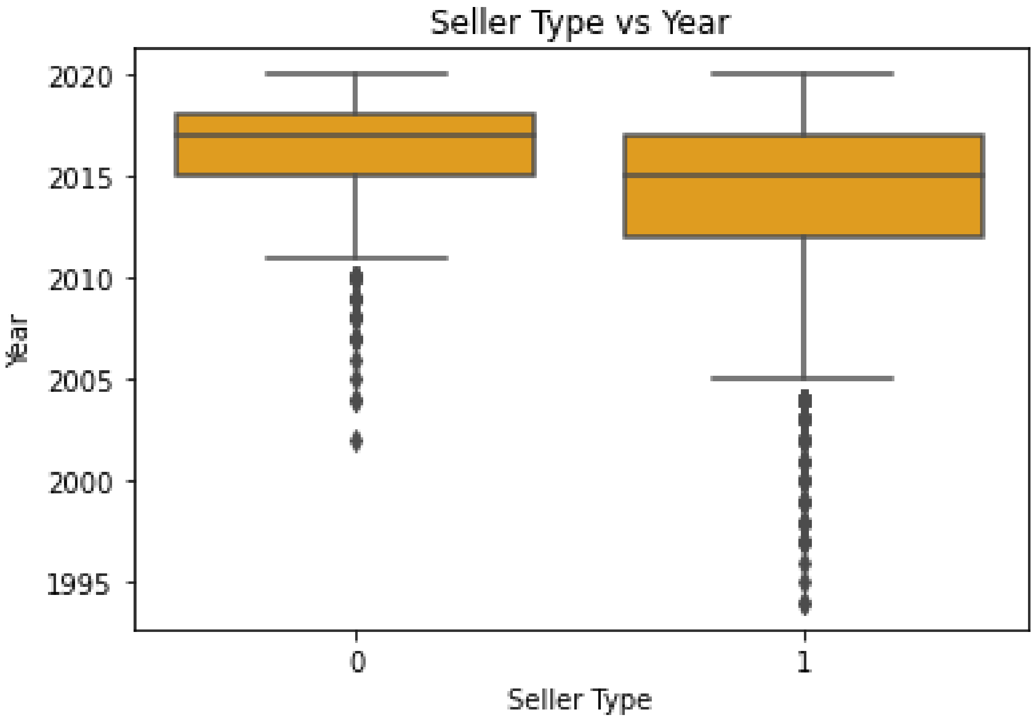


[36]:

```
# Create a boxplot
sns.boxplot(x=data['seats'], y=data['selling_price'], data=data, color='red')

# Add title and labels
plt.title('No. of Seats vs Selling Price')
plt.xlabel('No. of Seats')
plt.ylabel('Selling Price (Rs)')

# Display the plot
plt.show()
```



[37]:
```
# Create a boxplot
sns.boxplot(x=data['seller'], y=data['year'], data=data, color='orange')

# Add title and labels
plt.title('Seller Type vs Year')
plt.xlabel('Seller Type')
plt.ylabel('Year')

# Display the plot
plt.show()
```


Seller Type vs Year
2020
2015
2010
2005
2000
1995
Year
0
1
Seller Type

```
[ ]:
```