Import Libraries

In [76]:

```
# Import Libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px

%matplotlib inline
sns.set()
```

In [77]:

```
conda install -c https://conda.anaconda.org/plotly plotly
```

```
Collecting package metadata (current_repodata.json): done
Solving environment: done

# All requested packages already installed.


Note: you may need to restart the kernel to use updated p
ackages.
```

load dataset

In [78]:

```
# reading data with pandas
df = pd.read_csv('Car_details.csv')
```

In [79]:

```
# detect how many rows and columns
df.shape
```

Out[79]:

```
(8127, 13)
```

In [80]:

```
df.head()
```

Out[80]:

	name	year	selling_price	km_driven	fuel	seller_type	trans
0	Skoda Rapid 1.5 TDI Ambition	2014	370000	120000	Diesel	Individual	
1	Honda City 2017-2020 EXi	2006	158000	140000	Petrol	Individual	
2	Hyundai i20 Sportz Diesel	2010	225000	127000	Diesel	Individual	
3	Maruti Swift VXI BSIII	2007	130000	120000	Petrol	Individual	
4	Hyundai Xcent 1.2 VTVT E Plus	2017	440000	45000	Petrol	Individual	

Explore data analysis

In [81]:

```
#here we can see the Dtype of each column and check if th
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8127 entries, 0 to 8126
Data columns (total 13 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   name           8127 non-null   object 
 1   year           8127 non-null   int64  
 2   selling_price  8127 non-null   int64  
 3   km_driven      8127 non-null   int64  
 4   fuel           8127 non-null   object 
 5   seller_type    8127 non-null   object 
 6   transmission   8127 non-null   object 
 7   owner          8127 non-null   object 
 8   mileage        7906 non-null   object 
 9   engine         7906 non-null   object 
 10  max_power      7912 non-null   object 
 11  torque         7905 non-null   object 
 12  seats          7906 non-null   float64
dtypes: float64(1), int64(3), object(9)
memory usage: 825.5+ KB
```

In [82]:

```
#displays summary statistics
df.describe()
```

Out[82]:

	year	selling_price	km_driven	seats
count	8127.000000	8.127000e+03	8.127000e+03	7906.000000
mean	2013.803987	6.382950e+05	6.981020e+04	5.416772
std	4.044497	8.063003e+05	5.654780e+04	0.959637
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

In [83]:

```
df.columns
```

Out[83]:

```
Index(['name', 'year', 'selling_price', 'km_driven', 'fue
l', 'seller_type',
       'transmission', 'owner', 'mileage', 'engine', 'max
_power', 'torque',
       'seats'],
      dtype='object')
```

In [84]:

```
#show the data types for each columns
df.dtypes
```

Out[84]:

```
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
```

In [85]:

```
# check how many null values in our dataset
df.isna()
```

Out[85]:

	name	year	selling_price	km_driven	fuel	seller_type	transr
0	False	False	False	False	False	False	
1	False	False	False	False	False	False	
2	False	False	False	False	False	False	
3	False	False	False	False	False	False	
4	False	False	False	False	False	False	
...	...	...	...	...	...	...	
8122	False	False	False	False	False	False	
8123	False	False	False	False	False	False	
8124	False	False	False	False	False	False	
8125	False	False	False	False	False	False	
8126	False	False	False	False	False	False	

8127 rows × 13 columns

In [86]:

```
#here we can see that the last 5 cloumn has null values
df.isna().sum()
```

Out[86]:

```
name               0
year               0
selling_price      0
km_driven          0
fuel               0
seller_type        0
transmission       0
owner              0
mileage          221
engine           221
max_power        215
torque           222
seats            221
dtype: int64
```

In [87]:

```
#we can see the percentage null values from the datasest
df.isna().sum()/raw_data.shape[0]
```

Out[87]:

```
name             0.000000
year             0.000000
selling_price    0.000000
km_driven        0.000000
fuel             0.000000
seller_type      0.000000
transmission     0.000000
owner            0.000000
mileage          0.027193
engine           0.027193
max_power        0.026455
torque           0.027316
seats            0.027193
dtype: float64
```

Cleaning

In [88]:

```
#we gonna fill the seats column with mean(float64)
df.seats.fillna(df.seats.mean(),inplace=True)
```

In [89]:

```
df.seats.mean()
```

Out[89]:

```
5.416772071844173
```

In [90]:

```
#we gonna fill the engine column with mode(object)
df.engine.fillna(df.engine.mode()[0],inplace=True)
```

In [91]:

```
df.engine.mode()
```

Out[91]:

```
0    1248 CC
dtype: object
```

In [92]:

```
#we gonna fill the engine column with mode(object)
df.mileage.fillna(df.mileage.mode()[0],inplace=True)#we g
```

In [93]:

```
df.mileage.mode()
```

Out[93]:

```
0    18.9 kmpl
dtype: object
```

In [94]:

```
# drop the'torque','max_power'
df.drop(columns=['torque','max_power'],inplace=True)
```

In [95]:

```
#now we can see there is no more empty valuse
df.isna().sum()
```

Out[95]:

```
name             0
year             0
selling_price    0
km_driven        0
fuel             0
seller_type      0
transmission     0
owner            0
mileage          0
engine           0
seats            0
dtype: int64
```

In [96]:

```
#cheack if there is duplicated and we found 1202
df.duplicated().sum()
```

Out[96]:

```
1202
```

In [97]:

```
#drop the duplicated
df.drop_duplicates(inplace=True)
```

In [98]:

```
#notice that after we clean our dataset the num of the co
df.shape
```

Out[98]:

```
(6925, 11)
```

visualization

In [99]:

```
#count of selling prices in every year
# plotting the bar chart
fig = px.bar(df,x="year", y='selling_price')

# showing the plot
fig.show()
```

In [100…

```
 #count of selling prices according to it's km_driven
# plotting the histogram
fig = px.histogram(df, x="km_driven", y="selling_price")

# showing the plot
fig.show()
```

In [101…

```
 #sum of selling_price for each cars
# plotting the bar chart
fig = px.histogram(df,x="name", y='selling_price')

# showing the plot
fig.show()
```

In [102…

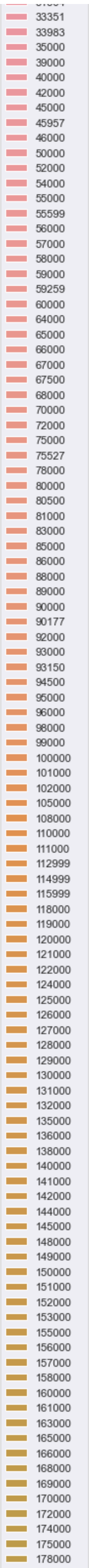
```
#count of selling prices in every year using countplot
plt.figure(figsize=[15,8])
sns.countplot(df.year,hue='selling_price',data=df)
```

```
/opt/anaconda3/lib/python3.9/site-packages/seaborn/_decor
ators.py:36: FutureWarning:

Pass the following variable as a keyword arg: x. From ver
sion 0.12, the only valid positional argument will be `da
ta`, and passing other arguments without an explicit keyw
ord will result in an error or misinterpretation.
```

Out[102…

```
<AxesSubplot:xlabel='year', ylabel='count'>
```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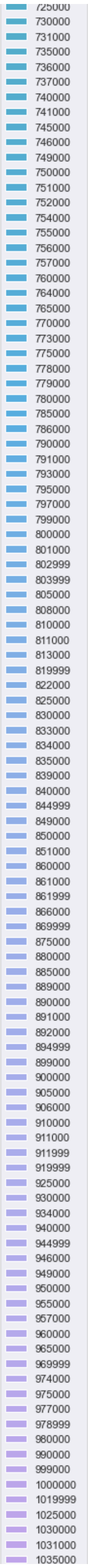

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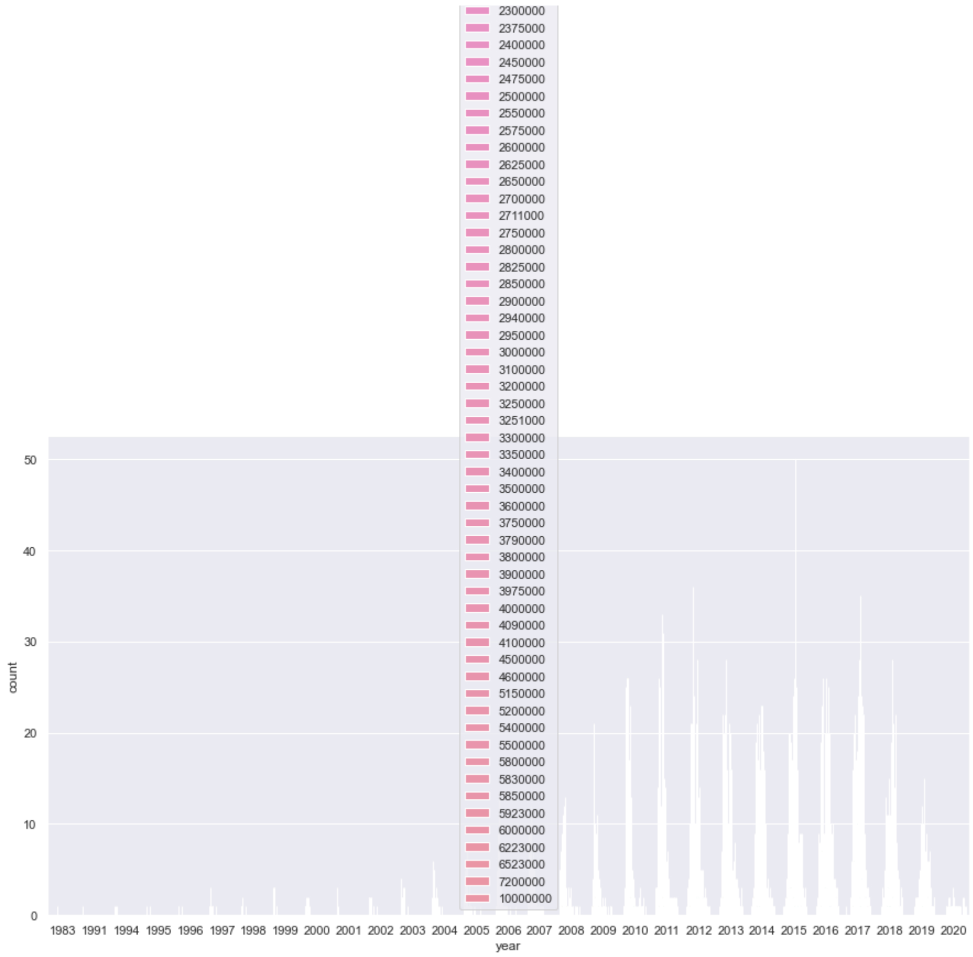


In [103…

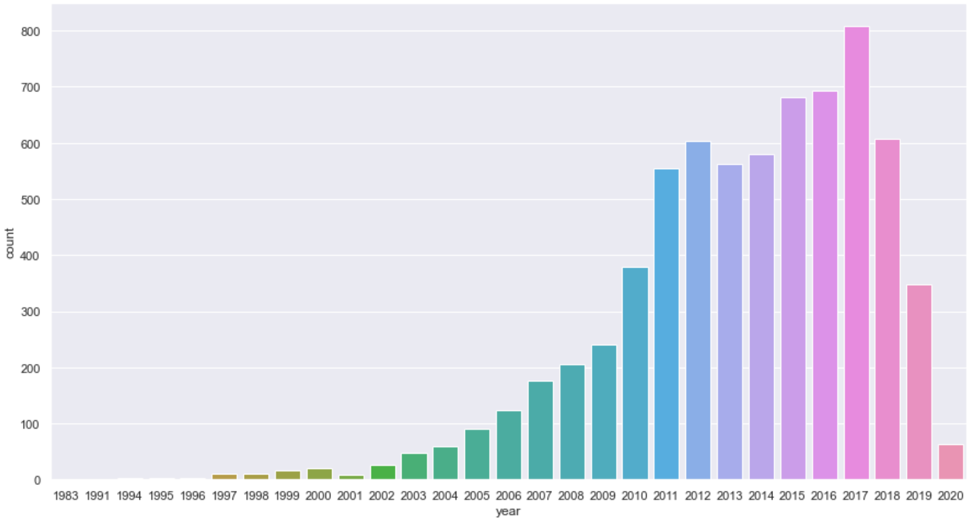
```
# plotting the countplot for the yaer
plt.figure(figsize=[15,8])
sns.countplot(df.year)
```

```
/opt/anaconda3/lib/python3.9/site-packages/seaborn/_decor
ators.py:36: FutureWarning:

Pass the following variable as a keyword arg: x. From ver
sion 0.12, the only valid positional argument will be `da
ta`, and passing other arguments without an explicit keyw
ord will result in an error or misinterpretation.
```

Out[103…

```
<AxesSubplot:xlabel='year', ylabel='count'>
```



In [104…

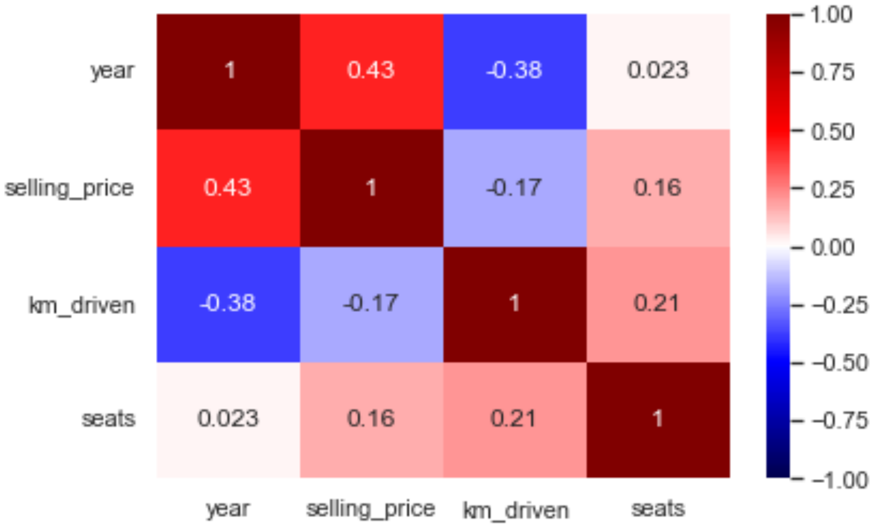
```
#find the correlation between variables
df.corr()
```

Out[104…

	year	selling_price	km_driven	seats
year	1.000000	0.433080	-0.377070	0.023098
selling_price	0.433080	1.000000	-0.165615	0.157154
km_driven	-0.377070	-0.165615	1.000000	0.205931
seats	0.023098	0.157154	0.205931	1.000000

In [105…

```
# visualize the correlations between the variables
sns.heatmap(df.corr(), cmap="seismic", annot=True, vmin=-
```



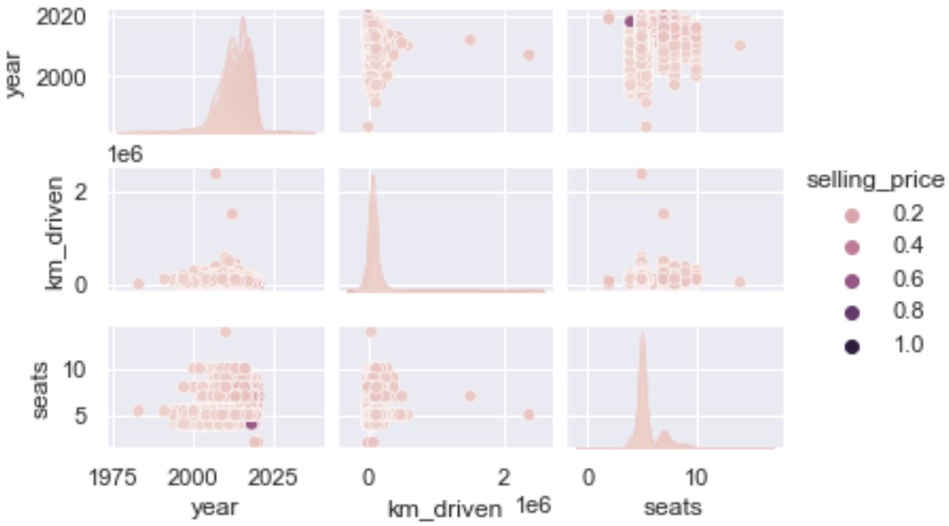
In [106…

```
#to visualize the relationship between each variable
plt.figure(figsize=[20,30])
sns.pairplot(df,diag_kind='kde',hue='selling_price',heigh
```

Out[106…

```
<seaborn.axisgrid.PairGrid at 0x7ff8823005b0>
```

```
<Figure size 1440x2160 with 0 Axes>
```



preprocessing for modeling

In [107…

```
#convert character columns to dummy variables to be ready
df=pd.get_dummies(df)
```

In [108…

```
df.head()
```

Out[108…

	year	selling_price	km_driven	seats	name_Ambassador CLASSIC 1500 DSL AC	name_A Classic
0	2014	370000	120000	5.0	0	
1	2006	158000	140000	5.0	0	
2	2010	225000	127000	5.0	0	
3	2007	130000	120000	5.0	0	
4	2017	440000	45000	5.0	0	

5 rows × 2590 columns

In [109…

```
#you can see that the columns increase after dummies vari
df.shape
```

Out[109…

```
(6925, 2590)
```

split Data

In [110…

```
# detect input and output
x=df.drop('selling_price',axis=1)
y=df.selling_price
y
```

Out[110…

```
0       370000
1       158000
2       225000
3       130000
4       440000
         ...
8120    260000
8121    475000
8122    320000
8123    135000
8124    382000
Name: selling_price, Length: 6925, dtype: int64
```

In [111…

```
# train test split
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(x, y,
```

In [112…

```
X_train
```

Out[112…

	year	km_driven	seats	name_Ambassador CLASSIC 1500 DSL AC	name_Ambassador Classic 2000 DSZ AC PS
2464	2008	58632	5.0	0	0
2437	2011	50000	5.0	0	0
7515	2018	50000	5.0	0	0
3063	2006	62900	5.0	0	0
1236	2013	300000	8.0	0	0
...	...	...	...	...	...
5701	1997	100000	5.0	0	0
3620	2008	110000	5.0	0	0
1817	2013	70000	9.0	0	0
2844	2017	90000	7.0	0	0
2981	2016	59300	5.0	0	0

5540 rows × 2589 columns

In [113…

```
y_train
```

Out[113…

```
2464      114999
2437      250000
7515     5500000
3063      135000
1236      200000
          ...
5701       70000
3620      250000
1817      500000
2844     1050000
2981      240000
Name: selling_price, Length: 5540, dtype: int64
```

In [114…

```
X_test
```

Out[114…

	year	km_driven	seats	name_Ambassador CLASSIC 1500 DSL AC	name_Ambassador Classic 2000 DSZ AC PS
1173	2012	70000	5.0	0	0
942	2008	100000	5.0	0	0
4282	2016	94000	5.0	0	0
313	2014	80100	5.0	0	0
5397	2011	25000	5.0	0	0
...	...	...	...	...	...
4104	2008	136500	8.0	0	0
351	2012	40000	5.0	0	0
2575	2019	14000	5.0	0	0
3350	2017	44000	5.0	0	0
4274	2016	120000	5.0	0	0

1385 rows × 2589 columns

In [115…

```
y_test
```

Out[115…

```
1173     254999
942      290000
4282    1100000
313      555000
5397     245000
          ...
4104     375000
351      325000
2575     380000
3350    2600000
4274     350000
Name: selling_price, Length: 1385, dtype: int64
```

In [116…

```
# feature scaling
#scale all the futur to same scale
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)
```

Modeling

In [117…

```
# apply LinearRegression
from sklearn.metrics import mean_squared_error, r2_score
from sklearn.linear_model import LinearRegression
from sklearn import metrics
```

In [118…

```
linreg_model = LinearRegression()
linreg_model.fit(x,y)
```

Out[118…

```
LinearRegression()
```

In [119…

```
y_pred = linreg_model.predict(x)
print(metrics.mean_absolute_error(y, y_pred))
```

```
44834.248419519965
```

In [120…

```
print(linreg_model.intercept_)
print(linreg_model.coef_)
```

```
3405192073097.6074
[ 3.07951709e+04 -2.07833909e-01 -9.01974974e+04 ... -3.7
7938069e+11
 -4.43547773e+11 -1.81815062e+11]
```

Model evaluation

In [121…

```
# R-Squared
linreg_model.score(x, y)
```

Out[121…

```
0.9741883150866637
```

In [ ]:

Loading [MathJax]/jax/output/CommonHTML/fonts/TeX/fontdata.js