Introduction

The data is provided with historical sales data for 1,115 Rossmann stores. The task is to forecast the "Sales" column for the test set.

Importing Basic Libraries

In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from pandas import datetime as dt
import seaborn as sns
```

```
c:\users\user\anaconda3\lib\site-packages\ipykernel_launcher.py:4: FutureWarning: The pandas.datetime class is deprecated and will be removed from pandas in a future version. Import from datetime module instead.
  after removing the cwd from sys.path.
```

Reading Data :

In [3]:

```
train = pd.read_csv('train.csv',low_memory = False)
```

In [4]:

```
train.head()
```

Out[4]:

	Store	DayOfWeek	Date	Sales	Customers	Open	Promo	StateHoliday	SchoolHoliday
0	1	5	2015-07-31	5263	555	1	1	0	1
1	2	5	2015-07-31	6064	625	1	1	0	1
2	3	5	2015-07-31	8314	821	1	1	0	1
3	4	5	2015-07-31	13995	1498	1	1	0	1
4	5	5	2015-07-31	4822	559	1	1	0	1

Converting Date Column to DateTime Data type :

In [5]:

```
train['Date'] = pd.to_datetime(train['Date'])
```

Extracting Date Features :

In [6]:

```
train['Year'] = train['Date'].dt.year
train['Month'] = train['Date'].dt.month
train['Day'] = train['Date'].dt.day
```

In [7]:

```
train = train.drop('Date',axis=1)
```

Exploratory Data Analysis

In [8]:

```
train.shape
```

Out[8]:

```
(1017209, 11)
```

In [9]:

```
train.columns
```

Out[9]:

```
Index(['Store', 'DayOfWeek', 'Sales', 'Customers', 'Open', 'Promo',
       'StateHoliday', 'SchoolHoliday', 'Year', 'Month', 'Day'],
      dtype='object')
```

In [10]:

```
train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1017209 entries, 0 to 1017208
Data columns (total 11 columns):
 #   Column         Non-Null Count    Dtype
---  ------         --------------    -----
 0   Store          1017209 non-null  int64
 1   DayOfWeek      1017209 non-null  int64
 2   Sales          1017209 non-null  int64
 3   Customers      1017209 non-null  int64
 4   Open           1017209 non-null  int64
 5   Promo          1017209 non-null  int64
 6   StateHoliday   1017209 non-null  object
 7   SchoolHoliday  1017209 non-null  int64
 8   Year           1017209 non-null  int64
 9   Month          1017209 non-null  int64
 10  Day            1017209 non-null  int64
dtypes: int64(10), object(1)
memory usage: 85.4+ MB
```

In [11]:

```
train.describe().T
```

Out[11]:

	count	mean	std	min	25%	50%	75%	max
Store	1017209.0	558.429727	321.908651	1.0	280.0	558.0	838.0	1115.0
DayOfWeek	1017209.0	3.998341	1.997391	1.0	2.0	4.0	6.0	7.0
Sales	1017209.0	5773.818972	3849.926175	0.0	3727.0	5744.0	7856.0	41551.0
Customers	1017209.0	633.145946	464.411734	0.0	405.0	609.0	837.0	7388.0
Open	1017209.0	0.830107	0.375539	0.0	1.0	1.0	1.0	1.0
Promo	1017209.0	0.381515	0.485759	0.0	0.0	0.0	1.0	1.0
SchoolHoliday	1017209.0	0.178647	0.383056	0.0	0.0	0.0	0.0	1.0
Year	1017209.0	2013.832292	0.777396	2013.0	2013.0	2014.0	2014.0	2015.0
Month	1017209.0	5.846762	3.326097	1.0	3.0	6.0	8.0	12.0

Day	1017209.0	15.702790	8.787638	1.0	8.0	16.0	23.0	31.0

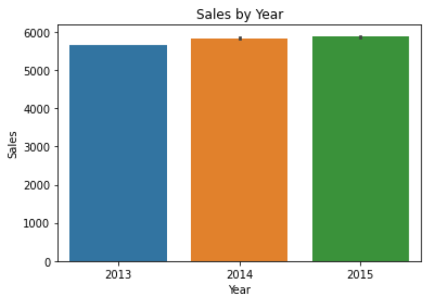
In [12]:
```
train.isnull().sum()
```

Out[12]:
```
Store            0
DayOfWeek        0
Sales            0
Customers        0
Open             0
Promo            0
StateHoliday     0
SchoolHoliday    0
Year             0
Month            0
Day              0
dtype: int64
```

Plots

In [13]:
```
sns.barplot(x = train['Year'], y = train['Sales'])
plt.title('Sales by Year')
```

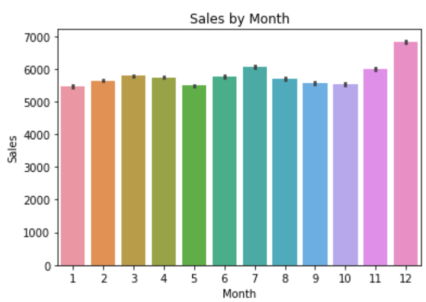
Out[13]:
```
Text(0.5, 1.0, 'Sales by Year')
```



Maximum Sales was in Year 2014 and 2015

In [14]:
```
sns.barplot(x = train['Month'], y = train['Sales'])
plt.title('Sales by Month')
```

Out[14]:
```
Text(0.5, 1.0, 'Sales by Month')
```



highest sales was in 12th month i.e, December

Creating Function to check various aspects of the dataset :

In [18]:
```
def sniff_modified(df):
    data = pd.DataFrame()
    data['Data Type'] = df.dtypes
    data['Percent_Missing'] = (df.isnull().sum()*100)/len(df)
    data['Unique_values'] = df.apply(lambda x: x.unique())
    data['Count_Unique_values'] = df.apply(lambda x: len(x.unique()))
    return data.sort_values('Data Type')
```

In [19]:
```
sniff_modified(train)
```

Out[19]:

	Data Type	Percent_Missing	Unique_values	Count_Unique_values
Store	int64	0.0	[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14...	1115
DayOfWeek	int64	0.0	[5, 4, 3, 2, 1, 7, 6]	7
Sales	int64	0.0	[5263, 6064, 8314, 13995, 4822, 5651, 15344, 8...	21734
Customers	int64	0.0	[555, 625, 821, 1498, 559, 589, 1414, 833, 687...	4086
Open	int64	0.0	[1, 0]	2
Promo	int64	0.0	[1, 0]	2
SchoolHoliday	int64	0.0	[1, 0]	2
Year	int64	0.0	[2015, 2014, 2013]	3
Month	int64	0.0	[7, 6, 5, 4, 3, 2, 1, 12, 11, 10, 9, 8]	12
Day	int64	0.0	[31, 30, 29, 28, 27, 26, 25, 24, 23, 22, 21, 2...	31
StateHoliday	object	0.0	[0, a, b, c]	4

In [22]:
```
import category_encoders as ce
encoder = ce.OrdinalEncoder(mapping=[{'col':'StateHoliday','mapping':{'0':0,'a':1,'b':2,'c':3}}])
```

```
encoder.fit(train)
train = encoder.transform(train)
```

Training The Model

In [23]:

```
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import r2_score,accuracy_score,mean_absolute_error
from sklearn.model_selection import train_test_split
x = train.drop('Sales',axis = 1)
y = train['Sales']
X_train,X_test,y_train,y_test = train_test_split(x,y,test_size = 0.20)
rf = RandomForestRegressor(n_jobs = -1,n_estimators=100)
rf.fit(X_train,y_train)
```

Out[23]:

```
RandomForestRegressor(n_jobs=-1)
```

In [24]:

```
prediction = rf.predict(X_test)
r2 = r2_score(y_test,prediction)
e = mean_absolute_error(y_test,prediction)
ep = e*100 / y_test.mean()
```

In [25]:

```
print(f"R^2 Score :{r2:.2f}")
```

```
R^2 Score :0.96
```

In [26]:

```
print(f"${e:.0f} error; {ep:.2f}% error")
```

```
$470 error; 8.14% error
```

In [27]:

```
output = pd.DataFrame({'Actual_Values':y_test,'Predictions':prediction})
```

In [28]:

```
output.head(20)
```

Out[28]:

	Actual_Values	Predictions
876867	9225	9027.68
934965	3745	3641.16
275889	4983	5345.60
627106	16353	17958.03
918021	9562	11022.88
968817	7118	6963.04
928003	5653	5806.58
103893	10171	7934.71
76761	0	0.00
316936	8725	8133.48
681209	6190	6455.90
264176	7932	6981.23
705656	7655	8108.53
80492	9124	8802.82
491768	7540	8409.51
488844	7438	7503.38
188351	9934	8958.75
64489	6462	6911.31
73749	5083	5496.78
379215	7992	8185.42

In [ ]: