In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.metrics import mean_squared_error as MSE
from sklearn.linear_model import LinearRegression, Lasso, Ridge
from sklearn.model_selection import train_test_split, cross_val_score, GridSearchCV
from sklearn.tree import DecisionTreeRegressor
from sklearn.ensemble import RandomForestRegressor, GradientBoostingRegressor
```

In [5]:
```
df_train =pd.read_csv(r'C:\Users\Dell\Downloads\house-prices-advanced-regression-techniques\train.csv')
df_test = pd.read_csv(r'C:\Users\Dell\Downloads\house-prices-advanced-regression-techniques\test.csv')
```

In [6]:
```
df_train
```

Out[6]:

	Id	MSSubClass	MSZoning	LotFrontage	LotArea	Street	Alley	LotShape	LandContour	Utilities	...	PoolArea	PoolQC	Fence	MiscFeature	MiscVal	MoSold	YrSold	SaleType	SaleCondition	SalePrice
0	1	60	RL	65.0	8450	Pave	NaN	Reg	Lvl	AllPub	...	0	NaN	NaN	NaN	0	2	2008	WD	Normal	208500
1	2	20	RL	80.0	9600	Pave	NaN	Reg	Lvl	AllPub	...	0	NaN	NaN	NaN	0	5	2007	WD	Normal	181500
2	3	60	RL	68.0	11250	Pave	NaN	IR1	Lvl	AllPub	...	0	NaN	NaN	NaN	0	9	2008	WD	Normal	223500
3	4	70	RL	60.0	9550	Pave	NaN	IR1	Lvl	AllPub	...	0	NaN	NaN	NaN	0	2	2006	WD	Abnorml	140000
4	5	60	RL	84.0	14260	Pave	NaN	IR1	Lvl	AllPub	...	0	NaN	NaN	NaN	0	12	2008	WD	Normal	250000
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1455	1456	60	RL	62.0	7917	Pave	NaN	Reg	Lvl	AllPub	...	0	NaN	NaN	NaN	0	8	2007	WD	Normal	175000
1456	1457	20	RL	85.0	13175	Pave	NaN	Reg	Lvl	AllPub	...	0	NaN	MnPrv	NaN	0	2	2010	WD	Normal	210000
1457	1458	70	RL	66.0	9042	Pave	NaN	Reg	Lvl	AllPub	...	0	NaN	GdPrv	Shed	2500	5	2010	WD	Normal	266500
1458	1459	20	RL	68.0	9717	Pave	NaN	Reg	Lvl	AllPub	...	0	NaN	NaN	NaN	0	4	2010	WD	Normal	142125
1459	1460	20	RL	75.0	9937	Pave	NaN	Reg	Lvl	AllPub	...	0	NaN	NaN	NaN	0	6	2008	WD	Normal	147500

1460 rows × 81 columns

In [7]:
```
df_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1460 entries, 0 to 1459
Data columns (total 81 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   Id             1460 non-null   int64  
 1   MSSubClass     1460 non-null   int64  
 2   MSZoning       1460 non-null   object 
 3   LotFrontage    1201 non-null   float64
 4   LotArea        1460 non-null   int64  
 5   Street         1460 non-null   object 
 6   Alley          91 non-null     object 
 7   LotShape       1460 non-null   object 
 8   LandContour    1460 non-null   object 
 9   Utilities      1460 non-null   object 
 10  LotConfig      1460 non-null   object 
 11  LandSlope      1460 non-null   object 
 12  Neighborhood   1460 non-null   object 
 13  Condition1     1460 non-null   object 
 14  Condition2     1460 non-null   object 
 15  BldgType       1460 non-null   object 
 16  HouseStyle     1460 non-null   object 
 17  OverallQual    1460 non-null   int64  
 18  OverallCond    1460 non-null   int64  
 19  YearBuilt      1460 non-null   int64  
 20  YearRemodAdd   1460 non-null   int64  
 21  RoofStyle      1460 non-null   object 
 22  RoofMatl       1460 non-null   object 
 23  Exterior1st    1460 non-null   object 
 24  Exterior2nd    1460 non-null   object 
 25  MasVnrType     588 non-null    object 
 26  MasVnrArea     1452 non-null   float64
 27  ExterQual      1460 non-null   object 
 28  ExterCond      1460 non-null   object 
 29  Foundation     1460 non-null   object 
 30  BsmtQual       1423 non-null   object 
 31  BsmtCond       1423 non-null   object 
 32  BsmtExposure   1422 non-null   object 
 33  BsmtFinType1   1423 non-null   object 
 34  BsmtFinSF1     1460 non-null   int64  
 35  BsmtFinType2   1422 non-null   object 
 36  BsmtFinSF2     1460 non-null   int64  
 37  BsmtUnfSF      1460 non-null   int64  
 38  TotalBsmtSF    1460 non-null   int64  
 39  Heating        1460 non-null   object 
 40  HeatingQC      1460 non-null   object 
 41  CentralAir     1460 non-null   object 
 42  Electrical     1459 non-null   object 
 43  1stFlrSF       1460 non-null   int64  
 44  2ndFlrSF       1460 non-null   int64  
 45  LowQualFinSF   1460 non-null   int64  
 46  GrLivArea      1460 non-null   int64  
 47  BsmtFullBath   1460 non-null   int64  
 48  BsmtHalfBath   1460 non-null   int64  
 49  FullBath       1460 non-null   int64  
 50  HalfBath       1460 non-null   int64  
 51  BedroomAbvGr   1460 non-null   int64  
 52  KitchenAbvGr   1460 non-null   int64  
 53  KitchenQual    1460 non-null   object 
 54  TotRmsAbvGrd   1460 non-null   int64  
 55  Functional     1460 non-null   object 
 56  Fireplaces     1460 non-null   int64  
 57  FireplaceQu    770 non-null    object 
 58  GarageType     1379 non-null   object 
 59  GarageYrBlt    1379 non-null   float64
 60  GarageFinish   1379 non-null   object 
 61  GarageCars     1460 non-null   int64  
 62  GarageArea     1460 non-null   int64  
 63  GarageQual     1379 non-null   object 
 64  GarageCond     1379 non-null   object 
 65  PavedDrive     1460 non-null   object 
 66  WoodDeckSF     1460 non-null   int64  
 67  OpenPorchSF    1460 non-null   int64  
 68  EnclosedPorch  1460 non-null   int64  
 69  3SsnPorch      1460 non-null   int64  
 70  ScreenPorch    1460 non-null   int64  
 71  PoolArea       1460 non-null   int64  
 72  PoolQC         7 non-null      object 
 73  Fence          281 non-null    object 
 74  MiscFeature    54 non-null     object 
 75  MiscVal        1460 non-null   int64  
 76  MoSold         1460 non-null   int64  
 77  YrSold         1460 non-null   int64  
 78  SaleType       1460 non-null   object 
 79  SaleCondition  1460 non-null   object 
 80  SalePrice      1460 non-null   int64  
dtypes: float64(3), int64(35), object(43)
memory usage: 924.0+ KB
```

In [11]:
```
num_variables=[]
for var in df_train.columns:
    if pd.api.types.is_numeric_dtype(df_train[var]) and var not in ['Id', 'SalePrice']:
        num_variables.append(var)

print(num_variables)
```

```
['MSSubClass', 'LotFrontage', 'LotArea', 'OverallQual', 'OverallCond', 'YearBuilt', 'YearRemodAdd', 'MasVnrArea', 'BsmtFinSF1', 'BsmtFinSF2', 'BsmtUnfSF', 'TotalBsmtSF', '1stFlrSF', '2ndFlrSF', 'LowQualFinSF', 'GrLivArea', 'BsmtFullBath', 'BsmtHalfBath', 'FullBath', 'HalfBath', 'BedroomAbvGr', 'KitchenAbvGr', 'TotRmsAbvGrd', 'Fireplaces', 'GarageYrBlt', 'GarageCars', 'GarageArea', 'WoodDeckSF', 'OpenPorchSF', 'EnclosedPorch', '3SsnPorch', 'ScreenPorch', 'PoolArea', 'MiscVal', 'MoSold', 'YrSold']
```

In [22]:
```
target_var = ['SalePrice']
y= df_train[target_var]
```

In [32]:
```
lr_dirty=LinearRegression()
df_test[num_variables]=df_test[num_variables].fillna(0)
df_train[num_variables]=df_train[num_variables].fillna(0)
X = df_train[num_variables]
X_train, X_test, y_train, y_test = train_test_split(X, y , test_size=0.3, random_state=seed)
```

In [33]:
```
lr_dirty.fit(X_train,y_train)
y_pred_dirty=lr_dirty.predict(X_test)
print("R2: ", lr_dirty.score(X_test,y_test))

#measuring the RMSE of the model
rmse_dirty = MSE(y_test, y_pred_dirty)**(1/2)
print("RMSE: ", rmse_dirty)
```

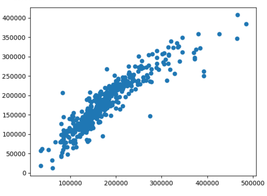
```
R2:  0.8383022552851169
RMSE:  28428.228070478086
```

In [34]:
```
y_pred_dirty[:5]
```

Out[34]:
```
array([[241294.46170002],
       [311350.80191562],
       [169980.88257419],
       [ 47472.25027878],
       [238621.57280549]])
```

In [35]:
```
plt.scatter(y_test,y_pred_dirty)
```

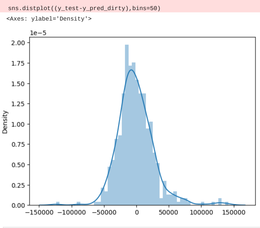
Out[35]:
```
<matplotlib.collections.PathCollection at 0x19cfaff0640>
```



In [36]:
```
sns.distplot((y_test-y_pred_dirty),bins=50)
```

```
C:\Users\Dell\AppData\Local\Temp\ipykernel_4476\2629852416.py:1: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot((y_test-y_pred_dirty),bins=50)
```

Out[36]:
```
<Axes: ylabel='Density'>
```



In [37]:
```
df_test[num_variables].info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1459 entries, 0 to 1458
Data columns (total 36 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   MSSubClass     1459 non-null   int64  
 1   LotFrontage    1459 non-null   float64
 2   LotArea        1459 non-null   int64  
 3   OverallQual    1459 non-null   int64  
 4   OverallCond    1459 non-null   int64  
 5   YearBuilt      1459 non-null   int64  
 6   YearRemodAdd   1459 non-null   int64  
 7   MasVnrArea     1459 non-null   float64
 8   BsmtFinSF1     1459 non-null   float64
 9   BsmtFinSF2     1459 non-null   float64
 10  BsmtUnfSF      1459 non-null   float64
 11  TotalBsmtSF    1459 non-null   float64
 12  1stFlrSF       1459 non-null   int64  
 13  2ndFlrSF       1459 non-null   int64  
 14  LowQualFinSF   1459 non-null   int64  
 15  GrLivArea      1459 non-null   int64  
 16  BsmtFullBath   1459 non-null   float64
 17  BsmtHalfBath   1459 non-null   float64
 18  FullBath       1459 non-null   int64  
 19  HalfBath       1459 non-null   int64  
 20  BedroomAbvGr   1459 non-null   int64  
 21  KitchenAbvGr   1459 non-null   int64  
 22  TotRmsAbvGrd   1459 non-null   int64  
 23  Fireplaces     1459 non-null   int64  
 24  GarageYrBlt    1459 non-null   float64
 25  GarageCars     1459 non-null   float64
 26  GarageArea     1459 non-null   float64
 27  WoodDeckSF     1459 non-null   int64  
 28  OpenPorchSF    1459 non-null   int64  
 29  EnclosedPorch  1459 non-null   int64  
 30  3SsnPorch      1459 non-null   int64  
 31  ScreenPorch    1459 non-null   int64  
 32  PoolArea       1459 non-null   int64  
 33  MiscVal        1459 non-null   int64  
 34  MoSold         1459 non-null   int64  
 35  YrSold         1459 non-null   int64  
dtypes: float64(11), int64(25)
memory usage: 410.5 KB
```

In [38]:
```
output_pred = lr_dirty.predict(df_test[num_variables]).ravel()  # or predictions.flatten() to make it a 1D array


#creating a dataframe with Id and predicted SalePrice
output = pd.DataFrame({'Id': df_test['Id'],
                       'SalePrice': output_pred})

output.head()
```

Out[38]:

	Id	SalePrice
0	1461	121637.507765
1	1462	151546.691299
2	1463	170589.501248
3	1464	200427.659711
4	1465	192851.842864

In [39]:
```
output.to_csv('submission.csv', index=False)

output.head()
```

Out[39]:

	Id	SalePrice
0	1461	121637.507765
1	1462	151546.691299
2	1463	170589.501248
3	1464	200427.659711

```
4  1465  192851.842864
```

In [ ]: