Problem Statement

A real estate agent want help to predict the house price for regions in USA.He gave us the dataset to work on use Linear Regression Model.Create a Model that helps him to estimate of what the house would sell sell for.

DATA COLLECTION

In [1]:
```
# import libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:
```
# To Import Dataset
sd=pd.read_csv(r"c:\Users\user\Downloads\bottle.csv")
sd
```

Out[2]:

	Cst_Cnt	Btl_Cnt	Sta_ID	Depth_ID	Depthm	T_degC	Salnty	O2ml_L	STheta	O2Sat	...
0	1	1	054.0 056.0	19-4903CR-HY-060-0930-05400560-0000A-3	0	10.50	33.440	NaN	25.649	NaN	...
1	1	2	054.0 056.0	19-4903CR-HY-060-0930-05400560-0008A-3	8	10.46	33.440	NaN	25.656	NaN	...
2	1	3	054.0 056.0	19-4903CR-HY-060-0930-05400560-0010A-7	10	10.46	33.437	NaN	25.654	NaN	...
3	1	4	054.0 056.0	19-4903CR-HY-060-0930-05400560-0019A-3	19	10.45	33.420	NaN	25.643	NaN	...
4	1	5	054.0 056.0	19-4903CR-HY-060-0930-05400560-0020A-7	20	10.45	33.421	NaN	25.643	NaN	...
...	...	...	...	...	...	...	...	...	...	...	...
5240	173	5241	069.0 144.0	19-4905CR-HY-125-1712-06901440-0279A-3	279	7.86	33.870	3.81	26.411	57.0	...
5241	173	5242	069.0 144.0	19-4905CR-HY-125-1712-06901440-0300A-7	300	7.52	33.896	3.55	26.481	52.7	...
5242	173	5243	069.0 144.0	19-4905CR-HY-125-1712-06901440-0371A-3	371	6.54	33.930	2.67	26.642	38.8	...
5243	173	5244	069.0 144.0	19-4905CR-HY-125-1712-06901440-0400A-7	400	6.25	33.951	2.32	26.697	33.5	...

	Cst_Cnt	Btl_Cnt	Sta_ID	Depth_ID	Depthm	T_degC	Salnty	O2ml_L	STheta	O2Sat	...
5244	173	5245	069.0 144.0	19-4905CR-HY-125-1712-06901440-0500A-7	500	5.44	34.027	1.30	26.858	18.4	...

5245 rows × 71 columns

In [3]:
```
# to display top 5 rows
sd.head()
```

Out[3]:

	Cst_Cnt	Btl_Cnt	Sta_ID	Depth_ID	Depthm	T_degC	Salnty	O2ml_L	STheta	O2Sat	...	R_
0	1	1	054.0 056.0	19-4903CR-HY-060-0930-05400560-0000A-3	0	10.50	33.440	NaN	25.649	NaN	...	
1	1	2	054.0 056.0	19-4903CR-HY-060-0930-05400560-0008A-3	8	10.46	33.440	NaN	25.656	NaN	...	
2	1	3	054.0 056.0	19-4903CR-HY-060-0930-05400560-0010A-7	10	10.46	33.437	NaN	25.654	NaN	...	
3	1	4	054.0 056.0	19-4903CR-HY-060-0930-05400560-0019A-3	19	10.45	33.420	NaN	25.643	NaN	...	
4	1	5	054.0 056.0	19-4903CR-HY-060-0930-05400560-0020A-7	20	10.45	33.421	NaN	25.643	NaN	...	

5 rows × 71 columns

DATA CLEANING AND PRE_PROCESSING

In [4]:
```
sd.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5245 entries, 0 to 5244
Data columns (total 71 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   Cst_Cnt      5245 non-null   int64
 1   Btl_Cnt      5245 non-null   int64
 2   Sta_ID       5245 non-null   object
 3   Depth_ID     5245 non-null   object
 4   Depthm       5245 non-null   int64
 5   T_degC       5225 non-null   float64
 6   Salnty       5092 non-null   float64
 7   O2ml_L       3051 non-null   float64
 8   STheta       5077 non-null   float64
 9   O2Sat        2954 non-null   float64
 10  Oxy_µmol/Kg  2954 non-null   float64
 11  BtlNum       0 non-null      float64
 12  RecInd       5245 non-null   int64
 13  T_prec       5225 non-null   float64
 14  T_qual       52 non-null     float64
 15  S_prec       5092 non-null   float64
 16  S_qual       239 non-null    float64
 17  P_qual       5245 non-null   int64
 18  O_qual       2198 non-null   float64
 19  SThtaq       283 non-null    float64
 20  O2Satq       2362 non-null   float64
 21  ChlorA       0 non-null      float64
 22  Chlqua       5245 non-null   int64
 23  Phaeop       0 non-null      float64
 24  Phaqua       5245 non-null   int64
 25  PO4uM        1236 non-null   float64
 26  PO4q         4009 non-null   float64
 27  SiO3uM       0 non-null      float64
 28  SiO3qu       5245 non-null   int64
 29  NO2uM        0 non-null      float64
 30  NO2q         5245 non-null   int64
 31  NO3uM        0 non-null      float64
 32  NO3q         5245 non-null   int64
 33  NH3uM        0 non-null      float64
 34  NH3q         5245 non-null   int64
 35  C14As1       0 non-null      float64
 36  C14A1p       0 non-null      float64
 37  C14A1q       5245 non-null   int64
 38  C14As2       0 non-null      float64
 39  C14A2p       0 non-null      float64
 40  C14A2q       5245 non-null   int64
 41  DarkAs       0 non-null      float64
 42  DarkAp       0 non-null      float64
 43  DarkAq       5245 non-null   int64
 44  MeanAs       0 non-null      float64
 45  MeanAp       0 non-null      float64
 46  MeanAq       5245 non-null   int64
 47  IncTim       0 non-null      float64
 48  LightP       0 non-null      float64
 49  R_Depth      5245 non-null   int64
 50  R_TEMP       5225 non-null   float64
 51  R_POTEMP     5019 non-null   float64
```

```
 52  R_SALINITY   5092 non-null   float64
 53  R_SIGMA      4962 non-null   float64
 54  R_SVA        4962 non-null   float64
 55  R_DYNHT      5031 non-null   float64
 56  R_O2         3051 non-null   float64
 57  R_O2Sat      2930 non-null   float64
 58  R_SIO3       0 non-null      float64
 59  R_PO4        1236 non-null   float64
 60  R_NO3        0 non-null      float64
 61  R_NO2        0 non-null      float64
 62  R_NH4        0 non-null      float64
 63  R_CHLA       0 non-null      float64
 64  R_PHAEO      0 non-null      float64
 65  R_PRES       5245 non-null   int64
 66  R_SAMP       0 non-null      float64
 67  DIC1         0 non-null      float64
 68  DIC2         0 non-null      float64
 69  TA1          0 non-null      float64
 70  TA2          0 non-null      float64
dtypes: float64(52), int64(17), object(2)
memory usage: 2.8+ MB
```

In [5]:
```
# to display summary of statistics
sd.describe()
```

Out[5]:

	Cst_Cnt	Btl_Cnt	Depthm	T_degC	Salnty	O2ml_L	SThet
count	5245.000000	5245.000000	5245.000000	5225.000000	5092.000000	3051.000000	5077.00000
mean	86.191992	2623.000000	345.400572	8.993144	33.827093	3.129839	26.11996
std	49.742962	1514.245412	356.298143	3.902631	0.492518	2.259226	0.92301
min	1.000000	1.000000	0.000000	2.700000	32.520000	0.210000	23.56800
25%	43.000000	1312.000000	54.000000	5.430000	33.490000	0.670000	25.11700
50%	86.000000	2623.000000	200.000000	8.620000	33.890000	2.990000	26.27900
75%	129.000000	3934.000000	600.000000	12.230000	34.255000	5.490000	26.99800
max	173.000000	5245.000000	1547.000000	19.760000	34.700000	6.630000	27.62300

8 rows × 69 columns

In [6]:
```
#to display colums heading
sd.columns
```

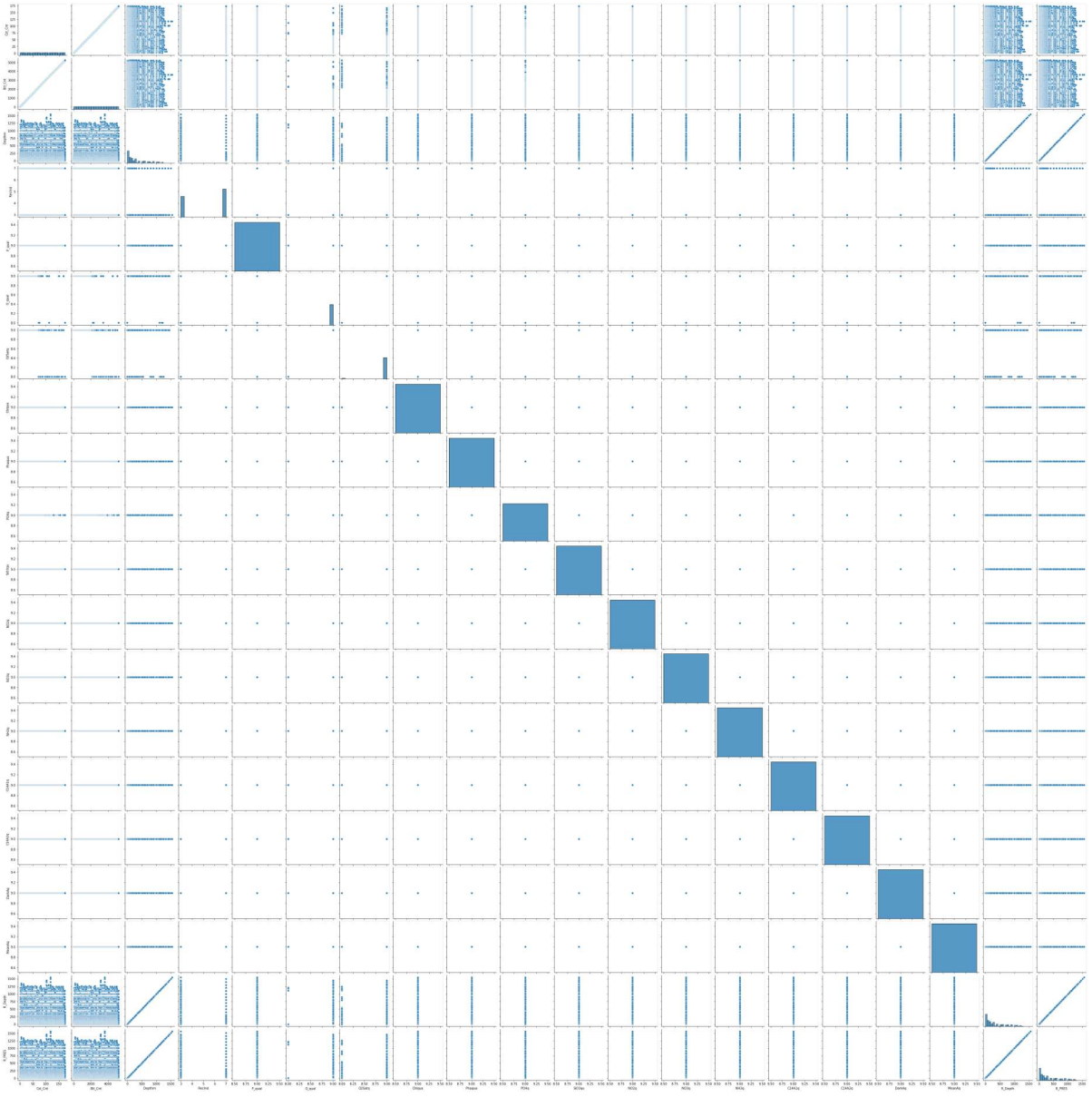
Out[6]:
```
Index(['Cst_Cnt', 'Btl_Cnt', 'Sta_ID', 'Depth_ID', 'Depthm', 'T_degC',
       'Salnty', 'O2ml_L', 'STheta', 'O2Sat', 'Oxy_µmol/Kg', 'BtlNum',
       'RecInd', 'T_prec', 'T_qual', 'S_prec', 'S_qual', 'P_qual', 'O_qual',
       'SThtaq', 'O2Satq', 'ChlorA', 'Chlqua', 'Phaeop', 'Phaqua', 'PO4uM',
       'PO4q', 'SiO3uM', 'SiO3qu', 'NO2uM', 'NO2q', 'NO3uM', 'NO3q', 'NH3uM',
       'NH3q', 'C14As1', 'C14A1p', 'C14A1q', 'C14As2', 'C14A2p', 'C14A2q',
       'DarkAs', 'DarkAp', 'DarkAq', 'MeanAs', 'MeanAp', 'MeanAq', 'IncTim',
       'LightP', 'R_Depth', 'R_TEMP', 'R_POTEMP', 'R_SALINITY', 'R_SIGMA',
       'R_SVA', 'R_DYNHT', 'R_O2', 'R_O2Sat', 'R_SIO3', 'R_PO4', 'R_NO3',
       'R_NO2', 'R_NH4', 'R_CHLA', 'R_PHAEO', 'R_PRES', 'R_SAMP', 'DIC1',
       'DIC2', 'TA1', 'TA2'],
      dtype='object')
```

EDA and visualization

In [96]:
```
sd1=sd[['Cst_Cnt', 'Btl_Cnt', 'Depthm', 'RecInd',
       'P_qual', 'O_qual', 'O2Satq', 'Chlqua', 'Phaqua', 'PO4q', 'SiO3qu',
       'NO2q', 'NO3q', 'NH3q', 'C14A1q', 'C14A2q', 'DarkAq', 'MeanAq',
       'R_Depth', 'R_PRES']]
```

In [97]:
```
sns.pairplot(sd1)
```

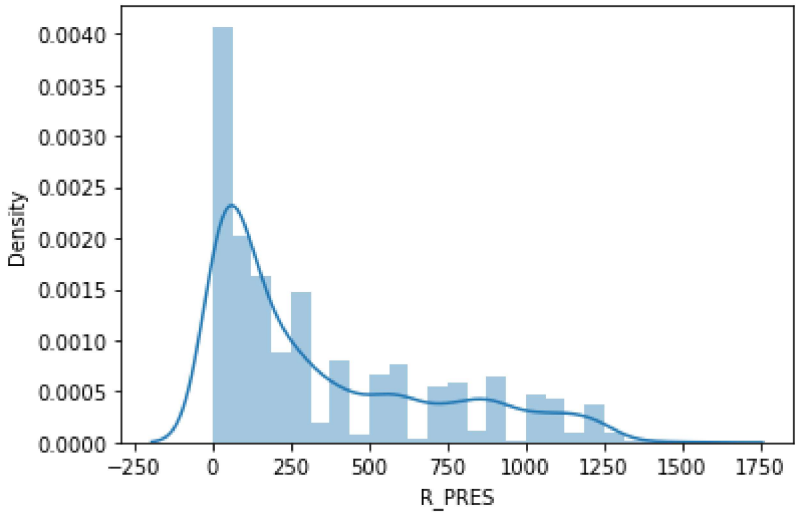
Out[97]:
```
<seaborn.axisgrid.PairGrid at 0x2ed22dca9a0>
```



In [98]:
```
sns.distplot(sd['R_PRES'])
```

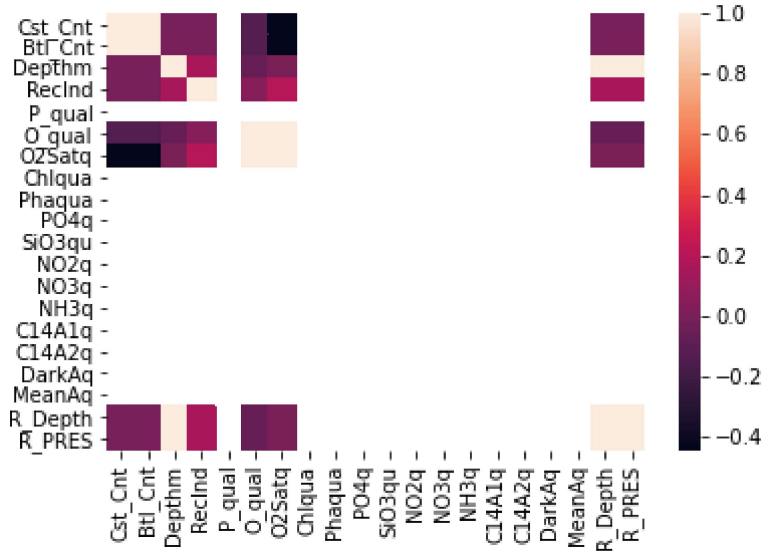
```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\distributions.py:2557: Fut
ureWarning: `distplot` is a deprecated function and will be removed in a futu
re version. Please adapt your code to use either `displot` (a figure-level fu
nction with similar flexibility) or `histplot` (an axes-level function for hi
stograms).
  warnings.warn(msg, FutureWarning)
```

Out[98]:
```
<AxesSubplot:xlabel='R_PRES', ylabel='Density'>
```



In [99]:
```
sns.heatmap(sd1.corr())
```

Out[99]:
```
<AxesSubplot:>
```



TO TRAIN THE MODEL _MODEL BUILDING

we are goint train Liner Regression model; we need to split out the data into two varibles x and y where x is independent on x (output) and y is dependent on x(output) adress coloumn as it is not required our model

In [100]:
```
x= sd1[['Cst_Cnt', 'Btl_Cnt', 'RecInd',
       'P_qual', 'O_qual', 'O2Satq', 'Chlqua', 'Phaqua', 'PO4q', 'SiO3qu',
       'NO2q', 'NO3q', 'NH3q', 'C14A1q', 'C14A2q', 'DarkAq', 'MeanAq',
       'R_Depth','R_PRES']]
y=sd1['Depthm']
```

In [101]:
```
# To split my dataset  into training data and test data
from sklearn .model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.5)
```

In [102]:
```
from sklearn.linear_model import LinearRegression

lr=LinearRegression()
lr.fit(x_train,y_train)
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
<ipython-input-102-b0fd2c20cba9> in <module>
      2
      3 lr=LinearRegression()
----> 4 lr.fit(x_train,y_train)

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\linear_model\_base.py in f
it(self, X, y, sample_weight)
    516         accept_sparse = False if self.positive else ['csr', 'csc', 'c
oo']
    517
--> 518         X, y = self._validate_data(X, y, accept_sparse=accept_sparse,
    519                                    y_numeric=True, multi_output=True)
    520

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\base.py in _validate_data
(self, X, y, reset, validate_separately, **check_params)
    431                 y = check_array(y, **check_y_params)
    432             else:
--> 433                 X, y = check_X_y(X, y, **check_params)
    434             out = X, y
    435

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py in inn
er_f(*args, **kwargs)
     61             extra_args = len(args) - len(all_args)
     62             if extra_args <= 0:
---> 63                 return f(*args, **kwargs)
     64
     65             # extra_args > 0

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py in che
ck_X_y(X, y, accept_sparse, accept_large_sparse, dtype, order, copy, force_al
l_finite, ensure_2d, allow_nd, multi_output, ensure_min_samples, ensure_min_f
eatures, y_numeric, estimator)
    812         raise ValueError("y cannot be None")
    813
--> 814     X = check_array(X, accept_sparse=accept_sparse,
    815                     accept_large_sparse=accept_large_sparse,
    816                     dtype=dtype, order=order, copy=copy,

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py in inn
er_f(*args, **kwargs)
     61             extra_args = len(args) - len(all_args)
     62             if extra_args <= 0:
---> 63                 return f(*args, **kwargs)
     64
     65             # extra_args > 0

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py in che
ck_array(array, accept_sparse, accept_large_sparse, dtype, order, copy, force
_all_finite, ensure_2d, allow_nd, ensure_min_samples, ensure_min_features, es
timator)
    661
    662         if force_all_finite:
--> 663             _assert_all_finite(array,
```

```
    664                                     allow_nan=force_all_finite == 'allow-n
an')
    665

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py in _as
sert_all_finite(X, allow_nan, msg_dtype)
    101                 not allow_nan and not np.isfinite(X).all()):
    102             type_err = 'infinity' if allow_nan else 'NaN, infinity'
--> 103             raise ValueError(
    104                     msg_err.format
    105                     (type_err,

ValueError: Input contains NaN, infinity or a value too large for dtype('floa
t64').
```

In [103]:
```
print(lr.intercept_)
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
<ipython-input-103-182bb45ab960> in <module>
----> 1 print(lr.intercept_)

AttributeError: 'LinearRegression' object has no attribute 'intercept_'
```

In [104]:
```
coeff= pd.DataFrame(lr.coef_,x.columns,columns=['Co-efficient'])
coeff
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
<ipython-input-104-31ae3bd46ea9> in <module>
----> 1 coeff= pd.DataFrame(lr.coef_,x.columns,columns=['Co-efficient'])
      2 coeff

AttributeError: 'LinearRegression' object has no attribute 'coef_'
```

In [23]:
```
prediction = lr.predict(x_test)
plt.scatter(y_test,prediction)
```

```
---------------------------------------------------------------------------
NotFittedError                            Traceback (most recent call last)
<ipython-input-23-10d398fd7dc3> in <module>
----> 1 prediction = lr.predict(x_test)
      2 plt.scatter(y_test,prediction)

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\linear_model\_base.py in p
redict(self, X)
    236             Returns predicted values.
    237         """
--> 238         return self._decision_function(X)
    239
    240     _preprocess_data = staticmethod(_preprocess_data)

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\linear_model\_base.py in _
decision_function(self, X)
    216
    217     def _decision_function(self, X):
--> 218         check_is_fitted(self)
    219
    220         X = check_array(X, accept_sparse=['csr', 'csc', 'coo'])

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py in inn
er_f(*args, **kwargs)
     61             extra_args = len(args) - len(all_args)
     62             if extra_args <= 0:
---> 63                 return f(*args, **kwargs)
     64
     65             # extra_args > 0

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py in che
ck_is_fitted(estimator, attributes, msg, all_or_any)
   1039
   1040     if not attrs:
-> 1041         raise NotFittedError(msg % {'name': type(estimator).__name_
_})
   1042
   1043

NotFittedError: This LinearRegression instance is not fitted yet. Call 'fit'
with appropriate arguments before using this estimator.
```

In [24]:
```
print(lr.score(x_test,y_test))
```

```
---------------------------------------------------------------------------
NotFittedError                            Traceback (most recent call last)
<ipython-input-24-6bc23016a4ce> in <module>
----> 1 print(lr.score(x_test,y_test))

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\base.py in score(self, X,
y, sample_weight)
    551
    552         from .metrics import r2_score
--> 553         y_pred = self.predict(X)
    554         return r2_score(y, y_pred, sample_weight=sample_weight)
    555

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\linear_model\_base.py in p
redict(self, X)
    236             Returns predicted values.
    237         """
--> 238         return self._decision_function(X)
    239
    240     _preprocess_data = staticmethod(_preprocess_data)

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\linear_model\_base.py in _
decision_function(self, X)
    216
    217     def _decision_function(self, X):
--> 218         check_is_fitted(self)
    219
    220         X = check_array(X, accept_sparse=['csr', 'csc', 'coo'])

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py in inn
er_f(*args, **kwargs)
     61             extra_args = len(args) - len(all_args)
     62             if extra_args <= 0:
---> 63                 return f(*args, **kwargs)
     64
     65             # extra_args > 0

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py in che
ck_is_fitted(estimator, attributes, msg, all_or_any)
   1039
   1040     if not attrs:
-> 1041         raise NotFittedError(msg % {'name': type(estimator).__name_
_})
   1042
   1043

NotFittedError: This LinearRegression instance is not fitted yet. Call 'fit'
with appropriate arguments before using this estimator.
```

In [ ]:
```
```