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 to use linear regression model.Create a model that helps him to estimate of what the house would sell for

Import libraries

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

In [2]:
```
# To import dataset
df=pd.read_csv('bottle csv')
df
```

```
C:\ProgramData\Anaconda3\lib\site-packages\IPython\core\interactiveshell.py:3
165: DtypeWarning: Columns (47,73) have mixed types.Specify dtype option on i
mport or set low_memory=False.
  has_raised = await self.run_ast_nodes(code_ast.body, cell_name,
```

Out[2]:

	Cst_Cnt	Btl_Cnt	Sta_ID	Depth_ID	Depthm	T_degC	Salnty	O2ml_L	STheta	O2S
0	1	1	054.0 056.0	19-4903CR-HY-060-0930-05400560-0000A-3	0	10.500	33.4400	NaN	25.64900	Na
1	1	2	054.0 056.0	19-4903CR-HY-060-0930-05400560-0008A-3	8	10.460	33.4400	NaN	25.65600	Na
2	1	3	054.0 056.0	19-4903CR-HY-060-0930-05400560-0010A-7	10	10.460	33.4370	NaN	25.65400	Na
3	1	4	054.0 056.0	19-4903CR-HY-060-0930-05400560-0019A-3	19	10.450	33.4200	NaN	25.64300	Na
4	1	5	054.0 056.0	19-4903CR-HY-060-0930-05400560-0020A-7	20	10.450	33.4210	NaN	25.64300	Na
...	...	...	...	...	...	...	...	...	...	
864858	34404	864859	093.4 026.4	20-1611SR-MX-310-2239-09340264-0000A-7	0	18.744	33.4083	5.805	23.87055	108.7
864859	34404	864860	093.4 026.4	20-1611SR-MX-310-2239-09340264-0002A-3	2	18.744	33.4083	5.805	23.87072	108.7
864860	34404	864861	093.4 026.4	20-1611SR-MX-310-2239-09340264-0005A-3	5	18.692	33.4150	5.796	23.88911	108.4
864861	34404	864862	093.4 026.4	20-1611SR-MX-310-2239-09340264-0010A-3	10	18.161	33.4062	5.816	24.01426	107.7

	Cst_Cnt	Btl_Cnt	Sta_ID	Depth_ID	Depthm	T_degC	Salnty	O2ml_L	STheta	O2S
864862	34404	864863	093.4 026.4	20-1611SR-MX-310-2239-09340264-0015A-3	15	17.533	33.3880	5.774	24.15297	105.6

864863 rows × 74 columns

In [3]:
```
# To display top 10 rows
df.head(10)
```

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	1	6	054.0 056.0	19-4903CR-HY-060-0930-05400560-0030A-7	30	10.45	33.431	NaN	25.651	NaN	...	
6	1	7	054.0 056.0	19-4903CR-HY-060-0930-05400560-0039A-3	39	10.45	33.440	NaN	25.658	NaN	...	
7	1	8	054.0 056.0	19-4903CR-HY-060-0930-05400560-0050A-7	50	10.24	33.424	NaN	25.682	NaN	...	
8	1	9	054.0 056.0	19-4903CR-HY-060-0930-05400560-0058A-3	58	10.06	33.420	NaN	25.710	NaN	...	

	Cst_Cnt	Btl_Cnt	Sta_ID	Depth_ID	Depthm	T_degC	Salnty	O2ml_L	STheta	O2Sat	...	R
9	1	10	054.0 056.0	19-4903CR-HY-060-0930-05400560-0075A-7	75	9.86	33.494	NaN	25.801	NaN	...	

10 rows × 74 columns

Data Cleaning and Pre-Processing

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 864863 entries, 0 to 864862
Data columns (total 74 columns):
 #   Column              Non-Null Count   Dtype  
---  ------              --------------   -----  
 0   Cst_Cnt             864863 non-null  int64  
 1   Btl_Cnt             864863 non-null  int64  
 2   Sta_ID              864863 non-null  object 
 3   Depth_ID            864863 non-null  object 
 4   Depthm              864863 non-null  int64  
 5   T_degC              853900 non-null  float64
 6   Salnty              817509 non-null  float64
 7   O2ml_L              696201 non-null  float64
 8   STheta              812174 non-null  float64
 9   O2Sat               661274 non-null  float64
 10  Oxy_µmol/Kg         661268 non-null  float64
 11  BtlNum              118667 non-null  float64
 12  RecInd              864863 non-null  int64  
 13  T_prec              853900 non-null  float64
 14  T_qual              23127 non-null   float64
 15  S_prec              817509 non-null  float64
 16  S_qual              74914 non-null   float64
 17  P_qual              673755 non-null  float64
 18  O_qual              184676 non-null  float64
 19  SThtaq              65823 non-null   float64
 20  O2Satq              217797 non-null  float64
 21  ChlorA              225272 non-null  float64
 22  Chlqua              639166 non-null  float64
 23  Phaeop              225271 non-null  float64
 24  Phaqua              639170 non-null  float64
 25  PO4uM               413317 non-null  float64
 26  PO4q                451786 non-null  float64
 27  SiO3uM              354091 non-null  float64
 28  SiO3qu              510866 non-null  float64
 29  NO2uM               337576 non-null  float64
 30  NO2q                529474 non-null  float64
 31  NO3uM               337403 non-null  float64
 32  NO3q                529933 non-null  float64
 33  NH3uM               64962 non-null   float64
 34  NH3q                808299 non-null  float64
 35  C14As1              14432 non-null   float64
 36  C14A1p              12760 non-null   float64
 37  C14A1q              848605 non-null  float64
 38  C14As2              14414 non-null   float64
 39  C14A2p              12742 non-null   float64
 40  C14A2q              848623 non-null  float64
 41  DarkAs              22649 non-null   float64
 42  DarkAp              20457 non-null   float64
 43  DarkAq              840440 non-null  float64
 44  MeanAs              22650 non-null   float64
 45  MeanAp              20457 non-null   float64
 46  MeanAq              840439 non-null  float64
 47  IncTim              14437 non-null   object 
 48  LightP              18651 non-null   float64
 49  R_Depth             864863 non-null  float64
 50  R_TEMP              853900 non-null  float64
 51  R_POTEMP            818816 non-null  float64
```

```
 52  R_SALINITY          817509 non-null  float64
 53  R_SIGMA             812007 non-null  float64
 54  R_SVA               812092 non-null  float64
 55  R_DYNHT             818206 non-null  float64
 56  R_O2                696201 non-null  float64
 57  R_O2Sat             666448 non-null  float64
 58  R_SIO3              354099 non-null  float64
 59  R_PO4               413325 non-null  float64
 60  R_NO3               337411 non-null  float64
 61  R_NO2               337584 non-null  float64
 62  R_NH4               64982 non-null   float64
 63  R_CHLA              225276 non-null  float64
 64  R_PHAEO             225275 non-null  float64
 65  R_PRES              864863 non-null  int64
 66  R_SAMP              122006 non-null  float64
 67  DIC1                1999 non-null    float64
 68  DIC2                224 non-null     float64
 69  TA1                 2084 non-null    float64
 70  TA2                 234 non-null     float64
 71  pH2                 10 non-null      float64
 72  pH1                 84 non-null      float64
 73  DIC Quality Comment  55 non-null     object
dtypes: float64(65), int64(5), object(4)
memory usage: 488.3+ MB
```

In [5]:
```
df.describe()
```

Out[5]:

	Cst_Cnt	Btl_Cnt	Depthm	T_degC	Salnty	O2ml_
count	864863.000000	864863.000000	864863.000000	853900.000000	817509.000000	696201.00000
mean	17138.790958	432432.000000	226.831951	10.799677	33.840350	3.39246
std	10240.949817	249664.587267	316.050259	4.243825	0.461843	2.07325
min	1.000000	1.000000	0.000000	1.440000	28.431000	-0.01000
25%	8269.000000	216216.500000	46.000000	7.680000	33.488000	1.36000
50%	16848.000000	432432.000000	125.000000	10.060000	33.863000	3.44000
75%	26557.000000	648647.500000	300.000000	13.880000	34.196900	5.50000
max	34404.000000	864863.000000	5351.000000	31.140000	37.034000	11.13000

8 rows × 70 columns

In [6]:
```
df.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', 'pH2', 'pH1', 'DIC Quality Comment'],
      dtype='object')
```

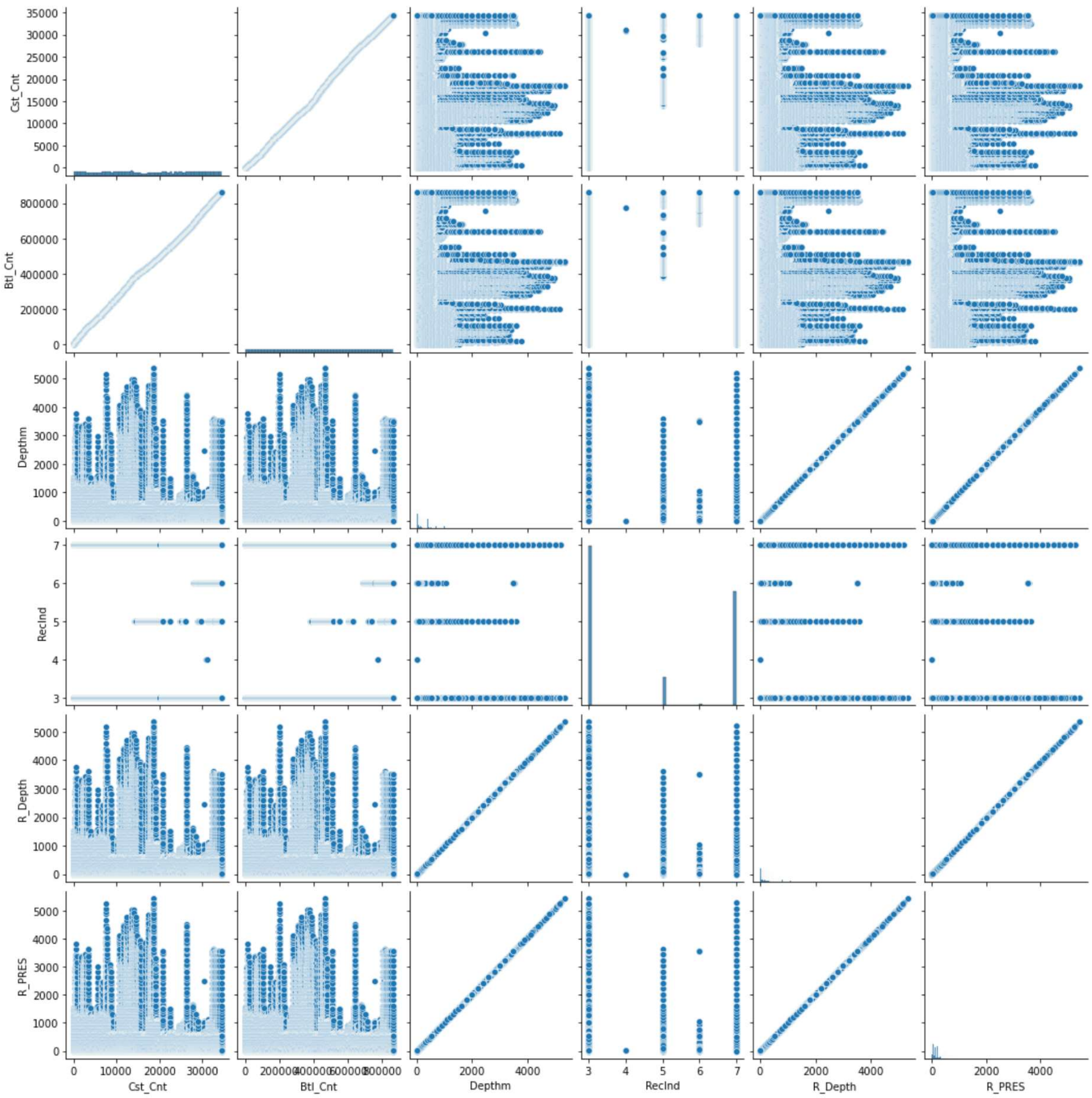
In [7]:
```
a = df.dropna(axis='columns')
a.columns
```

Out[7]:
```
Index(['Cst_Cnt', 'Btl_Cnt', 'Sta_ID', 'Depth_ID', 'Depthm', 'RecInd',
       'R_Depth', 'R_PRES'],
      dtype='object')
```

EDA and Visualization

In [8]:
```
sns.pairplot(a)
```

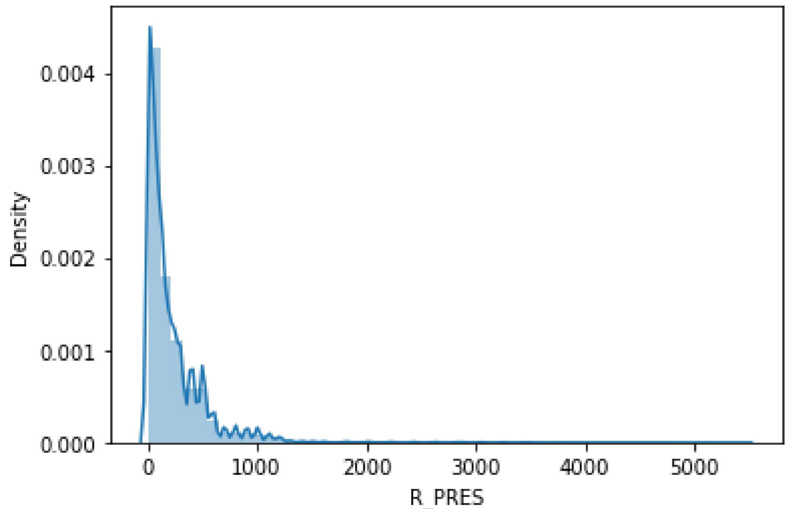
Out[8]: <seaborn.axisgrid.PairGrid at 0x2638d039e20>



In [9]:
```
sns.distplot(a['R_PRES'])
```

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

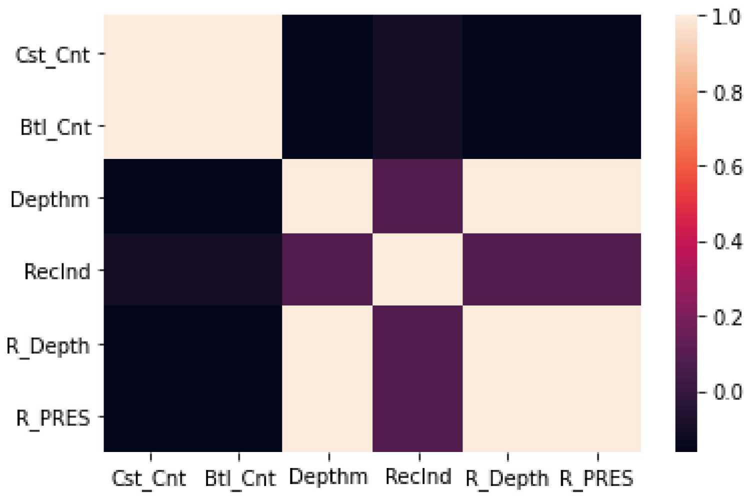
Out[9]:
```
<AxesSubplot:xlabel='R_PRES', ylabel='Density'>
```



In [10]:
```
a1=a[['Cst_Cnt', 'Btl_Cnt', 'Sta_ID', 'Depth_ID', 'Depthm', 'RecInd',
       'R_Depth', 'R_PRES']]
```

In [11]:
```
sns.heatmap(a1.corr())
```

Out[11]:
```
<AxesSubplot:>
```



To Train the Model - Model Building

We are going to train Linear Regression model:We need to split out data into two variables x

In [16]:
```
x=a1[['Cst_Cnt', 'Btl_Cnt', 'R_Depth', 'R_PRES']]
y=a1['Depthm']
```

To split my dataset into training and test data

In [18]:
```
from sklearn.model_selection import train_test_split

x_train,x_test,y_train,y_test = train_test_split(x,y,test_size=0.3)
```

In [19]:
```
from sklearn.linear_model import LinearRegression

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

Out[19]:
```
LinearRegression()
```

In [20]:
```
print(lr.intercept_)
```

```
0.0015351219604440303
```

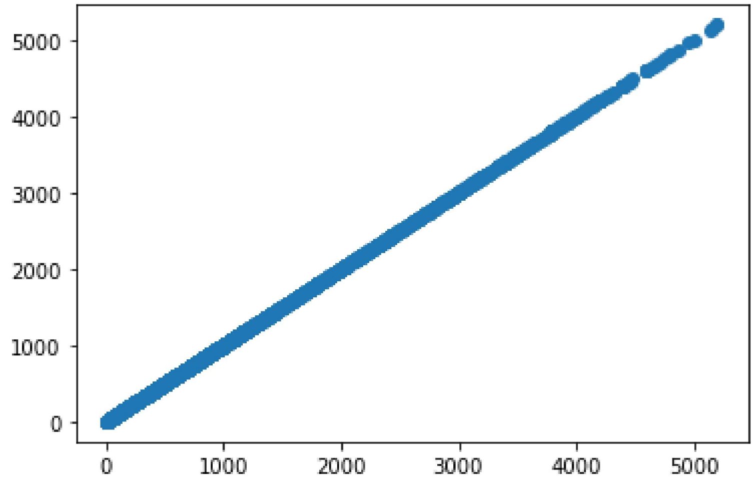
In [21]:
```
coeff=pd.DataFrame(lr.coef_,x.columns,columns=['Co-efficient'])
coeff
```

Out[21]:

	Co-efficient
Cst_Cnt	1.606121e-06
Btl_Cnt	-6.920989e-08
R_Depth	1.000296e+00
R_PRES	-2.925724e-04

In [22]:
```
prediction=lr.predict(x_test)
plt.scatter(y_test,prediction)
```

Out[22]: <matplotlib.collections.PathCollection at 0x26394a15a00>



In [23]:
```
print(lr.score(x_test,y_test))
```

0.9999999942244459

In [ ]: