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]:
```
data = pd.read_csv(r"C:\Users\user\Downloads\9_bottle.csv")
data
```

```
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	O2Sa
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	O2Sa
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 [12]:
```
data1 = data[0:5000]
data1
```

Out[12]:

	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	...
...	...	...	...	...	...	...	...	...	...	...	...
4995	165	4996	092.0 098.0	19-4904NS-HY-102-1342-09200980-0099A-3	99	11.41	33.440	5.42	25.490	87.6	...
4996	165	4997	092.0 098.0	19-4904NS-HY-102-1342-09200980-0100A-7	100	11.36	33.444	5.39	25.502	87.0	...
4997	165	4998	092.0 098.0	19-4904NS-HY-102-1342-09200980-0125A-7	125	10.16	33.555	4.59	25.800	72.2	...
4998	165	4999	092.0 098.0	19-4904NS-HY-102-1342-09200980-0149A-3	149	9.24	33.680	3.78	26.049	58.3	...

	Cst_Cnt	Btl_Cnt	Sta_ID	Depth_ID	Depthm	T_degC	Salnty	O2ml_L	STheta	O2Sat	...
4999	165	5000	092.0 098.0	19-4904NS-HY-102-1342-09200980-0150A-7	150	9.22	33.682	3.76	26.054	58.0	...

5000 rows × 74 columns

In [13]:
```
data1.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5000 entries, 0 to 4999
Data columns (total 74 columns):
 #   Column               Non-Null Count  Dtype  
---  ------               --------------  -----  
 0   Cst_Cnt              5000 non-null   int64  
 1   Btl_Cnt              5000 non-null   int64  
 2   Sta_ID               5000 non-null   object 
 3   Depth_ID             5000 non-null   object 
 4   Depthm               5000 non-null   int64  
 5   T_degC               4980 non-null   float64
 6   Salnty               4848 non-null   float64
 7   O2ml_L               2810 non-null   float64
 8   STheta               4833 non-null   float64
 9   O2Sat                2713 non-null   float64
 10  Oxy_µmol/Kg          2713 non-null   float64
 11  BtlNum               0 non-null      float64
 12  RecInd               5000 non-null   int64  
 13  T_prec               4980 non-null   float64
 14  T_qual               51 non-null     float64
 15  S_prec               4848 non-null   float64
 16  S_qual               238 non-null    float64
 17  P_qual               5000 non-null   float64
 18  O_qual               2193 non-null   float64
 19  SThtaq               281 non-null    float64
 20  O2Satq               2356 non-null   float64
 21  ChlorA               0 non-null      float64
 22  Chlqua               5000 non-null   float64
 23  Phaeop               0 non-null      float64
 24  Phaqua               5000 non-null   float64
 25  PO4uM                1046 non-null   float64
 26  PO4q                 3954 non-null   float64
 27  SiO3uM               0 non-null      float64
 28  SiO3qu               5000 non-null   float64
 29  NO2uM                0 non-null      float64
 30  NO2q                 5000 non-null   float64
 31  NO3uM                0 non-null      float64
 32  NO3q                 5000 non-null   float64
 33  NH3uM                0 non-null      float64
 34  NH3q                 5000 non-null   float64
 35  C14As1               0 non-null      float64
 36  C14A1p               0 non-null      float64
 37  C14A1q               5000 non-null   float64
 38  C14As2               0 non-null      float64
 39  C14A2p               0 non-null      float64
 40  C14A2q               5000 non-null   float64
 41  DarkAs               0 non-null      float64
 42  DarkAp               0 non-null      float64
 43  DarkAq               5000 non-null   float64
 44  MeanAs               0 non-null      float64
 45  MeanAp               0 non-null      float64
 46  MeanAq               5000 non-null   float64
 47  IncTim               0 non-null      object 
 48  LightP               0 non-null      float64
 49  R_Depth              5000 non-null   float64
 50  R_TEMP               4980 non-null   float64
 51  R_POTEMP             4775 non-null   float64
```

```
 52  R_SALINITY           4848 non-null   float64
 53  R_SIGMA              4719 non-null   float64
 54  R_SVA                4719 non-null   float64
 55  R_DYNHT              4786 non-null   float64
 56  R_O2                 2810 non-null   float64
 57  R_O2Sat              2690 non-null   float64
 58  R_SIO3               0 non-null      float64
 59  R_PO4                1046 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               5000 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
 71  pH2                  0 non-null      float64
 72  pH1                  0 non-null      float64
 73  DIC Quality Comment  0 non-null      object
dtypes: float64(65), int64(5), object(4)
memory usage: 2.8+ MB
```

In [14]:
```
data1.columns
```

Out[14]:
```
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 [15]:
```
df1 = data1[['Cst_Cnt','Btl_Cnt','Depthm','T_degC','Salnty']]
df1
```

Out[15]:

	Cst_Cnt	Btl_Cnt	Depthm	T_degC	Salnty
0	1	1	0	10.50	33.440
1	1	2	8	10.46	33.440
2	1	3	10	10.46	33.437
3	1	4	19	10.45	33.420
4	1	5	20	10.45	33.421
...	...	...	...	...	...
4995	165	4996	99	11.41	33.440
4996	165	4997	100	11.36	33.444
4997	165	4998	125	10.16	33.555
4998	165	4999	149	9.24	33.680
4999	165	5000	150	9.22	33.682

5000 rows × 5 columns

In [16]:
```
df1.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5000 entries, 0 to 4999
Data columns (total 5 columns):
 #   Column   Non-Null Count  Dtype  
---  ------   --------------  -----  
 0   Cst_Cnt  5000 non-null   int64  
 1   Btl_Cnt  5000 non-null   int64  
 2   Depthm   5000 non-null   int64  
 3   T_degC   4980 non-null   float64
 4   Salnty   4848 non-null   float64
dtypes: float64(2), int64(3)
memory usage: 195.4 KB
```

In [27]:
```
df1.isna().sum()
```

Out[27]:
```
Cst_Cnt      0
Btl_Cnt      0
Depthm       0
T_degC      20
Salnty     152
dtype: int64
```

In [31]:
```
df2 = df1.fillna(value=30)
```

In [32]:
```
df2.isna().sum()
```

Out[32]:
```
Cst_Cnt    0
Btl_Cnt    0
Depthm     0
T_degC     0
Salnty     0
dtype: int64
```

In [33]:
```
df2.describe()
```

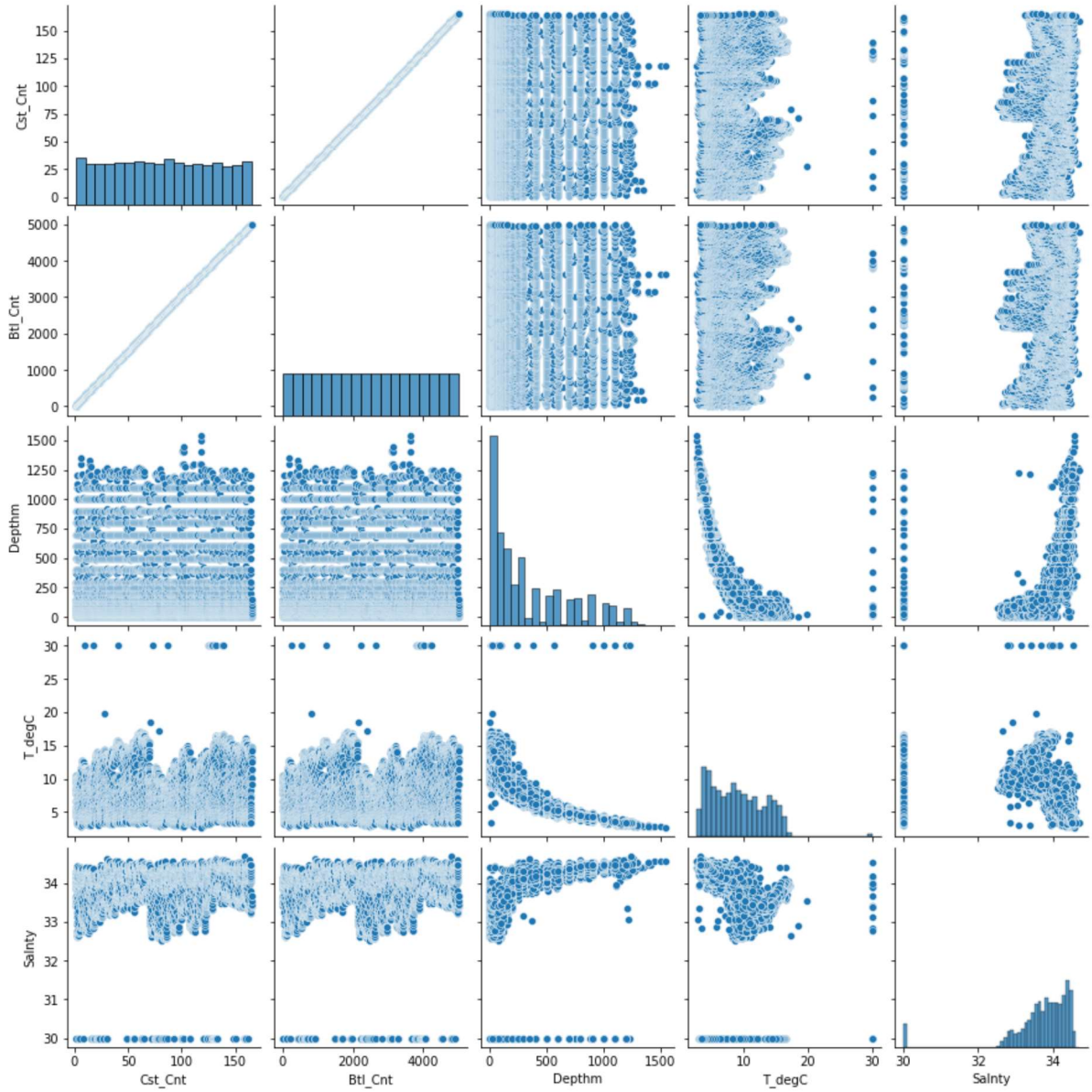
Out[33]:

	Cst_Cnt	Btl_Cnt	Depthm	T_degC	Salnty
count	5000.000000	5000.000000	5000.000000	5000.000000	5000.000000
mean	82.129400	2500.500000	347.985200	9.058438	33.711692
std	47.348975	1443.520003	358.279702	4.122914	0.818492
min	1.000000	1.000000	0.000000	2.700000	30.000000
25%	41.000000	1250.750000	55.000000	5.400000	33.460000
50%	82.000000	2500.500000	200.000000	8.630000	33.863500
75%	123.000000	3750.250000	600.000000	12.230000	34.250000
max	165.000000	5000.000000	1547.000000	30.000000	34.700000

EDA and Visualization

In [34]:
```
sns.pairplot(df2)
```

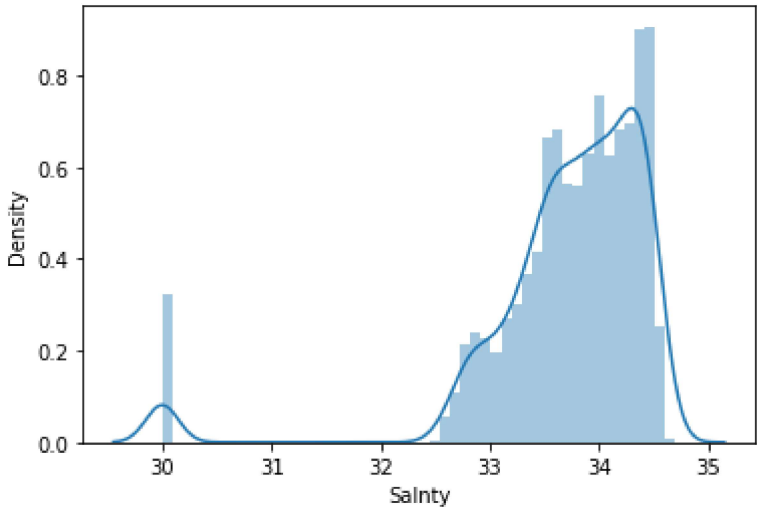
Out[34]:
```
<seaborn.axisgrid.PairGrid at 0x249a9593280>
```



In [36]:
```
sns.distplot(df2["Salnty"])
```

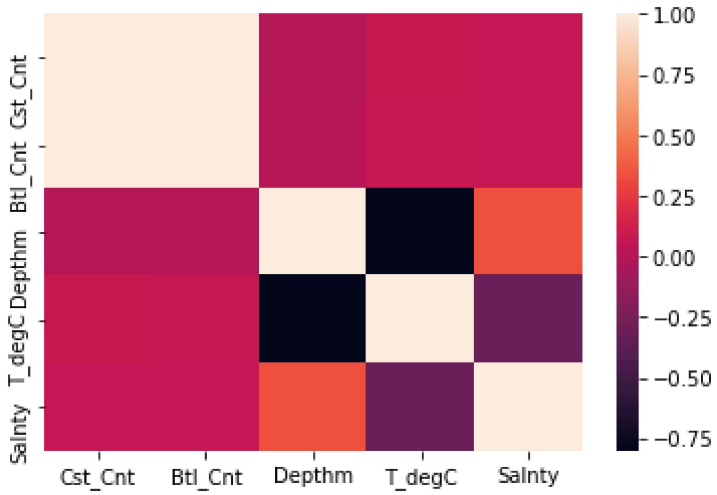
```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\distributions.py:2557: Fut
ureWarning: `distplot` is a deprecated function and will be removed in a futu
re version. Please adapt your code to use either `displot` (a figure-level fu
nction with similar flexibility) or `histplot` (an axes-level function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

Out[36]: <AxesSubplot:xlabel='Salnty', ylabel='Density'>



In [38]:
```
sns.heatmap(df2.corr())
```

Out[38]: <AxesSubplot:>



Linear Regression

In [39]:
```
x = df2[['Cst_Cnt','Btl_Cnt','Depthm','T_degC']]
y = df2["Salnty"]
```

In [40]:
```
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 [41]:
```
from sklearn.linear_model import LinearRegression

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

Out[41]:
```
LinearRegression()
```

In [42]:
```
print(lr.intercept_)
```

```
33.74313638793897
```

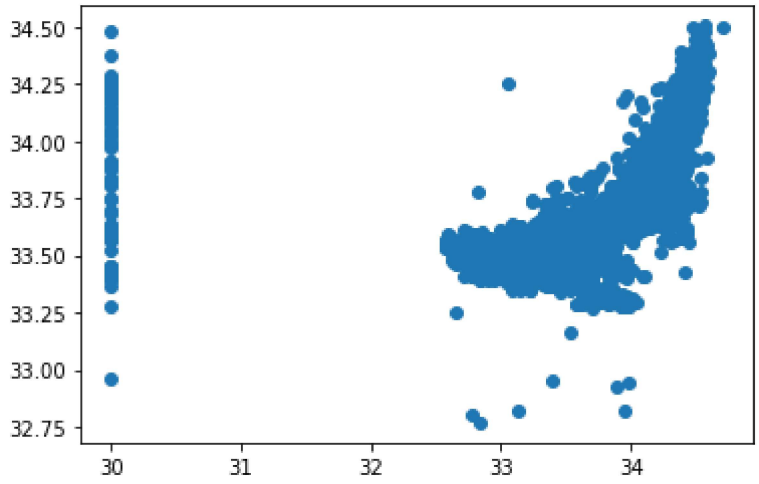
In [43]:
```
coeff = pd.DataFrame(lr.coef_,x.columns,columns=["Co-efficient"])
coeff
```

Out[43]:

	Co-efficient
Cst_Cnt	0.085575
Btl_Cnt	-0.002753
Depthm	0.000467
T_degC	-0.035911

In [44]:
```
prediction = lr.predict(x_test)
plt.scatter(y_test,prediction)
```

Out[44]:
```
<matplotlib.collections.PathCollection at 0x249a97a8280>
```



In [45]:
```
print(lr.score(x_test,y_test))
```

```
0.12803415035240273
```

In [ ]: