

```
In [1]: import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn import preprocessing, svm
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.preprocessing import StandardScaler
```

```
In [2]: dt=pd.read_csv(r"C:\Users\91903\Downloads\bottle.csv")
dt
```

C:\Users\91903\AppData\Local\Temp\ipykernel\_19628\3720528792.py:1: DtypeWarning: Columns (47,73) have mixed types. Specify dtype option on import or set low\_memory=False.

```
dt=pd.read_csv(r"C:\Users\91903\Downloads\bottle.csv")
```

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	Ni
1	1	2	054.0 056.0	19- 4903CR- HY-060- 0930- 05400560- 0008A-3	8	10.460	33.4400	NaN	25.65600	Ni
2	1	3	054.0 056.0	19- 4903CR- HY-060- 0930- 05400560- 0010A-7	10	10.460	33.4370	NaN	25.65400	Ni
3	1	4	054.0 056.0	19- 4903CR- HY-060- 0930- 05400560- 0019A-3	19	10.450	33.4200	NaN	25.64300	Ni
4	1	5	054.0 056.0	19- 4903CR- HY-060- 0930- 05400560- 0020A-7	20	10.450	33.4210	NaN	25.64300	Ni
...	...	...	...	...	...	...	...	...	...	...
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.
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.
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.
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.

	Cst_Cnt	Btl_Cnt	Sta_ID	Depth_ID	Depthm	T_degC	Salnty	O2ml_L	STheta	O2S
				20-1611SR-MX-310-2239-09340264-0015A-3						
864862	34404	864863	093.4026.4		15	17.533	33.3880	5.774	24.15297	105.

864863 rows × 74 columns

```
In [3]: dt=dt[['Salnty','T_degC']]
dt.columns=['Sal','Temp']
```

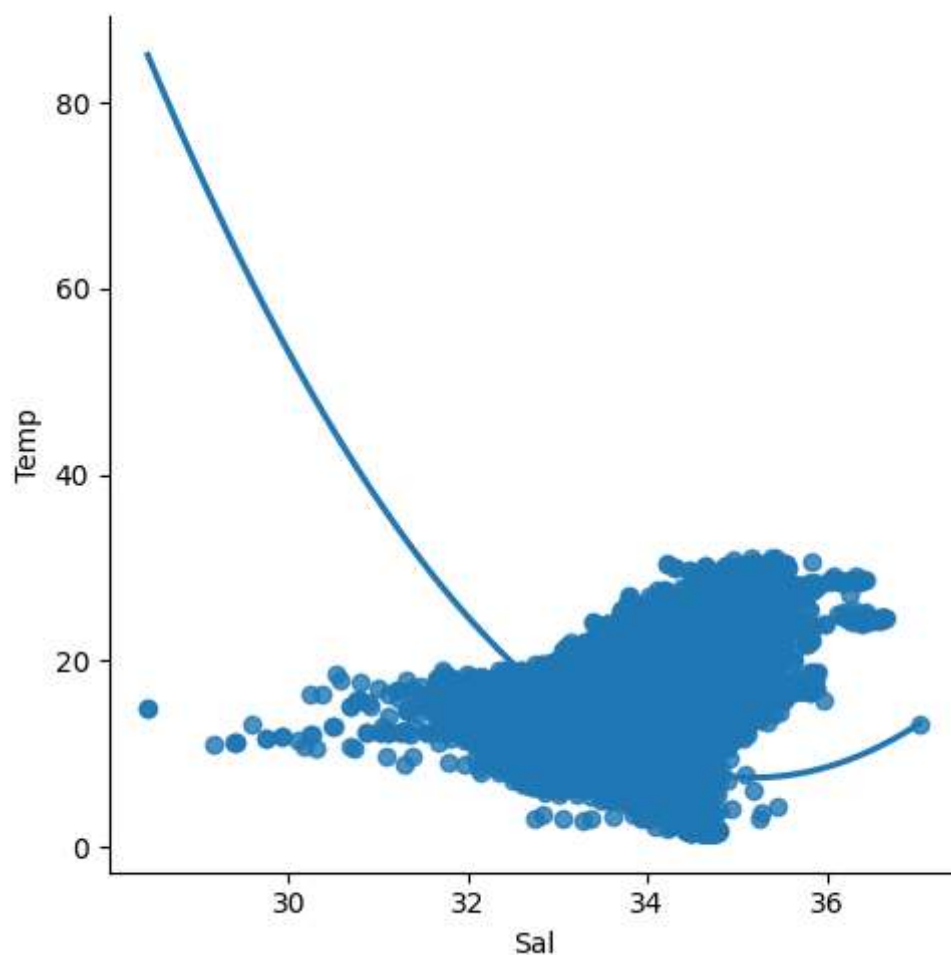
```
In [4]: dt.head()
```

Out[4]:

	Sal	Temp
0	33.440	10.50
1	33.440	10.46
2	33.437	10.46
3	33.420	10.45
4	33.421	10.45

```
In [5]: sns.lmplot(x='Sal',y='Temp',data=dt,order=2,ci=None)
```

```
Out[5]: <seaborn.axisgrid.FacetGrid at 0x25789548fa0>
```



```
In [6]: dt.info()
```

```
<class 'pandas.core.frame.DataFrame'>  
RangeIndex: 864863 entries, 0 to 864862  
Data columns (total 2 columns):  
#   Column  Non-Null Count  Dtype  
---  ---      -  
0   Sal      817509 non-null   float64  
1   Temp     853900 non-null   float64  
dtypes: float64(2)  
memory usage: 13.2 MB
```

```
In [7]: dt.describe()
```

```
Out[7]:
```

	Sal	Temp
count	817509.000000	853900.000000
mean	33.840350	10.799677
std	0.461843	4.243825
min	28.431000	1.440000
25%	33.488000	7.680000
50%	33.863000	10.060000
75%	34.196900	13.880000
max	37.034000	31.140000

```
In [8]: dt.fillna(method='ffill')
```

```
Out[8]:
```

	Sal	Temp
0	33.4400	10.500
1	33.4400	10.460
2	33.4370	10.460
3	33.4200	10.450
4	33.4210	10.450
...	...	...
864858	33.4083	18.744
864859	33.4083	18.744
864860	33.4150	18.692
864861	33.4062	18.161
864862	33.3880	17.533

864863 rows × 2 columns

```
In [9]: dt.fillna(value=0,inplace=True)
```

C:\Users\91903\AppData\Local\Temp\ipykernel\_19628\678165680.py:1: SettingWithCopyWarning:

A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: [https://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy) ([https://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy))

```
dt.fillna(value=0,inplace=True)
```

```
In [10]: dt.isnull().sum()
```

```
Out[10]: Sal      0  
Temp      0  
dtype: int64
```

```
In [11]: x=np.array(dt['Sal']).reshape(-1,1)  
y=np.array(dt['Temp']).reshape(-1,1)
```

```
In [12]: dt.isna().any()
```

```
Out[12]: Sal      False  
Temp      False  
dtype: bool
```

```
In [13]: dt.dropna(inplace=True)
```

C:\Users\91903\AppData\Local\Temp\ipykernel\_19628\735218168.py:1: SettingWithCopyWarning:

A value is trying to be set on a copy of a slice from a DataFrame

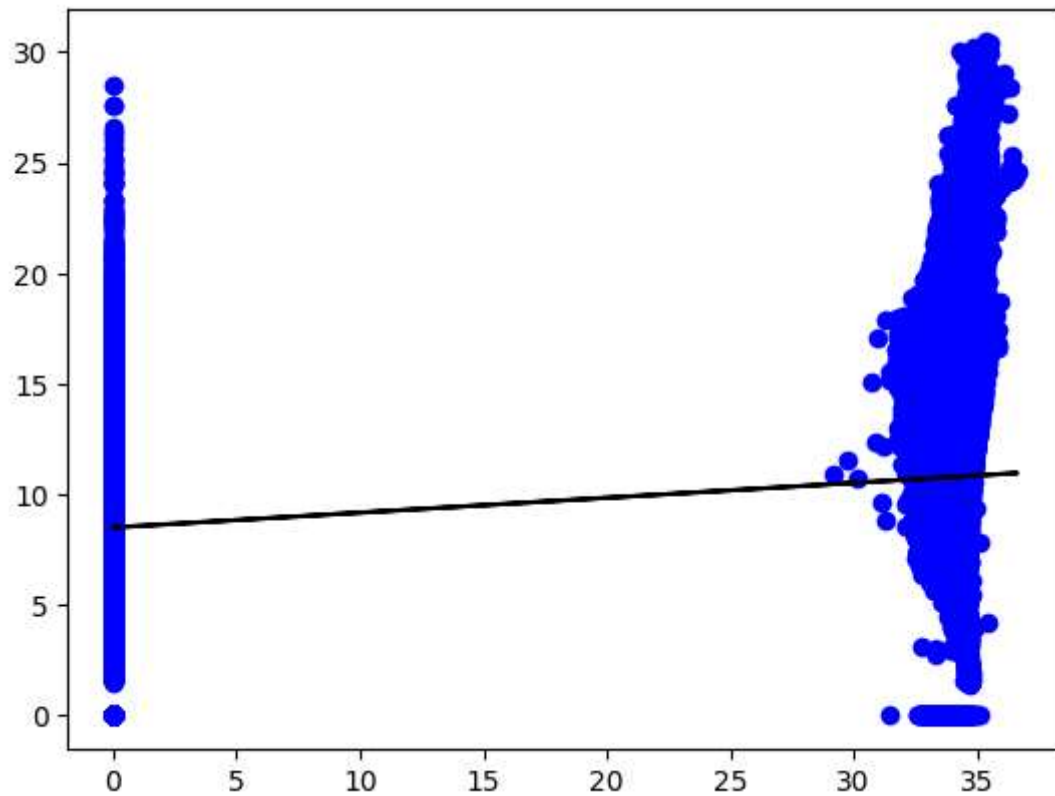
See the caveats in the documentation: [https://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy) ([https://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy))

```
dt.dropna(inplace=True)
```

```
In [14]: X_train,X_test,y_train,y_test=train_test_split(x,y,test_size=0.25)  
reg=LinearRegression()  
reg.fit(X_train,y_train)  
print(reg.score(X_test,y_test))
```

```
0.01440273111913759
```

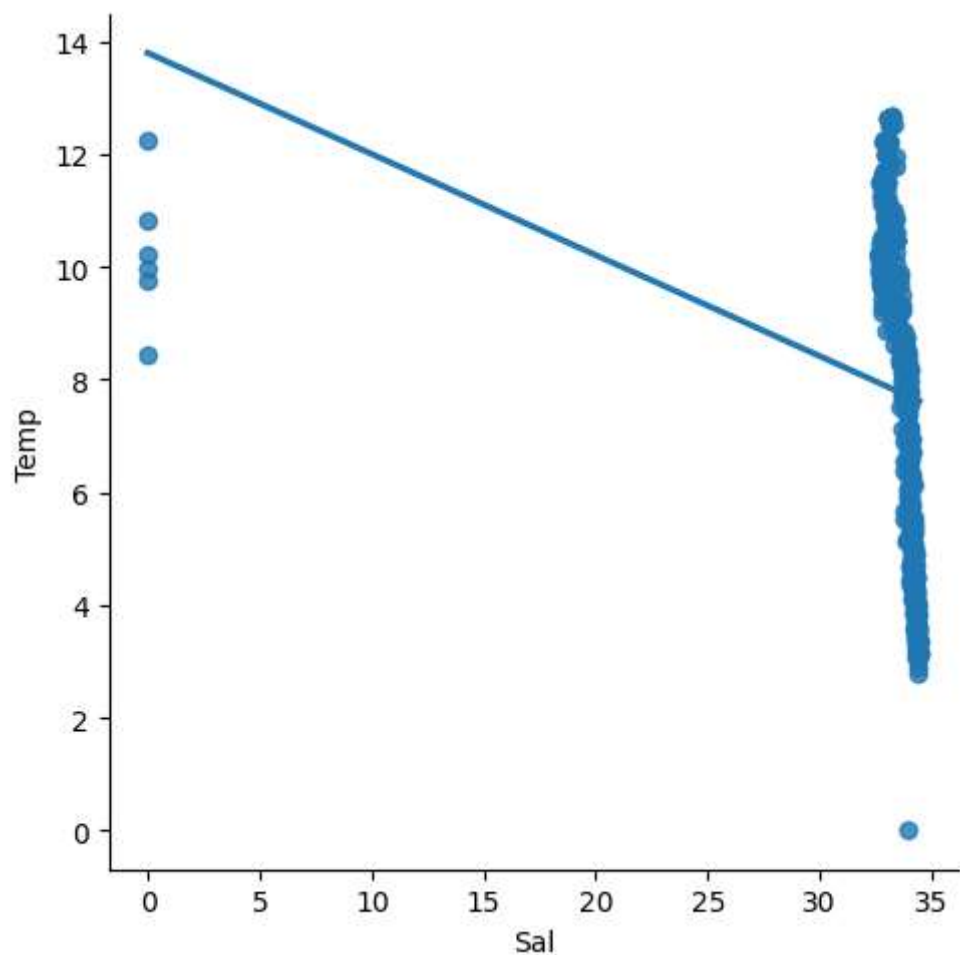
```
In [15]: y_pred=reg.predict(X_test)
plt.scatter(X_test,y_test,color='b')
plt.plot(X_test,y_pred,color='k')
plt.show()
```





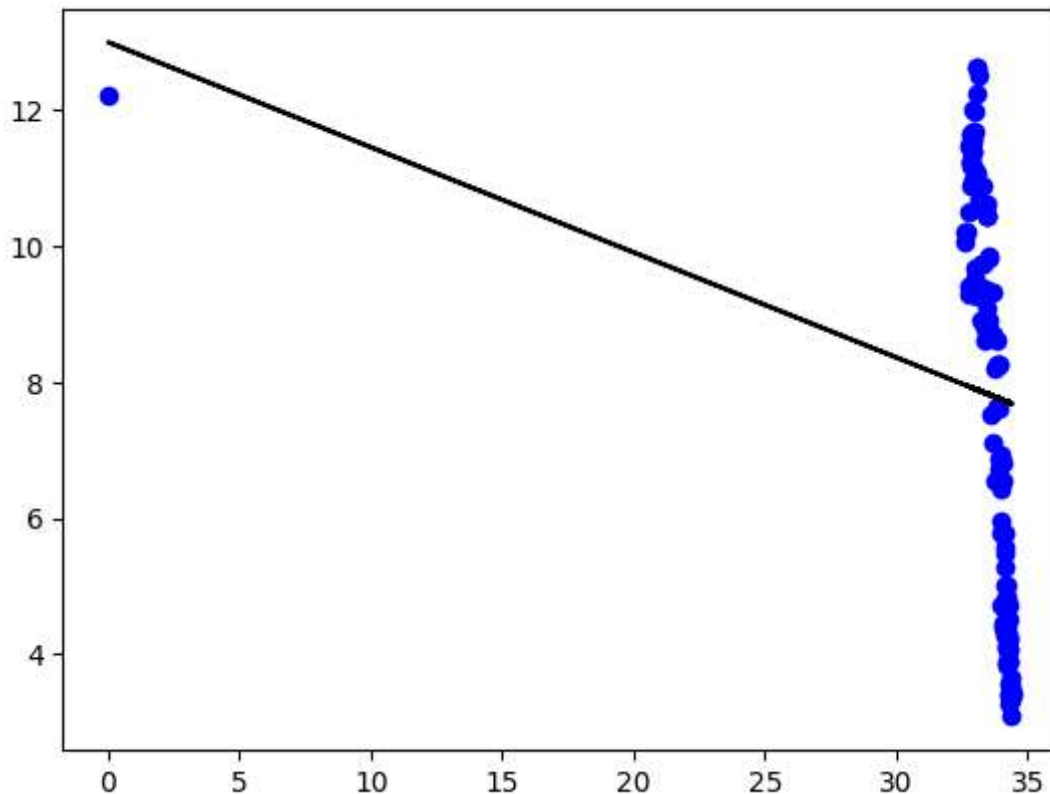
```
In [16]: dt500=dt[:][:500]  
sns.lmplot(x="Sal",y="Temp",data=dt500,order=1,ci=None)
```

Out[16]: <seaborn.axisgrid.FacetGrid at 0x257d0bcf5e0>



```
In [17]: dt500.fillna(method='ffill',inplace=True)
X=np.array(dt500['Sal']).reshape(-1,1)
y=np.array(dt500['Temp']).reshape(-1,1)
dt500.dropna(inplace=True)
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.25)
reg=LinearRegression()
reg.fit(X_train,y_train)
print("Regression:",reg.score(X_test,y_test))
y_pred=reg.predict(X_test)
plt.scatter(X_test,y_test,color="b")
plt.plot(X_test,y_pred,color='k')
plt.show()
```

Regression: 0.06939273838834747



```
In [18]: from sklearn.linear_model import LinearRegression
from sklearn.metrics import r2_score
model=LinearRegression()
model.fit(X_train,y_train)
y_pred=model.predict(X_test)
r2=r2_score(y_test,y_pred)
print("R2 score:",r2)
```

R2 score: 0.06939273838834747

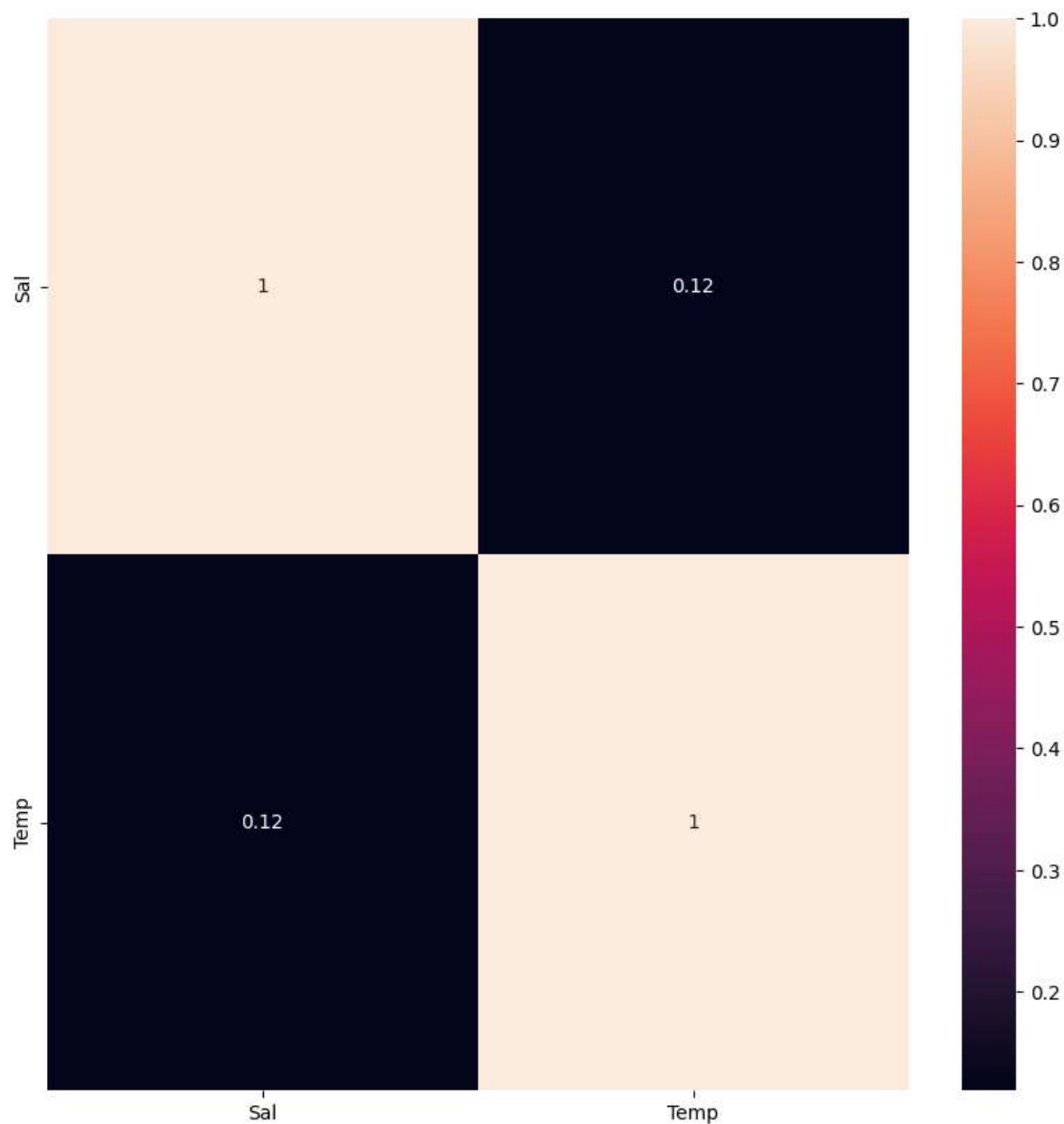
#conclusion : Linear regression is best fit for the model

## Ridge and Lasso Regression

```
In [19]: from sklearn.linear_model import Ridge  
from sklearn.linear_model import RidgeCV  
from sklearn.linear_model import Lasso
```

```
In [20]: plt.figure(figsize = (10, 10))  
sns.heatmap(dt.corr(), annot = True)
```

Out[20]: <Axes: >



```
In [21]: features = dt.columns[0:2]
target = dt.columns[-1]
#X and y values
X = dt[features].values
y = dt[target].values
#split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=42)
print("The dimension of X_train is {}".format(X_train.shape))
print("The dimension of X_test is {}".format(X_test.shape))
#Scale features
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
```

The dimension of X\_train is (605404, 2)

The dimension of X\_test is (259459, 2)

```
In [22]: lr = LinearRegression()
#Fit model
lr.fit(X_train, y_train)
#predict
#prediction = lr.predict(X_test)
#actual
actual = y_test
train_score_lr = lr.score(X_train, y_train)
test_score_lr = lr.score(X_test, y_test)
print("\nLinear Regression Model:\n")
print("The train score for lr model is {}".format(train_score_lr))
print("The test score for lr model is {}".format(test_score_lr))
```

Linear Regression Model:

The train score for lr model is 1.0

The test score for lr model is 1.0

```
In [23]: ridgeReg = Ridge(alpha=10)
ridgeReg.fit(X_train,y_train)
#train and test scorefor ridge regression
train_score_ridge = ridgeReg.score(X_train, y_train)
test_score_ridge = ridgeReg.score(X_test, y_test)
print("\nRidge Model:\n")
print("The train score for ridge model is {}".format(train_score_ridge))
print("The test score for ridge model is {}".format(test_score_ridge))
```

Ridge Model:

The train score for ridge model is 0.999999999723243

The test score for ridge model is 0.9999999997231402

```
In [24]: plt.figure(figsize = (10, 10))
plt.plot(features,ridgeReg.coef_,alpha=0.7,linestyle='none',marker='*',markersize=7,
         plt.plot(features,lr.coef_,alpha=0.4,linestyle='none',marker='o',markersize=7,
plt.xticks(rotation = 90)
plt.legend()
plt.show()
```



```
In [25]: print("\nLasso Model: \n")
lasso = Lasso(alpha = 10)
lasso.fit(X_train,y_train)
train_score_ls =lasso.score(X_train,y_train)
test_score_ls =lasso.score(X_test,y_test)
print("The train score for ls model is {}".format(train_score_ls))
print("The train score for ls model is {}".format(test_score_ls))
```

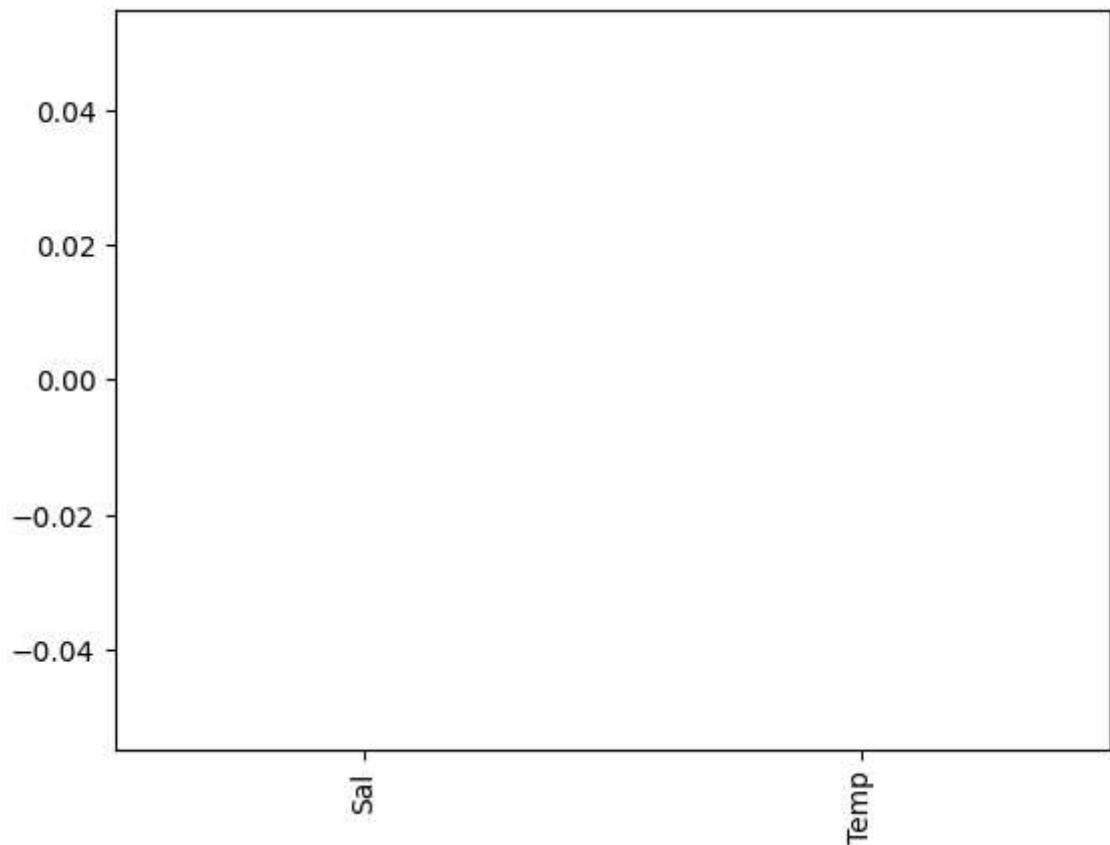
Lasso Model:

The train score for ls model is 0.0

The train score for ls model is -1.9031696447013857e-05

```
In [26]: pd.Series(lasso.coef_, features).sort_values(ascending = True).plot(kind = "bar")
```

Out[26]: <Axes: >



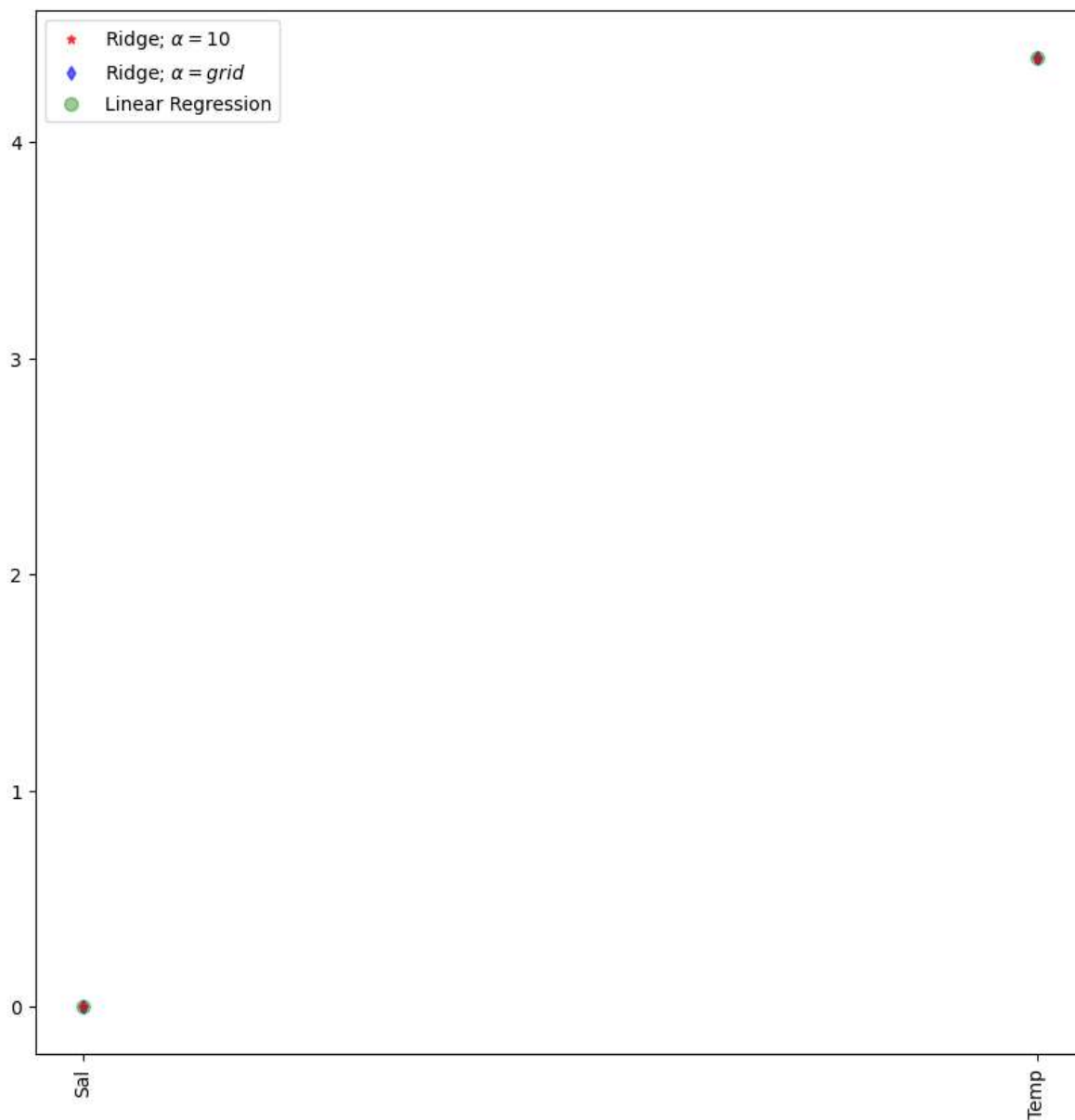
```
In [27]: #Using the Linear CV model
from sklearn.linear_model import LassoCV
#Lasso Cross validation
lasso_cv = LassoCV(alphas = [0.0001, 0.001,0.01, 0.1, 1, 10], random_state=0).
#score
print(lasso_cv.score(X_train, y_train))
print(lasso_cv.score(X_test, y_test))
```

0.9999999994806811

0.9999999994806712

```
In [28]: plt.figure(figsize = (10, 10))
plt.plot(features,ridgeReg.coef_,alpha=0.7,linestyle='none',marker='*',markersize=50,
plt.plot(features,ridgeReg.coef_,alpha=0.6,linestyle='none',marker='d',markersize=50,

plt.plot(features,lr.coef_,alpha=0.4,linestyle='none',marker='o',markersize=7,
plt.xticks(rotation = 90)
plt.legend()
plt.show()
```



```
In [29]: #Using the Linear CV model
from sklearn.linear_model import RidgeCV
#Ridge Cross validation
ridge_cv = RidgeCV(alphas = [0.0001, 0.001,0.01, 0.1, 1, 10]).fit(X_train, y_train)
#score
print("The train score for ridge model is {}".format(ridge_cv.score(X_train, y_train)))
print("The train score for ridge model is {}".format(ridge_cv.score(X_test, y_test)))
```

The train score for ridge model is 0.9999999986821938

The train score for ridge model is 0.9999999986802476

## ElasticNet Regression

```
In [30]: from sklearn.linear_model import ElasticNet
regr=ElasticNet()
regr.fit(X,y)
print(regr.coef_)
print(regr.intercept_)
```

```
[0.          0.94934511]
0.5401219631068575
```

```
In [33]: y_pred_elastic=regr.predict(X_train)
```

```
In [34]: mean_squared_error=np.mean((y_pred_elastic-y_train)**2)
print("Mean Squared Error on test set",mean_squared_error)
```

Mean Squared Error on test set 114.409848086591

```
In [ ]:
```