Neural Networks & Deep Learning: ICP1

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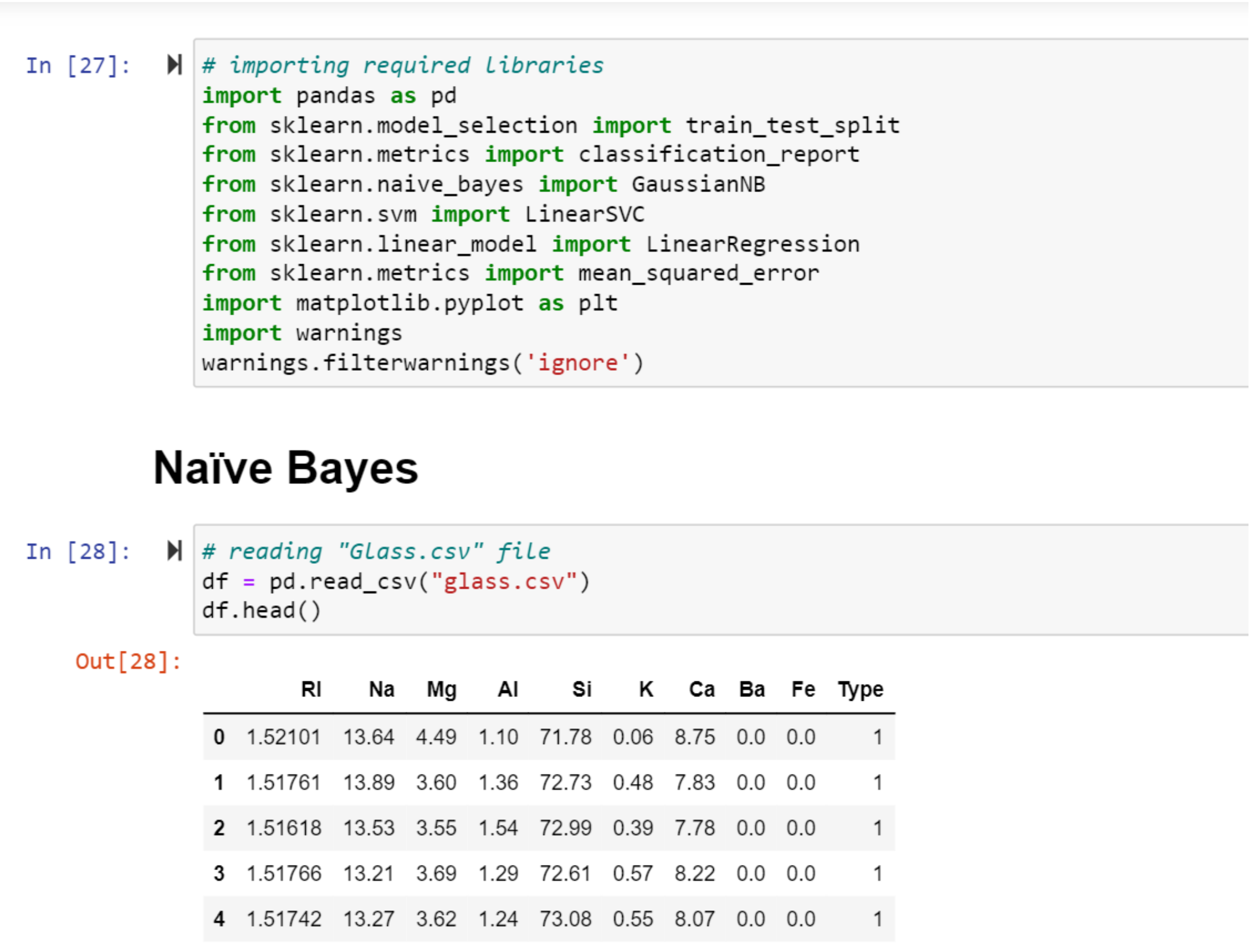
Video Link:
https://drive.google.com/file/d/1aTMw6G4H21r2y4EkU218qJR1MPEgWl1i/view?usp=sharing

GitHub Link:
https://github.com/Krishnavamsikoppula/Assignment-1-NNDL-Summer

1. Implement Naïve Bayes method using scikit-learn library.
   Use dataset available with name glass.
   Use train_test_split to create training and testing part.
   Evaluate the model on test part using score and
   classification_report(y_true, y_pred)



```
In [27]:
# importing required libraries
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.metrics import classification_report
from sklearn.naive_bayes import GaussianNB
from sklearn.svm import LinearSVC
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings('ignore')
```

Naïve Bayes

```
In [28]:
# reading "Glass.csv" file
df = pd.read_csv("glass.csv")
df.head()
```

Out[28]:

	RI	Na	Mg	Al	Si	K	Ca	Ba	Fe	Type
0	1.52101	13.64	4.49	1.10	71.78	0.06	8.75	0.0	0.0	1
1	1.51761	13.89	3.60	1.36	72.73	0.48	7.83	0.0	0.0	1
2	1.51618	13.53	3.55	1.54	72.99	0.39	7.78	0.0	0.0	1
3	1.51766	13.21	3.69	1.29	72.61	0.57	8.22	0.0	0.0	1
4	1.51742	13.27	3.62	1.24	73.08	0.55	8.07	0.0	0.0	1

In [29]:

```
# seperating x_data and y_data
y_data = df['Type']
x_data = df.drop('Type', axis=1)
```

In [30]:

```
# x_data
x_data.head()
```

Out[30]:

	RI	Na	Mg	Al	Si	K	Ca	Ba	Fe
0	1.52101	13.64	4.49	1.10	71.78	0.06	8.75	0.0	0.0
1	1.51761	13.89	3.60	1.36	72.73	0.48	7.83	0.0	0.0
2	1.51618	13.53	3.55	1.54	72.99	0.39	7.78	0.0	0.0
3	1.51766	13.21	3.69	1.29	72.61	0.57	8.22	0.0	0.0
4	1.51742	13.27	3.62	1.24	73.08	0.55	8.07	0.0	0.0

In [31]:

```
# splitting the data into train and test sets
x_train, x_test, y_train, y_test = train_test_split(x_data, y_data, test_size=0.3, random_state=7)
```

In [32]:

```
# train data shape
print(x_train.shape, y_train.shape)
```

```
(149, 9) (149,)
```

In [33]:

```
# test data shape
print(x_test.shape, y_test.shape)
```

```
(65, 9) (65,)
```

In [34]:

```
# training Naive Bayes Model
nb_model = GaussianNB()
nb_model.fit(x_train, y_train)
```

Out[34]:

```
GaussianNB()
```

In [35]:

```
# predicting the x_test data using Naive Bayes Model
y_pred = nb_model.predict(x_test)
print(y_pred)
```

```
[3 3 3 3 6 3 2 3 3 3 3 2 3 3 3 1 1 2 3 6 3 2 3 7 3 7 7 1 1 3 7 2 3 5 2 7 3
 3 3 3 3 7 5 3 3 7 1 2 3 3 3 3 3 3 2 2 1 3 2 3 3 3 3 7 3]
```

In [36]:

```
# Naive Bayes Model score
print(nb_model.score(x_test, y_test))
```

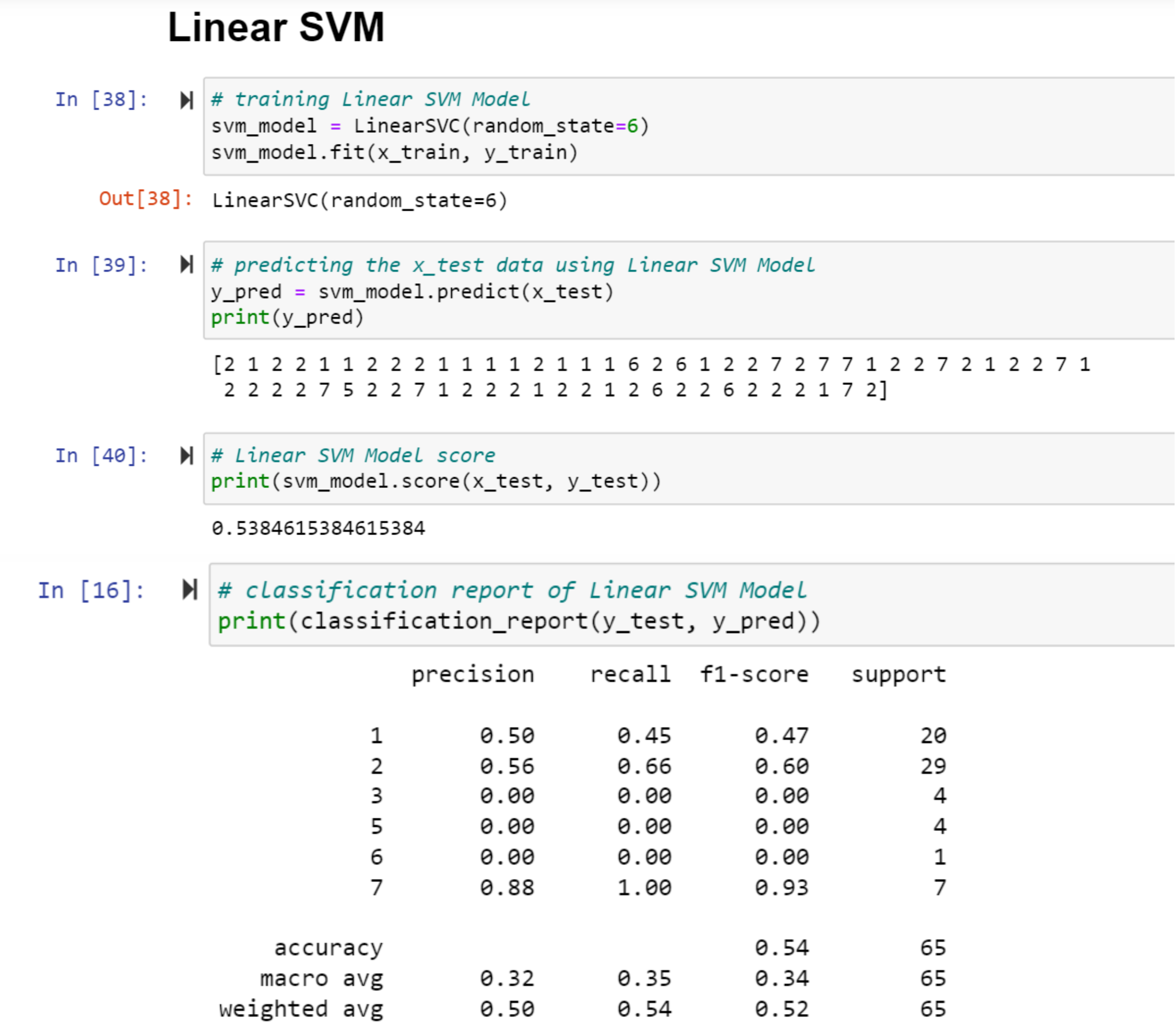
```
0.24615384615384617
```

In [37]:

```
# classification report of Naive Bayes Model
print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           1       0.33      0.10      0.15        20
           2       0.60      0.21      0.31        29
           3       0.03      0.25      0.05         4
           5       0.00      0.00      0.00         4
           6       0.00      0.00      0.00         1
           7       0.88      1.00      0.93         7

    accuracy                           0.25        65
   macro avg       0.31      0.26      0.24        65
weighted avg       0.47      0.25      0.29        65
```

2. Implement linear SVM method using scikit-learn.
   Use the same dataset above.
   Use train_test_split to create training and testing part.
   Evaluate the model on test part using score and
   classification_report(y_true, y_pred)



Linear SVM

```
In [38]:  # training Linear SVM Model
          svm_model = LinearSVC(random_state=6)
          svm_model.fit(x_train, y_train)

Out[38]:  LinearSVC(random_state=6)
```

```
In [39]:  # predicting the x_test data using Linear SVM Model
          y_pred = svm_model.predict(x_test)
          print(y_pred)

          [2 1 2 2 1 1 2 2 2 1 1 1 1 2 1 1 1 6 2 6 1 2 2 7 2 7 7 1 2 2 7 2 1 2 2 7 1
           2 2 2 2 7 5 2 2 7 1 2 2 2 1 2 2 1 2 6 2 2 6 2 2 2 1 7 2]
```

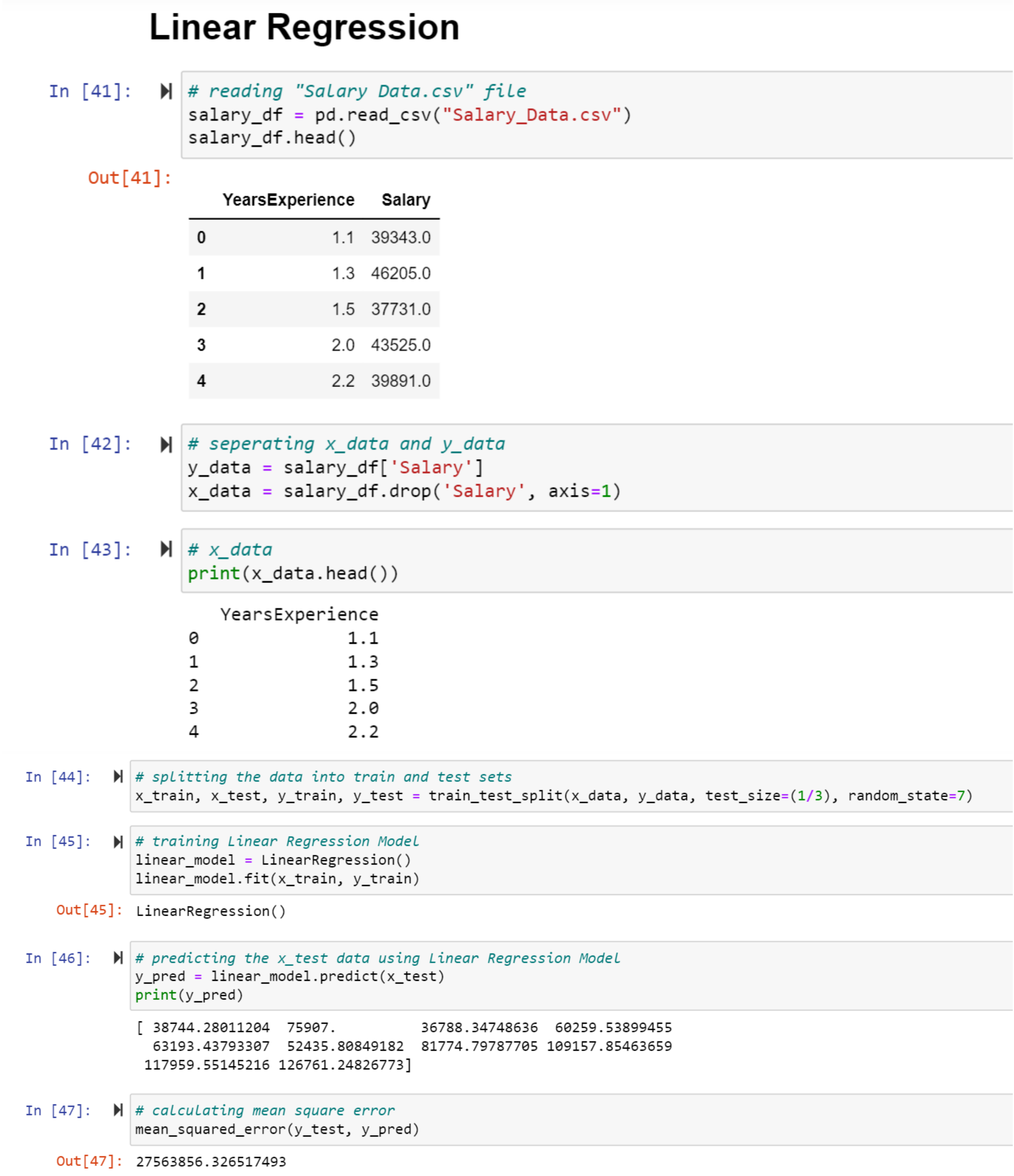
```
In [40]:  # Linear SVM Model score
          print(svm_model.score(x_test, y_test))

          0.5384615384615384
```

```
In [16]:  # classification report of Linear SVM Model
          print(classification_report(y_test, y_pred))

                        precision    recall  f1-score   support

                     1       0.50      0.45      0.47        20
                     2       0.56      0.66      0.60        29
                     3       0.00      0.00      0.00         4
                     5       0.00      0.00      0.00         4
                     6       0.00      0.00      0.00         1
                     7       0.88      1.00      0.93         7

              accuracy                           0.54        65
             macro avg       0.32      0.35      0.34        65
          weighted avg       0.50      0.54      0.52        65
```

Which algorithm you got better accuracy? Can you justify why?

Justification: Linear SVM has better accuracy than Naive Bayes Model because SVM can perform well in classifying multi-dimensional data and since Naive Bayes is based upon the frequency of occurrence it was not able to classify data.

3. Implement Linear Regression using scikit-learn
a) Import the given “Salary_Data.csv”
b) Split the data in train_test partitions, such that 1/3 of the data is reserved as test subset.
c) Train and predict the model.
d) Calculate the mean_squared error.
e) Visualize both train and test data using scatter plot.



Linear Regression

In [41]:

```
# reading "Salary Data.csv" file
salary_df = pd.read_csv("Salary_Data.csv")
salary_df.head()
```

Out[41]:

	YearsExperience	Salary
0	1.1	39343.0
1	1.3	46205.0
2	1.5	37731.0
3	2.0	43525.0
4	2.2	39891.0

In [42]:

```
# seperating x_data and y_data
y_data = salary_df['Salary']
x_data = salary_df.drop('Salary', axis=1)
```

In [43]:

```
# x_data
print(x_data.head())
```

```
   YearsExperience
0              1.1
1              1.3
2              1.5
3              2.0
4              2.2
```

In [44]:

```
# splitting the data into train and test sets
x_train, x_test, y_train, y_test = train_test_split(x_data, y_data, test_size=(1/3), random_state=7)
```

In [45]:

```
# training Linear Regression Model
linear_model = LinearRegression()
linear_model.fit(x_train, y_train)
```

Out[45]:

```
LinearRegression()
```

In [46]:

```
# predicting the x_test data using Linear Regression Model
y_pred = linear_model.predict(x_test)
print(y_pred)
```

```
[ 38744.28011204  75907.          36788.34748636  60259.53899455
  63193.43793307  52435.80849182  81774.79787705 109157.85463659
 117959.55145216 126761.24826773]
```

In [47]:

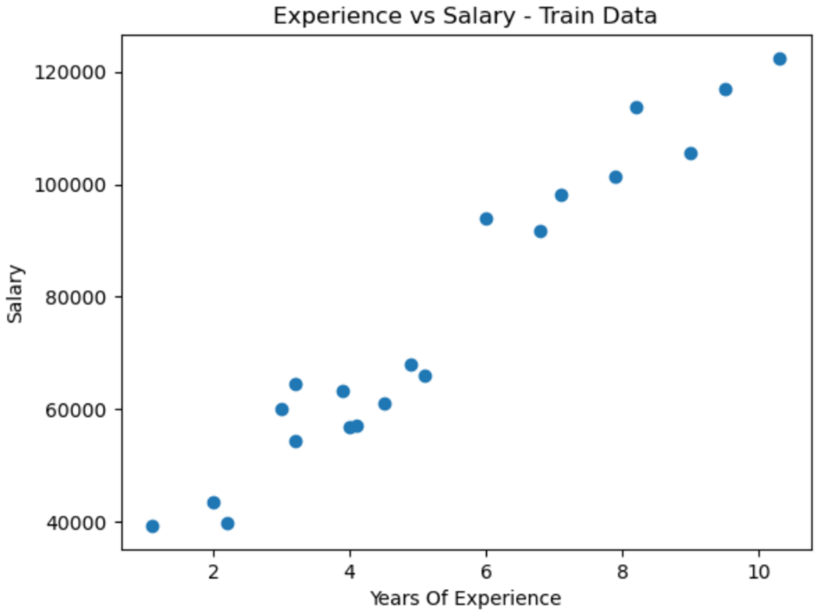
```
# calculating mean square error
mean_squared_error(y_test, y_pred)
```

Out[47]:

```
27563856.326517493
```

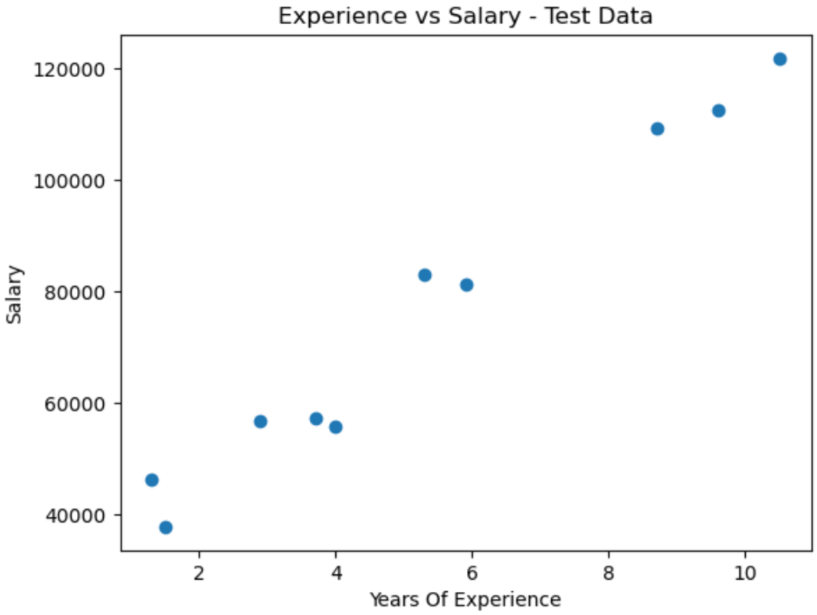
In [48]:

```
# visualizing x_train data
plt.scatter(x_train, y_train)
plt.xlabel("Years Of Experience")
plt.ylabel("Salary");
plt.title("Experience vs Salary - Train Data");
```



In [28]:

```
# visualizing x_test data
plt.scatter(x_test, y_test)
plt.xlabel("Years Of Experience")
plt.ylabel("Salary");
plt.title("Experience vs Salary - Test Data");
```



In [ ]: