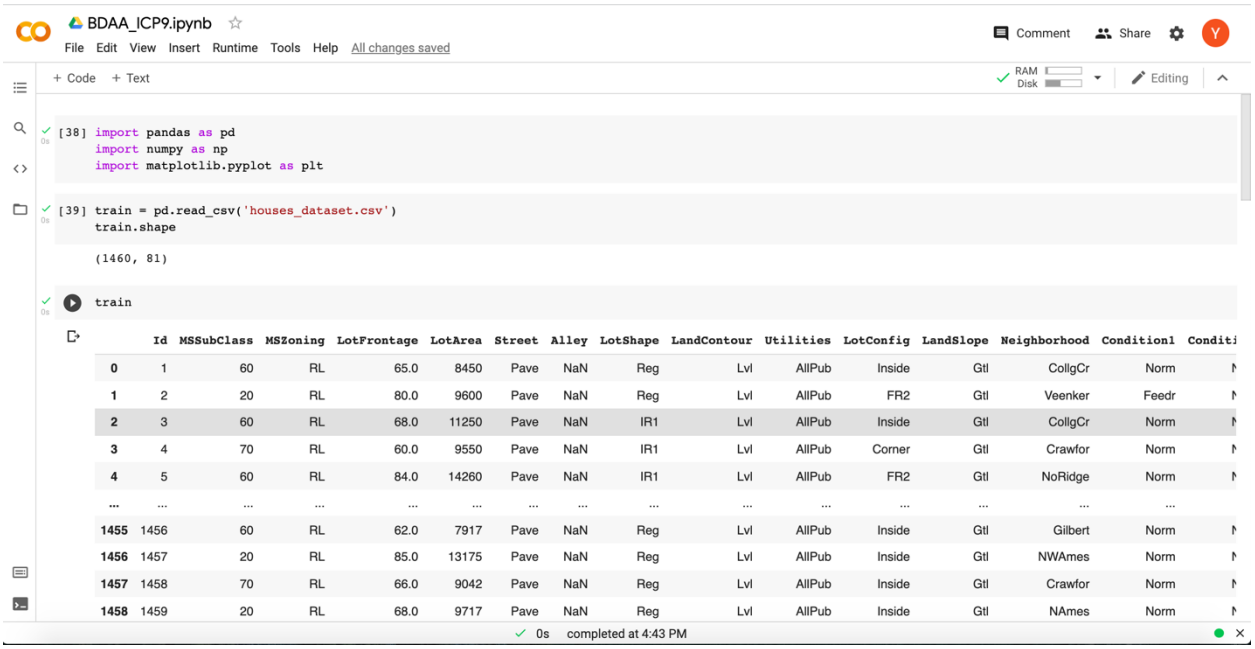
BDAA-ICP9-wiki report : Yousef Almutairi
Date: 10/31/2021

1. What you learned in the ICP:

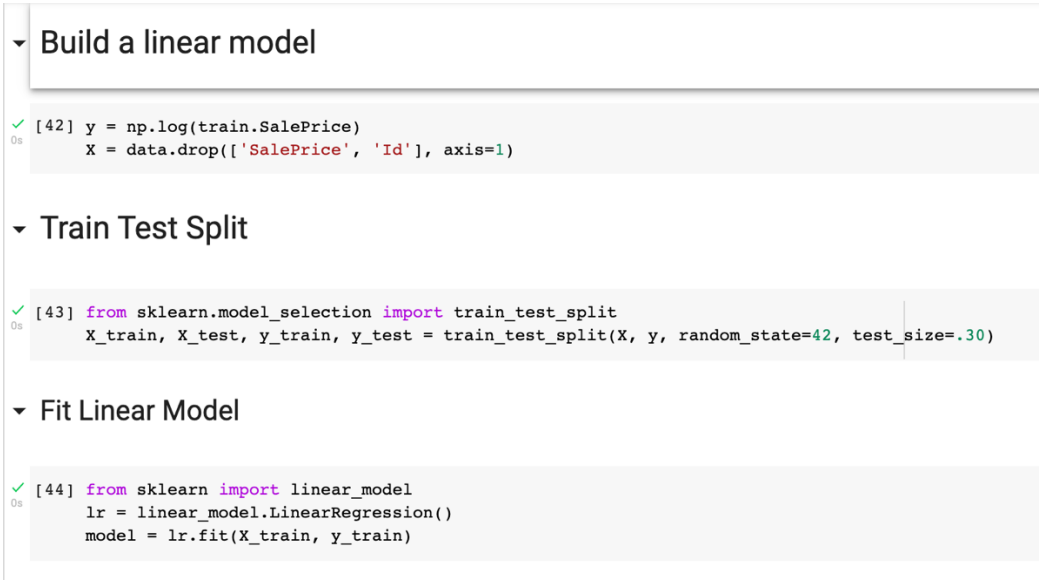
   Linear Regression is the most statistical technique that is used for prediction. Its applied on a causal relationships between two or more variables. In this ICP, I learned how to implement a linear regression model on the Houses Dataset in order to show the predicting price of the houses. Also, I found the best fit line in the data and calculating the Mean Squared Error, Y intercept, and Slope. I'll explain what I did in details in the upcoming part of the report.

2. Screen shots that shows the successful execution of each required step of your code:

   First of all, I have import all the required libraries and read the data using pandas function read_csv.



In this step, I built the linear model by creating a new variable called (y = SalePrice), and all the rest of columns to X (except SalePrice, ID). Then, I split the data using the Sklearn library and fit the linear regression.



Build a linear model

```
[42] y = np.log(train.SalePrice)
     X = data.drop(['SalePrice', 'Id'], axis=1)
```

Train Test Split

```
[43] from sklearn.model_selection import train_test_split
     X_train, X_test, y_train, y_test = train_test_split(X, y, random_state=42, test_size=.30)
```

Fit Linear Model

```
[44] from sklearn import linear_model
     lr = linear_model.LinearRegression()
     model = lr.fit(X_train, y_train)
```

After I saved the model predict on the prediction variable, I calculate and print the following:

- Mean Squared Error: which tells us how close a regression line is to a set of points
- Mean Absolute Error: to know the amount of error in our measurements
- Root Mean Square Error: to tells us the standard deviation of the residuals (prediction errors)
- R Squared (R^2): to show us how close the data are to the fitted regression line

Please note that: Although the instructor has only asked for the Mean Squared Error, I did the rest functions in order to learn more about the linear regression.

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Predict in testing data

```
[45] predictions = model.predict(X_test)
```

```
from sklearn.metrics import mean_absolute_error, r2_score, mean_squared_error
import math

mae = mean_absolute_error(y_test, predictions)
mse = mean_squared_error(y_test, predictions)
rmse = math.sqrt(mse)
r2 = r2_score(y_test, predictions)

print('Mean Squared Error is: \n', mse)
print('\n')
print('Mwan Absulate Error is: \n', mae)
print('\n')
print('Root Mean Square Error (RMSE) is: \n', rmse)
print('\n')
print("R Squared (R²) Score is: \n", r2)
```

```
Mean Squared Error is:
 0.022179533395466976


Mwan Absulate Error is:
 0.10907817789132872


Root Mean Square Error (RMSE) is:
 0.14892794699272188


R Squared (R²) Score is:
 0.8692600366399272
```

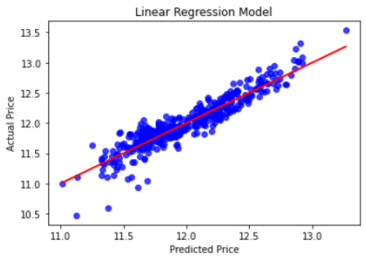
In the last screenshot, plot the data in a scatter plot and print out the intercept and slope.

- Intercept: to indicates the location where it intersects an axis
- Slope: to indicates the steepness of a line.

visualize

```
actual_values = y_test
plt.scatter(predictions, actual_values, alpha=.75, color='b')  #alpha helps to show overlapping data
plt.plot(predictions, model.predict(X_test),color='red')
plt.xlabel('Predicted Price')
plt.ylabel('Actual Price')
plt.title('Linear Regression Model')
plt.show()


#Y intercept, and Slope for the relationship in data
print('\n')
print("intercept = ",model.intercept_,"solpe = ", model.coef_[0])
```




```
intercept =  10.343091966865943 solpe =  -0.0008492436316884773
```

3. Conclusion:

   I have Successfully executed the code and built a Linear Regression model. As shown in the screenshot above, the MSE result has less than 0 which means the model is perfect and the prediction value is close to the actual one. On the other side, R^2 should reach more than 80% to indicate a better fit for the model. However, I got a positive Y intercept and negative slope, which means the line crosses the y-axis above the origin.

4. Video link:

   https://drive.google.com/file/d/1dkhOZIIFufMKw2FIEbrnhlVxf_dT6VF-/view?usp=sharing