TUGAS

MACHINE LEARNING

Disusun oleh :

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Kelas : Teknik Informatika B

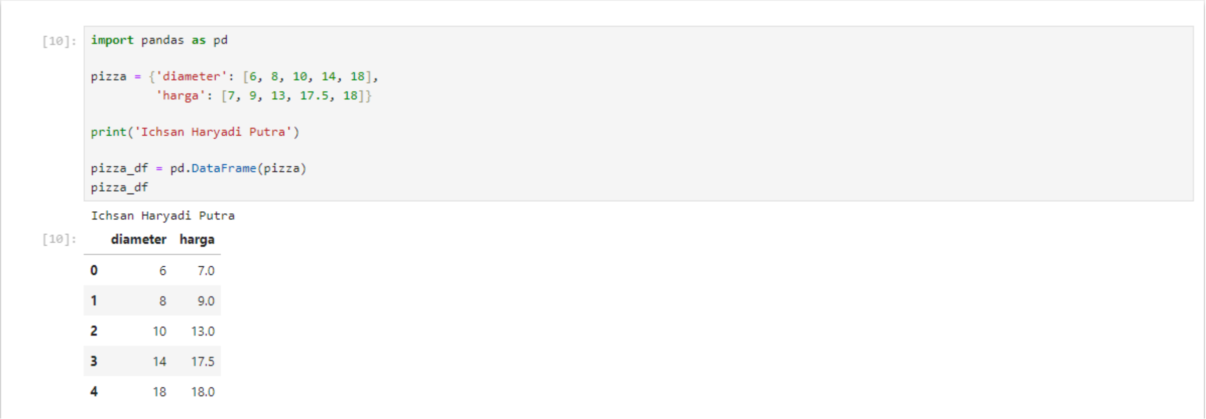
UNIVERSITAS LANGLANGBUANA

BANDUNG

Tugas Pertemuan 2

1. Praktek 1

- Sample Dataset



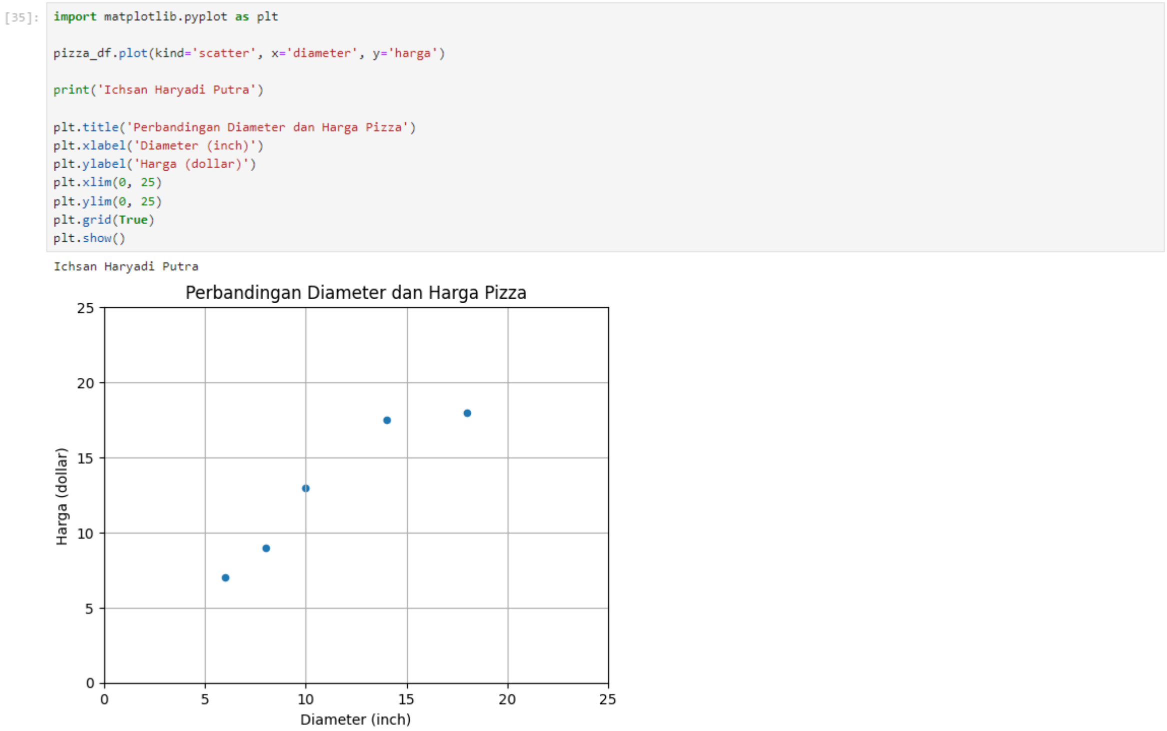
```
[10]: import pandas as pd

      pizza = {'diameter': [6, 8, 10, 14, 18],
               'harga': [7, 9, 13, 17.5, 18]}

      print('Ichsan Haryadi Putra')

      pizza_df = pd.DataFrame(pizza)
      pizza_df
```

```
Ichsan Haryadi Putra
```

[10]:

	diameter	harga
0	6	7.0
1	8	9.0
2	10	13.0
3	14	17.5
4	18	18.0

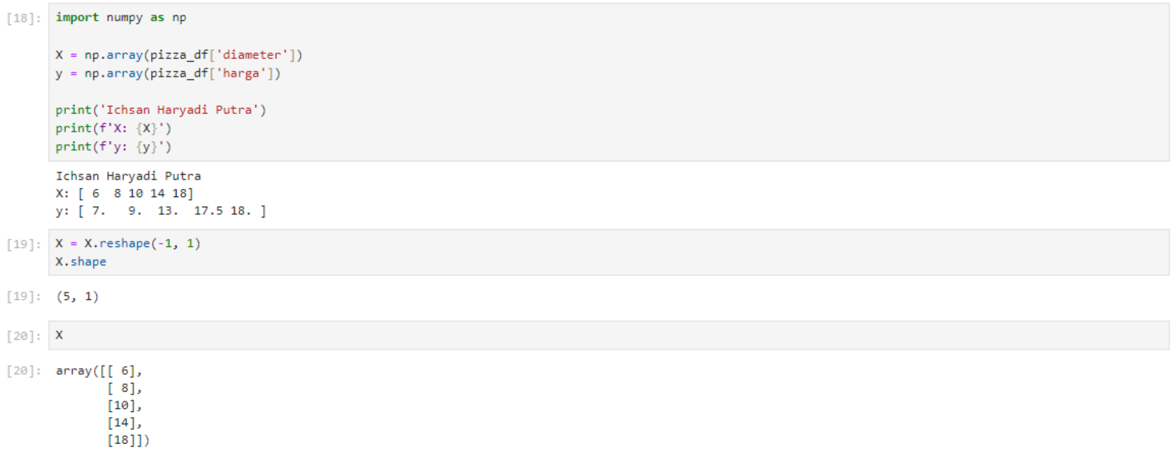
- Visualisasi Data



```
[35]: import matplotlib.pyplot as plt

      pizza_df.plot(kind='scatter', x='diameter', y='harga')

      print('Ichsan Haryadi Putra')

      plt.title('Perbandingan Diameter dan Harga Pizza')
      plt.xlabel('Diameter (inch)')
      plt.ylabel('Harga (dollar)')
      plt.xlim(0, 25)
      plt.ylim(0, 25)
      plt.grid(True)
      plt.show()
```

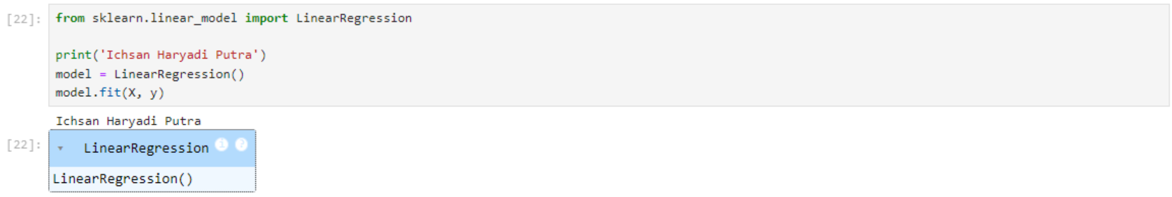
```
Ichsan Haryadi Putra
```

- Transformasi Data



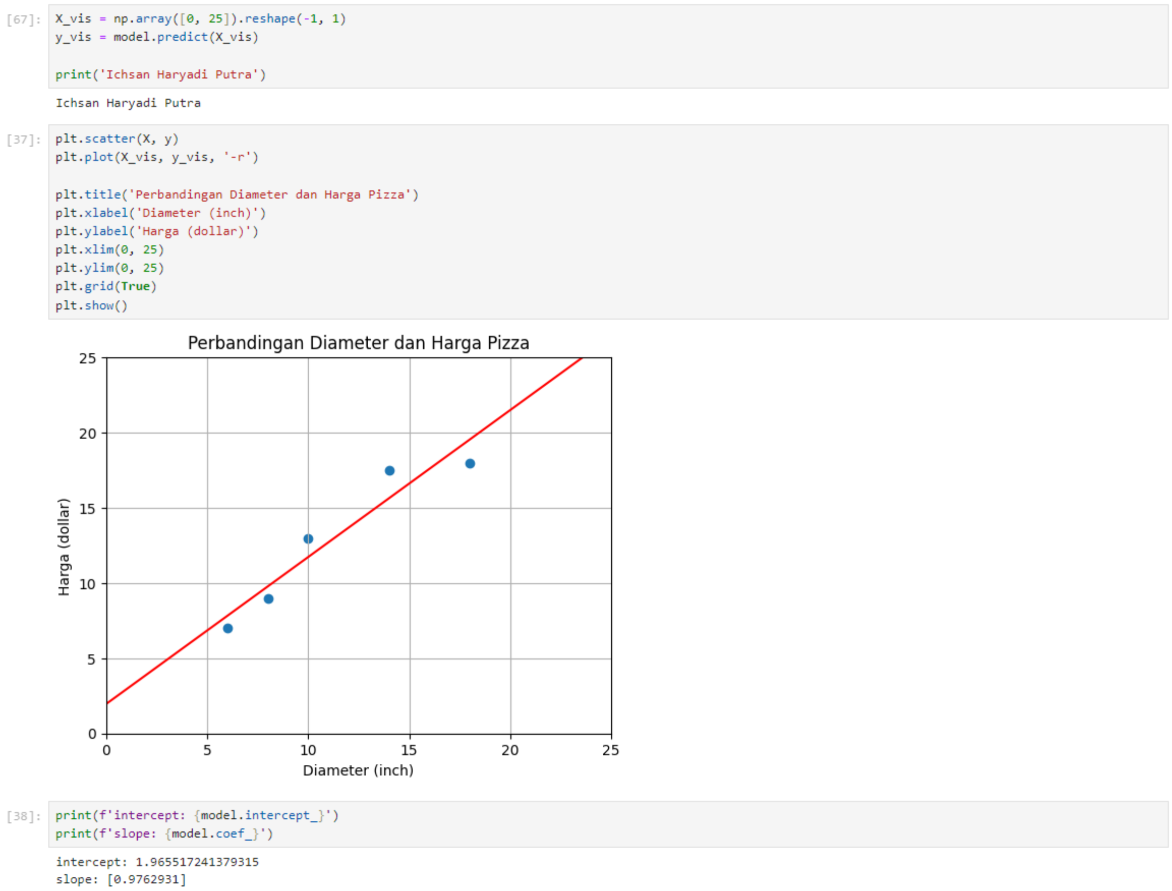
```
[18]: import numpy as np

      X = np.array(pizza_df['diameter'])
      y = np.array(pizza_df['harga'])

      print('Ichsan Haryadi Putra')
      print(f'X: {X}')
      print(f'y: {y}')

      Ichsan Haryadi Putra
      X: [ 6  8 10 14 18]
      y: [ 7.   9.   13.   17.5 18. ]

[19]: X = X.reshape(-1, 1)
      X.shape

[19]: (5, 1)

[20]: X

[20]: array([[ 6],
             [ 8],
             [10],
             [14],
             [18]])
```

- Training Simple Linear Regression Model



```
[22]: from sklearn.linear_model import LinearRegression

      print('Ichsan Haryadi Putra')
      model = LinearRegression()
      model.fit(X, y)

      Ichsan Haryadi Putra
[22]:  ▾ LinearRegression
      LinearRegression()
```

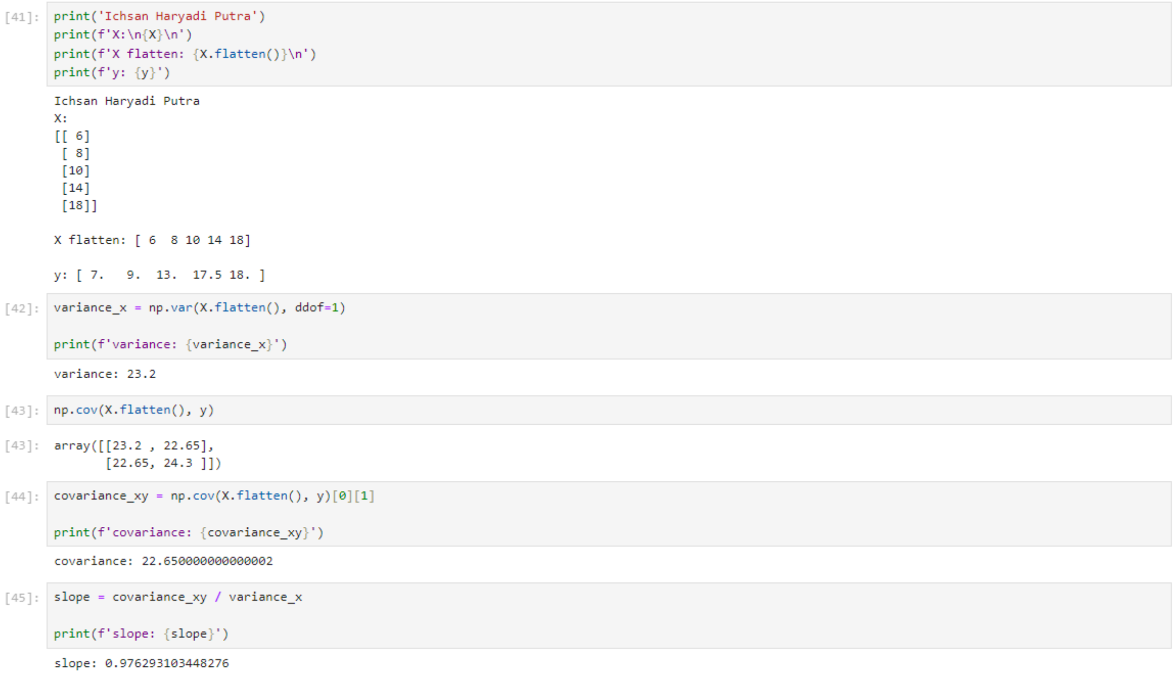
- Visualisasi Simple Linear Regression Model | Penjelasan persamaan garis linear



```
[67]: X_vis = np.array([0, 25]).reshape(-1, 1)
      y_vis = model.predict(X_vis)

      print('Ichsan Haryadi Putra')

      Ichsan Haryadi Putra

[37]: plt.scatter(X, y)
      plt.plot(X_vis, y_vis, '-r')

      plt.title('Perbandingan Diameter dan Harga Pizza')
      plt.xlabel('Diameter (inch)')
      plt.ylabel('Harga (dollar)')
      plt.xlim(0, 25)
      plt.ylim(0, 25)
      plt.grid(True)
      plt.show()
```

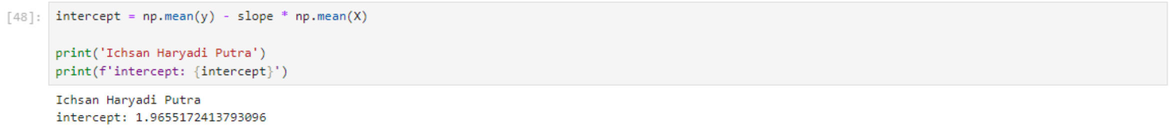
```
[38]: print(f'intercept: {model.intercept_}')
      print(f'slope: {model.coef_}')

      intercept: 1.965517241379315
      slope: [0.9762931]
```

- Kalkulasi nilai slope



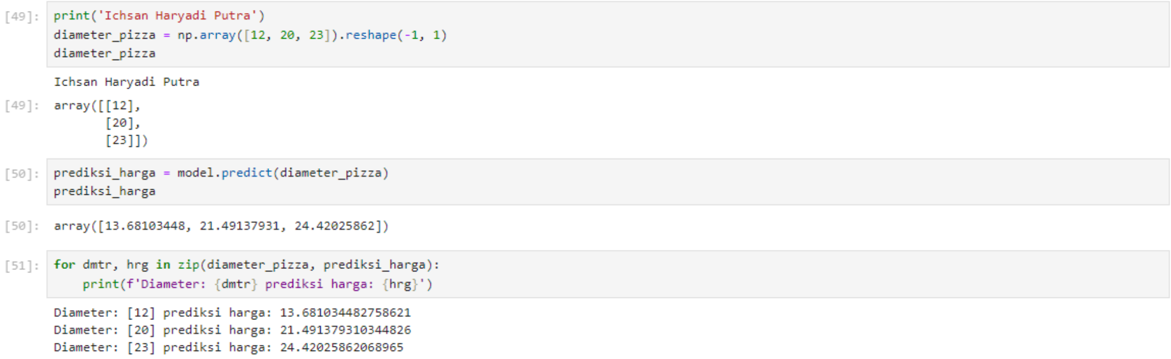
```
[41]: print('Ichsan Haryadi Putra')
      print(f'X:\n{X}\n')
      print(f'X flatten: {X.flatten()}\n')
      print(f'y: {y}')

      Ichsan Haryadi Putra
      X:
      [[ 6]
       [ 8]
       [10]
       [14]
       [18]]

      X flatten: [ 6  8 10 14 18]

      y: [ 7.   9.   13.   17.5 18. ]

[42]: variance_x = np.var(X.flatten(), ddof=1)

      print(f'variance: {variance_x}')

      variance: 23.2

[43]: np.cov(X.flatten(), y)

[43]: array([[23.2 , 22.65],
             [22.65, 24.3 ]])

[44]: covariance_xy = np.cov(X.flatten(), y)[0][1]

      print(f'covariance: {covariance_xy}')

      covariance: 22.650000000000002

[45]: slope = covariance_xy / variance_x

      print(f'slope: {slope}')

      slope: 0.976293103448276
```

- Kalkukasi nilai intercept



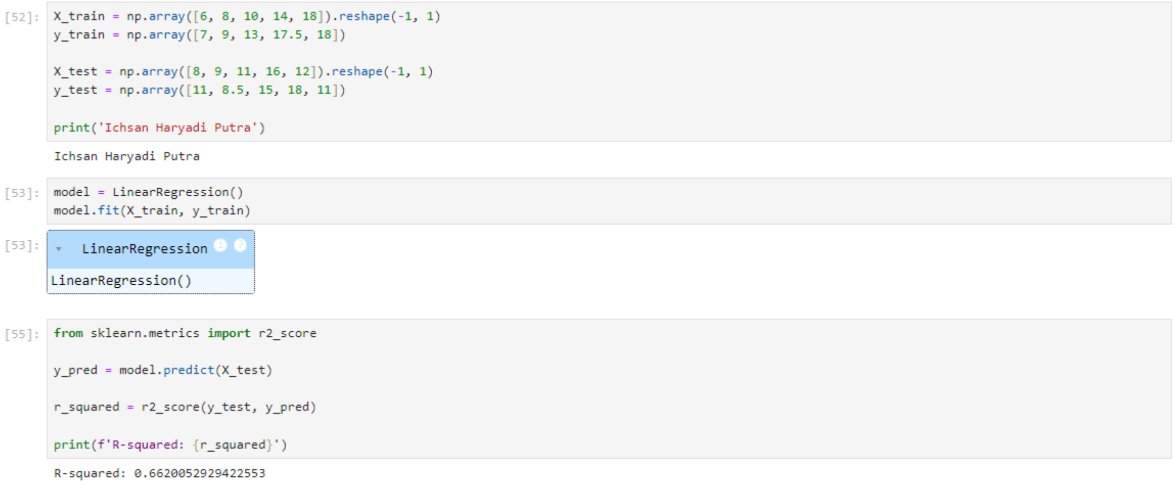
```
[48]: intercept = np.mean(y) - slope * np.mean(X)

      print('Ichsan Haryadi Putra')
      print(f'intercept: {intercept}')

      Ichsan Haryadi Putra
      intercept: 1.9655172413793096
```

- Prediksi harga pizza dengan Simple Linear Regression Model



```
[49]: print('Ichsan Haryadi Putra')
      diameter_pizza = np.array([12, 20, 23]).reshape(-1, 1)
      diameter_pizza

      Ichsan Haryadi Putra

[49]: array([[12],
             [20],
             [23]])

[50]: prediksi_harga = model.predict(diameter_pizza)
      prediksi_harga

[50]: array([13.68103448, 21.49137931, 24.42025862])

[51]: for dmtr, hrg in zip(diameter_pizza, prediksi_harga):
          print(f'Diameter: {dmtr} prediksi harga: {hrg}')

      Diameter: [12] prediksi harga: 13.681034482758621
      Diameter: [20] prediksi harga: 21.491379310344826
      Diameter: [23] prediksi harga: 24.42025862068965
```

- Evaluasi model dengan Coefficient of Determination | R Squared



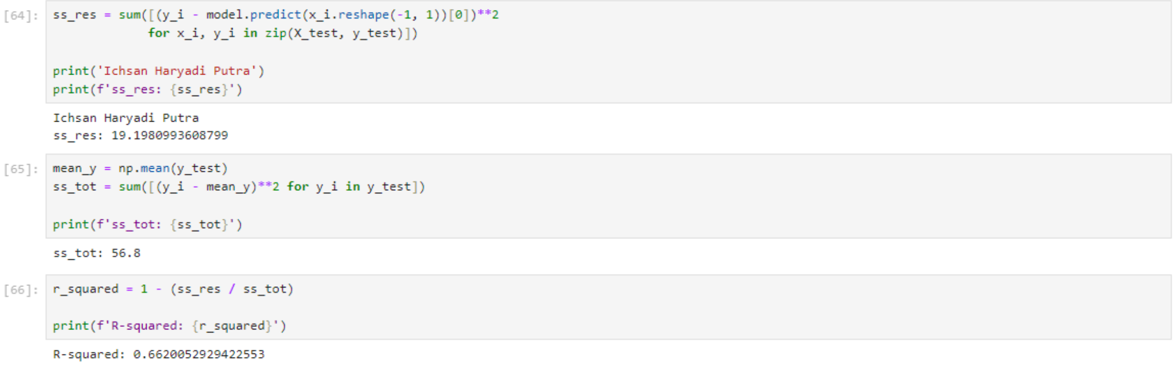
[52]:
```
X_train = np.array([6, 8, 10, 14, 18]).reshape(-1, 1)
y_train = np.array([7, 9, 13, 17.5, 18])

X_test = np.array([8, 9, 11, 16, 12]).reshape(-1, 1)
y_test = np.array([11, 8.5, 15, 18, 11])

print('Ichsan Haryadi Putra')
```
```
Ichsan Haryadi Putra
```

[53]:
```
model = LinearRegression()
model.fit(X_train, y_train)
```

[53]:
```
LinearRegression
LinearRegression()
```

[55]:
```
from sklearn.metrics import r2_score

y_pred = model.predict(X_test)

r_squared = r2_score(y_test, y_pred)

print(f'R-squared: {r_squared}')
```
```
R-squared: 0.6620052929422553
```

- Kalkulasi nilai R Squared | Coefficient of Determination



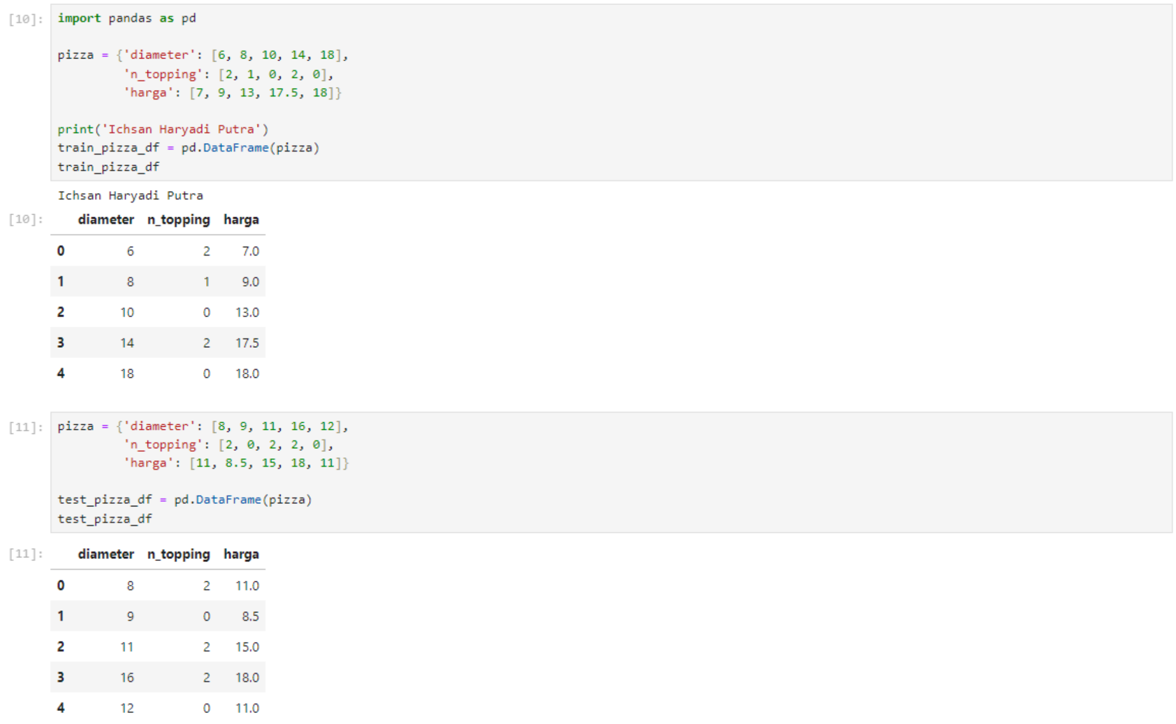
[64]:
```
ss_res = sum([(y_i - model.predict(x_i.reshape(-1, 1))[0])**2
              for x_i, y_i in zip(X_test, y_test)])

print('Ichsan Haryadi Putra')
print(f'ss_res: {ss_res}')
```
```
Ichsan Haryadi Putra
ss_res: 19.1980993608799
```

[65]:
```
mean_y = np.mean(y_test)
ss_tot = sum([(y_i - mean_y)**2 for y_i in y_test])

print(f'ss_tot: {ss_tot}')
```
```
ss_tot: 56.8
```

[66]:
```
r_squared = 1 - (ss_res / ss_tot)

print(f'R-squared: {r_squared}')
```
```
R-squared: 0.6620052929422553
```

2. Praktek 2

- Persiapan sample dataset



```
[10]: import pandas as pd

      pizza = {'diameter': [6, 8, 10, 14, 18],
               'n_topping': [2, 1, 0, 2, 0],
               'harga': [7, 9, 13, 17.5, 18]}

      print('Ichsan Haryadi Putra')
      train_pizza_df = pd.DataFrame(pizza)
      train_pizza_df
```

```
Ichsan Haryadi Putra
```

[10]:

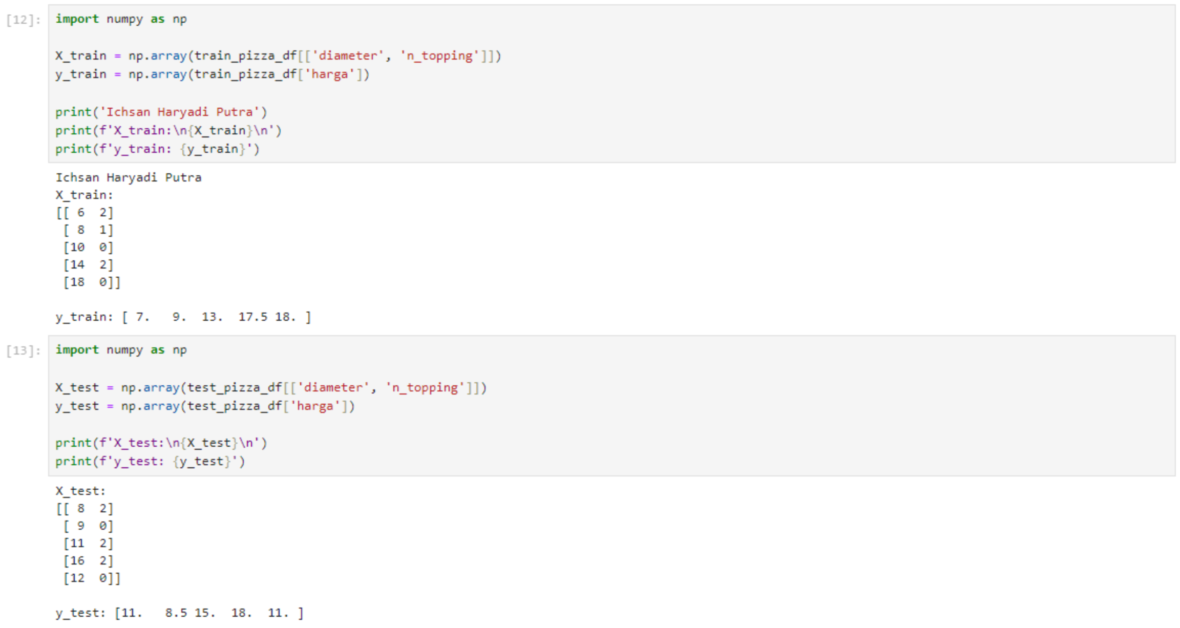
	diameter	n_topping	harga
0	6	2	7.0
1	8	1	9.0
2	10	0	13.0
3	14	2	17.5
4	18	0	18.0

```
[11]: pizza = {'diameter': [8, 9, 11, 16, 12],
               'n_topping': [2, 0, 2, 2, 0],
               'harga': [11, 8.5, 15, 18, 11]}

      test_pizza_df = pd.DataFrame(pizza)
      test_pizza_df
```

[11]:

	diameter	n_topping	harga
0	8	2	11.0
1	9	0	8.5
2	11	2	15.0
3	16	2	18.0
4	12	0	11.0

- Preprocessing dataset



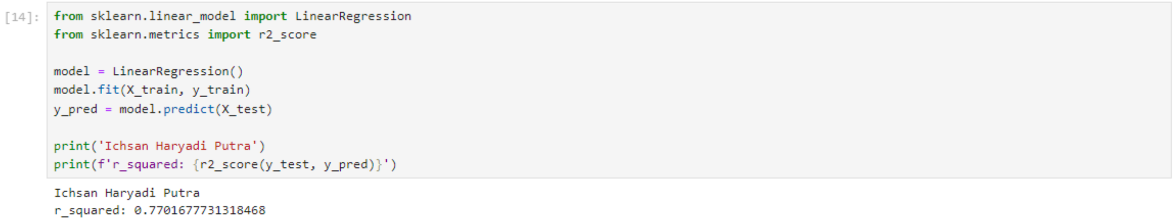
```
[12]: import numpy as np

      X_train = np.array(train_pizza_df[['diameter', 'n_topping']])
      y_train = np.array(train_pizza_df['harga'])

      print('Ichsan Haryadi Putra')
      print(f'X_train:\n{X_train}\n')
      print(f'y_train: {y_train}')
```

```
Ichsan Haryadi Putra
X_train:
[[ 6  2]
 [ 8  1]
 [10  0]
 [14  2]
 [18  0]]

y_train: [ 7.   9.  13.  17.5 18. ]
```

```
[13]: import numpy as np

      X_test = np.array(test_pizza_df[['diameter', 'n_topping']])
      y_test = np.array(test_pizza_df['harga'])

      print(f'X_test:\n{X_test}\n')
      print(f'y_test: {y_test}')
```

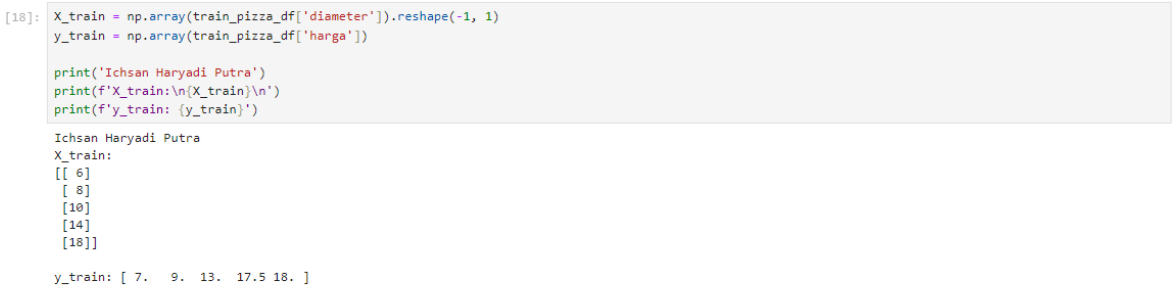
```
X_test:
[[ 8  2]
 [ 9  0]
 [11  2]
 [16  2]
 [12  0]]

y_test: [11.   8.5 15.  18.  11. ]
```

- Pengenalan Multiple Linear Regression



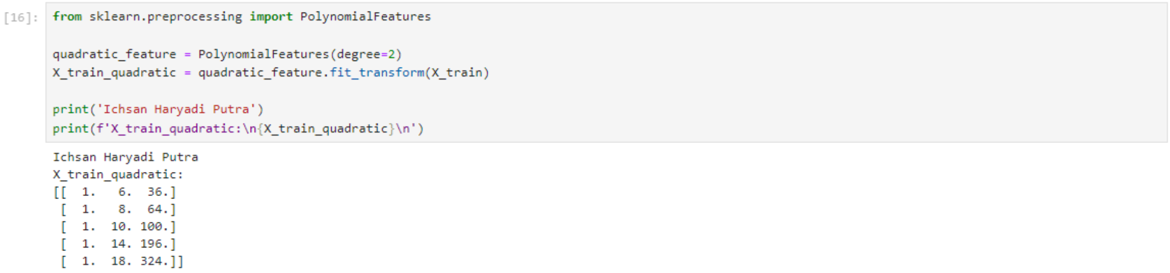
```
[14]: from sklearn.linear_model import LinearRegression
      from sklearn.metrics import r2_score

      model = LinearRegression()
      model.fit(X_train, y_train)
      y_pred = model.predict(X_test)

      print('Ichsan Haryadi Putra')
      print(f'r_squared: {r2_score(y_test, y_pred)}')

      Ichsan Haryadi Putra
      r_squared: 0.7701677731318468
```

- Pengenalan Polynomial Regression

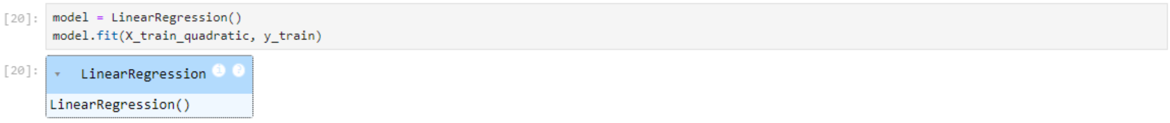


```
[18]: X_train = np.array(train_pizza_df['diameter']).reshape(-1, 1)
      y_train = np.array(train_pizza_df['harga'])

      print('Ichsan Haryadi Putra')
      print(f'X_train:\n{X_train}\n')
      print(f'y_train: {y_train}')

      Ichsan Haryadi Putra
      X_train:
      [[ 6]
       [ 8]
       [10]
       [14]
       [18]]

      y_train: [ 7.   9.  13.  17.5 18. ]
```

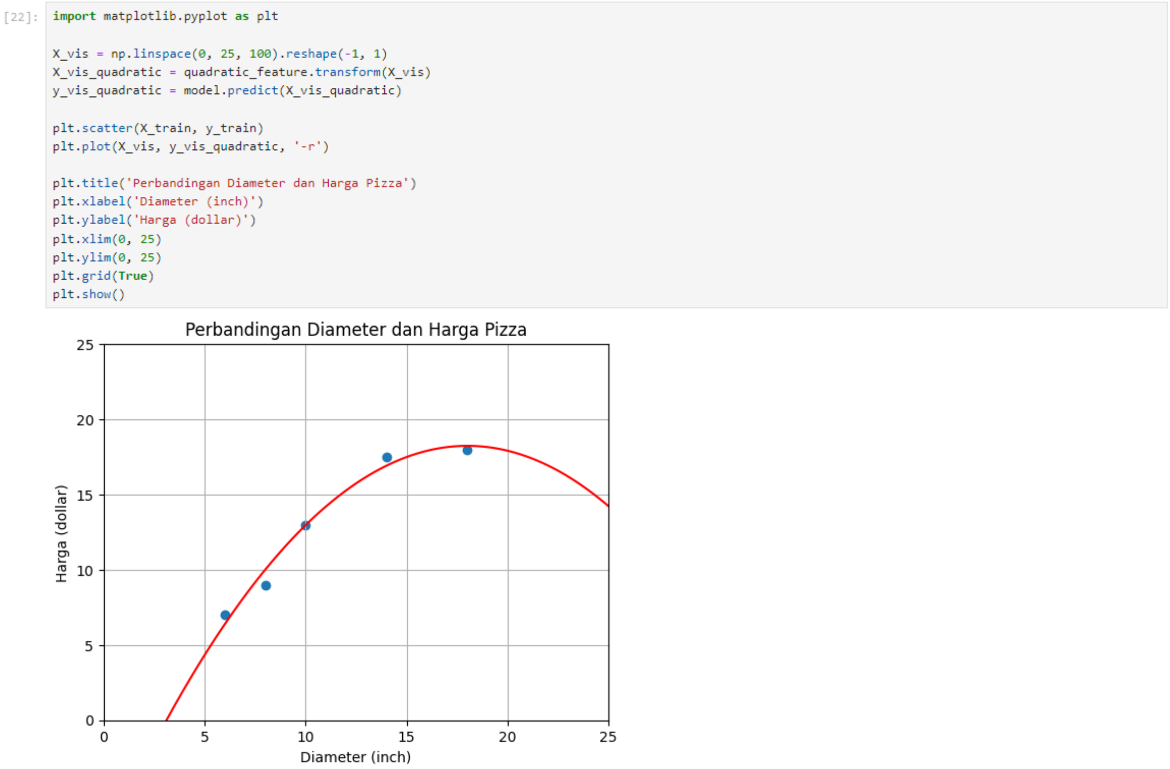
- Quadratic Polynomial Regression



```
[16]: from sklearn.preprocessing import PolynomialFeatures

      quadratic_feature = PolynomialFeatures(degree=2)
      X_train_quadratic = quadratic_feature.fit_transform(X_train)

      print('Ichsan Haryadi Putra')
      print(f'X_train_quadratic:\n{X_train_quadratic}\n')

      Ichsan Haryadi Putra
      X_train_quadratic:
      [[  1.   6.  36.]
       [  1.   8.  64.]
       [  1.  10. 100.]
       [  1.  14. 196.]
       [  1.  18. 324.]]
```

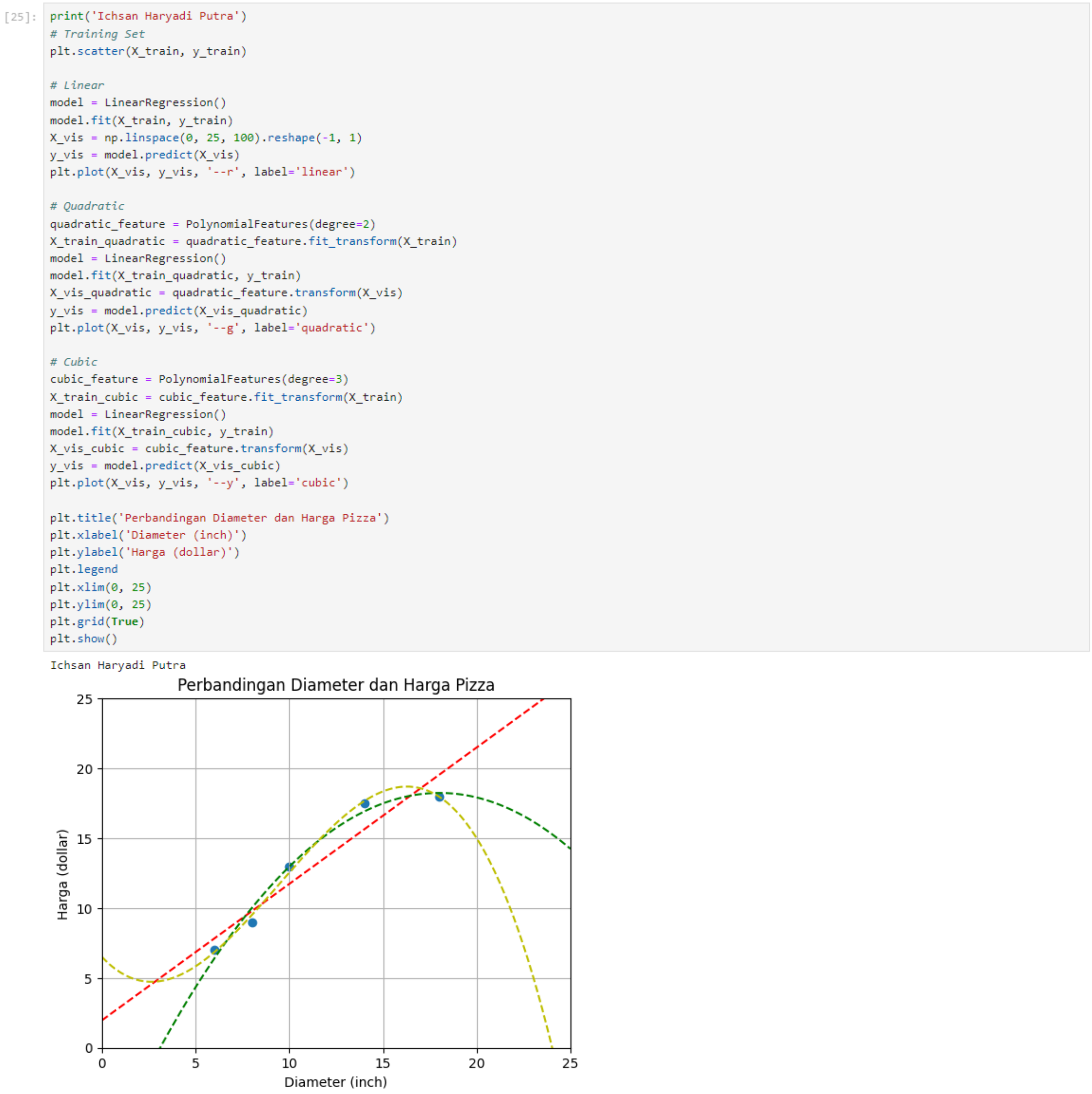


```
[20]: model = LinearRegression()
      model.fit(X_train_quadratic, y_train)

[20]:  ▾  LinearRegression
      LinearRegression()
```



```
[22]: import matplotlib.pyplot as plt

      X_vis = np.linspace(0, 25, 100).reshape(-1, 1)
      X_vis_quadratic = quadratic_feature.transform(X_vis)
      y_vis_quadratic = model.predict(X_vis_quadratic)

      plt.scatter(X_train, y_train)
      plt.plot(X_vis, y_vis_quadratic, '-r')

      plt.title('Perbandingan Diameter dan Harga Pizza')
      plt.xlabel('Diameter (inch)')
      plt.ylabel('Harga (dollar)')
      plt.xlim(0, 25)
      plt.ylim(0, 25)
      plt.grid(True)
      plt.show()
```

- Linear Regression vs Quadratic Polynomial Regression vs Cubic Polynomial Regression

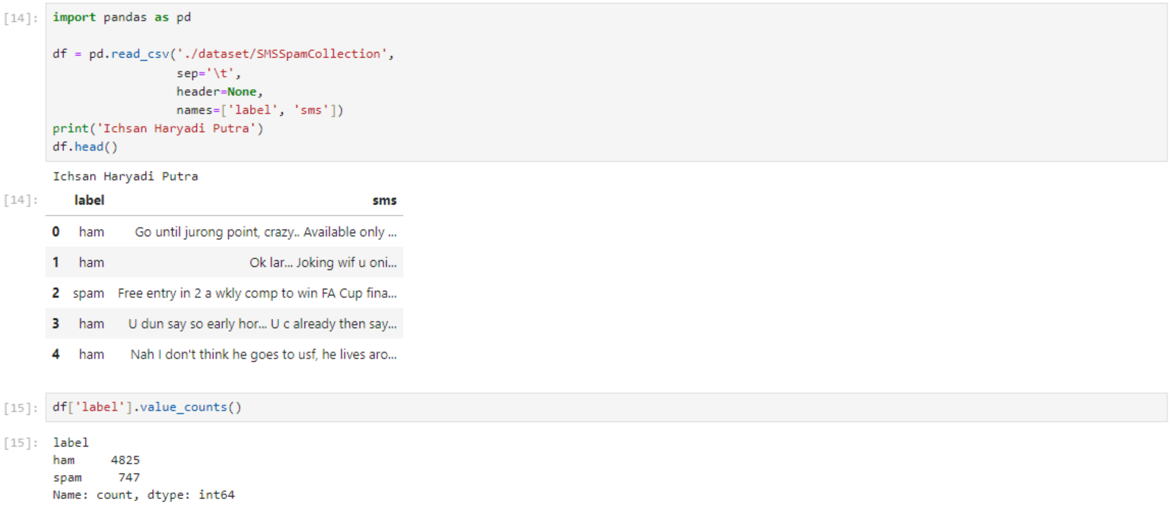


```
[25]: print('Ichsan Haryadi Putra')
      # Training Set
      plt.scatter(X_train, y_train)

      # Linear
      model = LinearRegression()
      model.fit(X_train, y_train)
      X_vis = np.linspace(0, 25, 100).reshape(-1, 1)
      y_vis = model.predict(X_vis)
      plt.plot(X_vis, y_vis, '--r', label='linear')

      # Quadratic
      quadratic_feature = PolynomialFeatures(degree=2)
      X_train_quadratic = quadratic_feature.fit_transform(X_train)
      model = LinearRegression()
      model.fit(X_train_quadratic, y_train)
      X_vis_quadratic = quadratic_feature.transform(X_vis)
      y_vis = model.predict(X_vis_quadratic)
      plt.plot(X_vis, y_vis, '--g', label='quadratic')

      # Cubic
      cubic_feature = PolynomialFeatures(degree=3)
      X_train_cubic = cubic_feature.fit_transform(X_train)
      model = LinearRegression()
      model.fit(X_train_cubic, y_train)
      X_vis_cubic = cubic_feature.transform(X_vis)
      y_vis = model.predict(X_vis_cubic)
      plt.plot(X_vis, y_vis, '--y', label='cubic')

      plt.title('Perbandingan Diameter dan Harga Pizza')
      plt.xlabel('Diameter (inch)')
      plt.ylabel('Harga (dollar)')
      plt.legend
      plt.xlim(0, 25)
      plt.ylim(0, 25)
      plt.grid(True)
      plt.show()
```

```
Ichsan Haryadi Putra
```

3. Praktek 3

- Persiapan dataset | SMS Spam Collection Dataset



```
[14]: import pandas as pd

      df = pd.read_csv('./dataset/SMSSpamCollection',
                       sep='\t',
                       header=None,
                       names=['label', 'sms'])
      print('Ichsan Haryadi Putra')
      df.head()
```

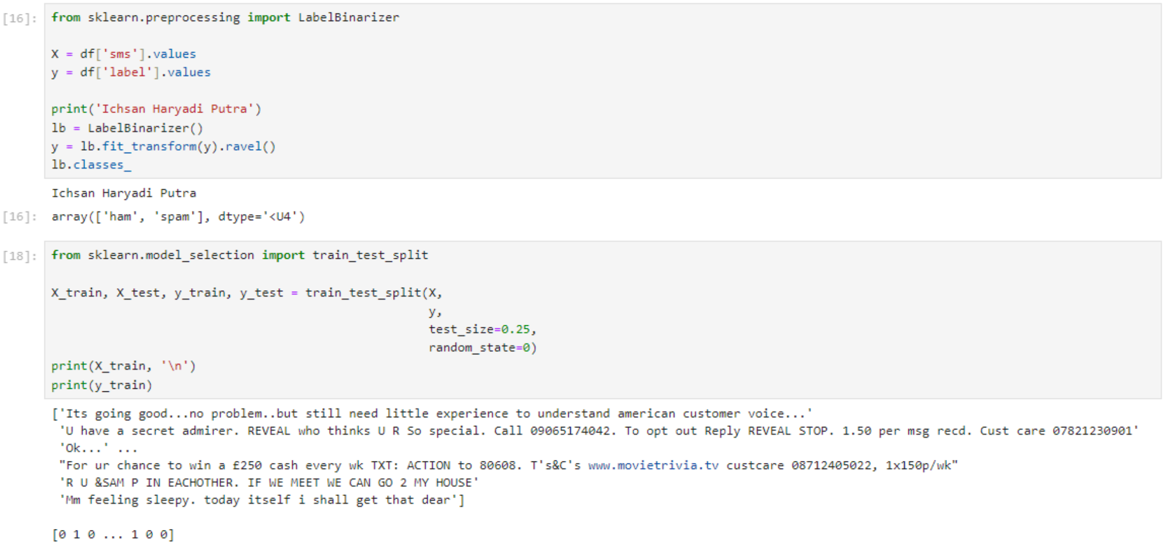
```
      Ichsan Haryadi Putra
[14]:
```

	label	sms
0	ham	Go until jurong point, crazy.. Available only ...
1	ham	Ok lar... Joking wif u oni...
2	spam	Free entry in 2 a wkly comp to win FA Cup fina...
3	ham	U dun say so early hor... U c already then say...
4	ham	Nah I don't think he goes to usf, he lives aro...

```
[15]: df['label'].value_counts()
```

```
[15]: label
      ham     4825
      spam     747
      Name: count, dtype: int64
```

- Pembagian training dan testing set



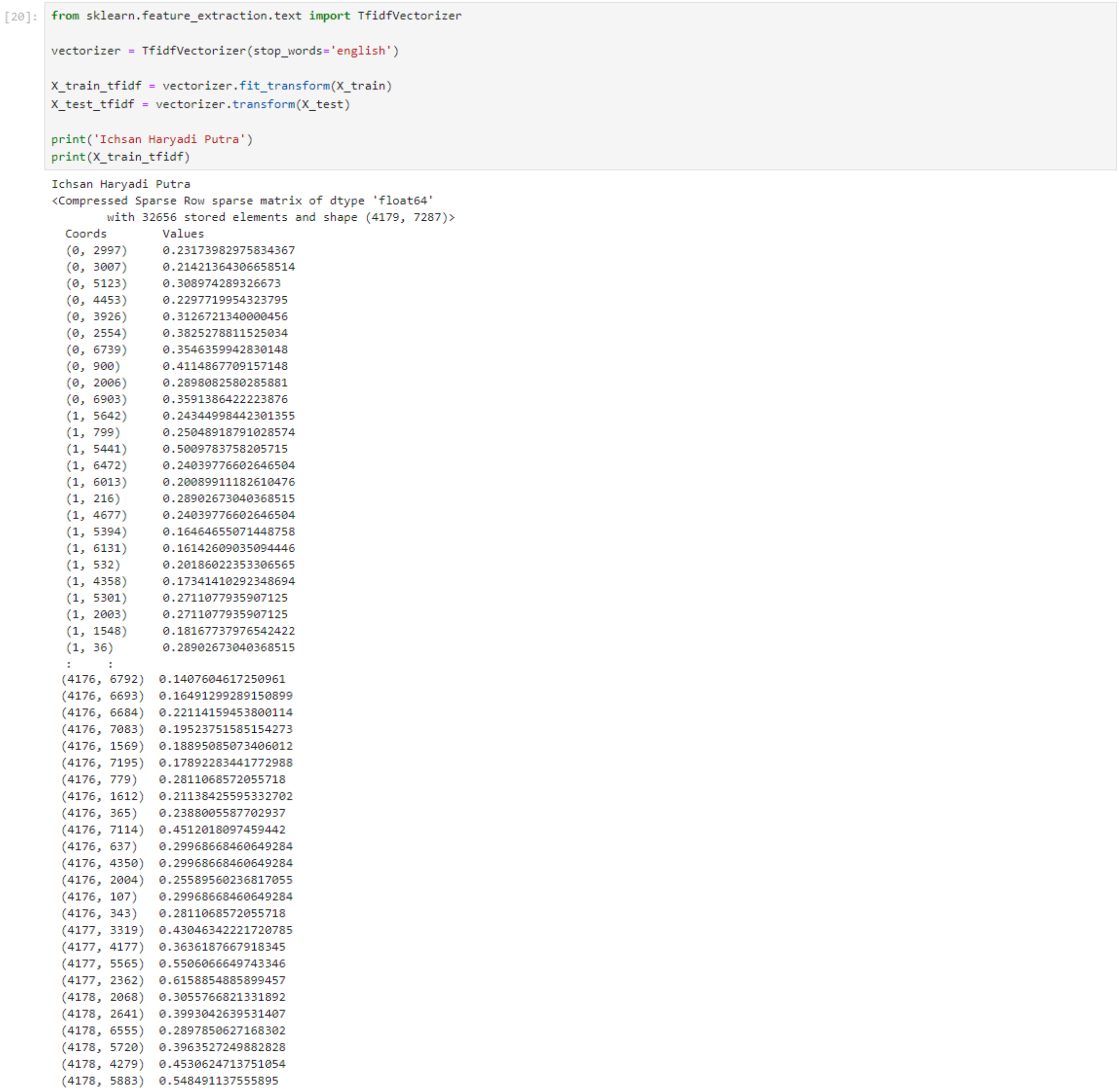
```
[16]: from sklearn.preprocessing import LabelBinarizer

      X = df['sms'].values
      y = df['label'].values

      print('Ichsan Haryadi Putra')
      lb = LabelBinarizer()
      y = lb.fit_transform(y).ravel()
      lb.classes_
```

```
      Ichsan Haryadi Putra
[16]: array(['ham', 'spam'], dtype='<U4')
```

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

      X_train, X_test, y_train, y_test = train_test_split(X,
                                                          y,
                                                          test_size=0.25,
                                                          random_state=0)
      print(X_train, '\n')
      print(y_train)
```

```
['Its going good...no problem..but still need little experience to understand american customer voice...'
 'U have a secret admirer. REVEAL who thinks U R So special. Call 09065174042. To opt out Reply REVEAL STOP. 1.50 per msg recd. Cust care 07821230901'
 'Ok...' ...
 "For ur chance to win a £250 cash every wk TXT: ACTION to 80608. T's&C's www.movietrivia.tv custcare 08712405022, 1x150p/wk"
 'R U &SAM P IN EACHOTHER. IF WE MEET WE CAN GO 2 MY HOUSE'
 'Mm feeling sleepy. today itself i shall get that dear']

[0 1 0 ... 1 0 0]
```

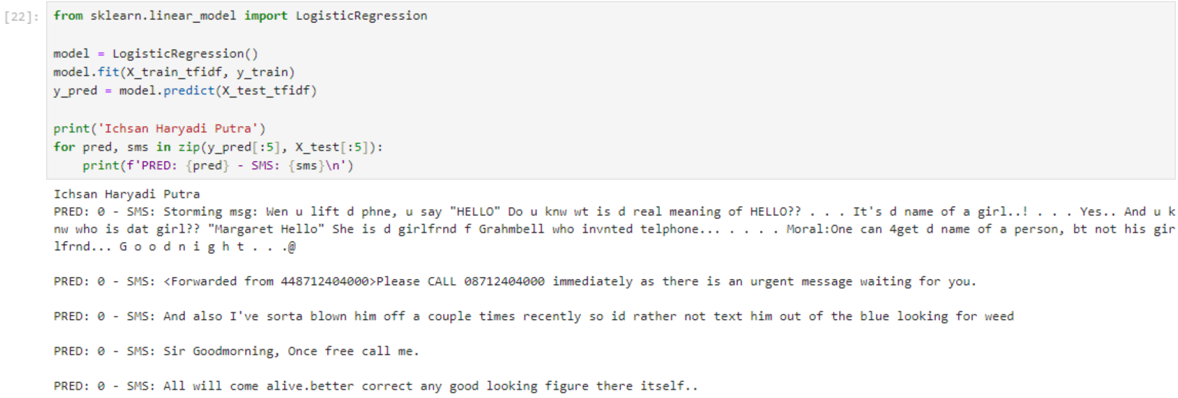
- Feature extraction dengan TF-IDF



```
[20]: from sklearn.feature_extraction.text import TfidfVectorizer

      vectorizer = TfidfVectorizer(stop_words='english')

      X_train_tfidf = vectorizer.fit_transform(X_train)
      X_test_tfidf = vectorizer.transform(X_test)

      print('Ichsan Haryadi Putra')
      print(X_train_tfidf)
```

```
Ichsan Haryadi Putra
<Compressed Sparse Row sparse matrix of dtype 'float64'
	with 32656 stored elements and shape (4179, 7287)>
  Coords	Values
  (0, 2997)	0.23173982975834367
  (0, 3007)	0.21421364306658514
  (0, 5123)	0.308974289326673
  (0, 4453)	0.2297719954323795
  (0, 3926)	0.3126721340000456
  (0, 2554)	0.3825278811525034
  (0, 6739)	0.3546359942830148
  (0, 900)	0.4114867709157148
  (0, 2006)	0.2898082580285881
  (0, 6903)	0.3591386422223876
  (1, 5642)	0.24344998442301355
  (1, 799)	0.25048918791028574
  (1, 5441)	0.5009783758205715
  (1, 6472)	0.24039776602646504
  (1, 6013)	0.20089911182610476
  (1, 216)	0.28902673040368515
  (1, 4677)	0.24039776602646504
  (1, 5394)	0.16464655071448758
  (1, 6131)	0.16142609035094446
  (1, 532)	0.20186022353306565
  (1, 4358)	0.17341410292348694
  (1, 5301)	0.2711077935907125
  (1, 2003)	0.2711077935907125
  (1, 1548)	0.18167737976542422
  (1, 36)	0.28902673040368515
  :	:
 (4176, 6792)	0.1407604617250961
 (4176, 6693)	0.16491299289150899
 (4176, 6684)	0.22114159453800114
 (4176, 7083)	0.19523751585154273
 (4176, 1569)	0.18895085073406012
 (4176, 7195)	0.17892283441772988
 (4176, 779)	0.2811068572055718
 (4176, 1612)	0.21138425595332702
 (4176, 365)	0.2388005587702937
 (4176, 7114)	0.4512018097459442
 (4176, 637)	0.29968668460649284
 (4176, 4350)	0.29968668460649284
 (4176, 2004)	0.25589560236817055
 (4176, 107)	0.29968668460649284
 (4176, 343)	0.2811068572055718
 (4177, 3319)	0.43046342221720785
 (4177, 4177)	0.3636187667918345
 (4177, 5565)	0.5506066649743346
 (4177, 2362)	0.6158854885899457
 (4178, 2068)	0.3055766821331892
 (4178, 2641)	0.3993042639531407
 (4178, 6555)	0.2897850627168302
 (4178, 5720)	0.3963527249882828
 (4178, 4279)	0.4530624713751054
 (4178, 5883)	0.548491137555895
```

- Binary Classification dengan Logistic Regression

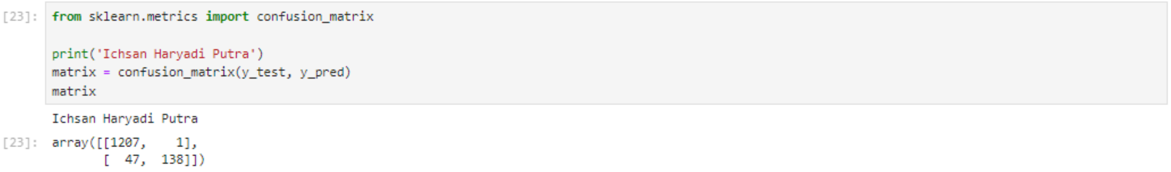


```
[22]: from sklearn.linear_model import LogisticRegression

      model = LogisticRegression()
      model.fit(X_train_tfidf, y_train)
      y_pred = model.predict(X_test_tfidf)

      print('Ichsan Haryadi Putra')
      for pred, sms in zip(y_pred[:5], X_test[:5]):
          print(f'PRED: {pred} - SMS: {sms}\n')
```

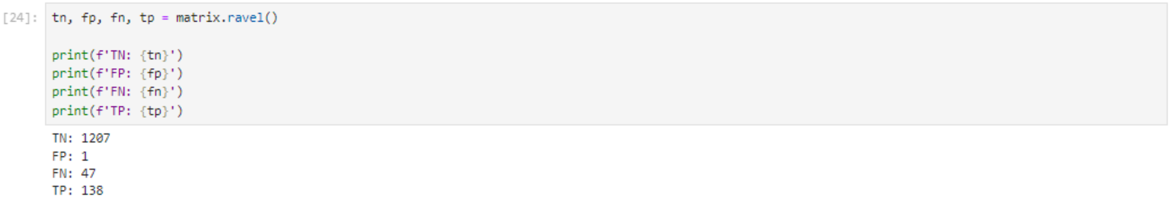
```
Ichsan Haryadi Putra
PRED: 0 - SMS: Storming msg: Wen u lift d phne, u say "HELLO" Do u knw wt is d real meaning of HELLO?? . . . It's d name of a girl..! . . . Yes.. And u k
nw who is dat girl?? "Margaret Hello" She is d girlfrnd f Grahmbell who invnted telphone... . . . . Moral:One can 4get d name of a person, bt not his gir
lfrnd... G o o d n i g h t . . .@

PRED: 0 - SMS: <Forwarded from 448712404000>Please CALL 08712404000 immediately as there is an urgent message waiting for you.

PRED: 0 - SMS: And also I've sorta blown him off a couple times recently so id rather not text him out of the blue looking for weed

PRED: 0 - SMS: Sir Goodmorning, Once free call me.

PRED: 0 - SMS: All will come alive.better correct any good looking figure there itself..
```

- Evaluation Metrics pada Binary Classification Task

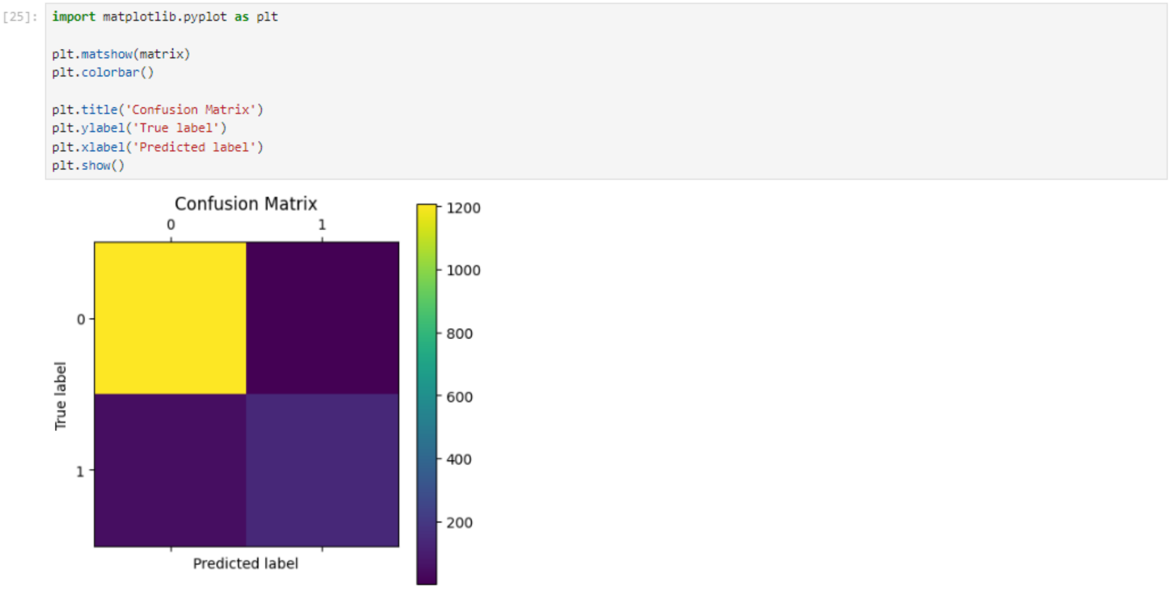
1) Pengenalan Confusion Matrix



```
[23]: from sklearn.metrics import confusion_matrix

      print('Ichsan Haryadi Putra')
      matrix = confusion_matrix(y_test, y_pred)
      matrix

      Ichsan Haryadi Putra

[23]: array([[1207,    1],
             [  47,  138]])
```

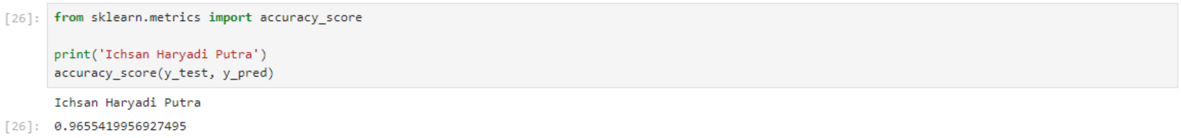


```
[24]: tn, fp, fn, tp = matrix.ravel()

      print(f'TN: {tn}')
      print(f'FP: {fp}')
      print(f'FN: {fn}')
      print(f'TP: {tp}')

      TN: 1207
      FP: 1
      FN: 47
      TP: 138
```



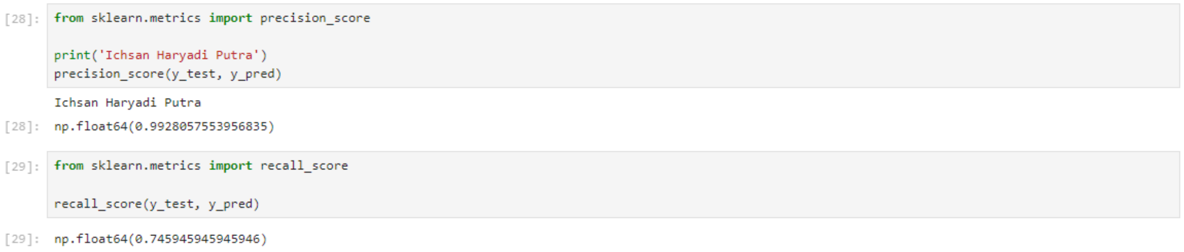
```
[25]: import matplotlib.pyplot as plt

      plt.matshow(matrix)
      plt.colorbar()

      plt.title('Confusion Matrix')
      plt.ylabel('True label')
      plt.xlabel('Predicted label')
      plt.show()
```

2) Pengenalan Accuracy Score



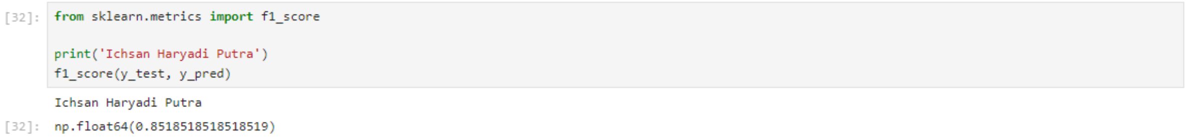
```
[26]: from sklearn.metrics import accuracy_score

      print('Ichsan Haryadi Putra')
      accuracy_score(y_test, y_pred)

      Ichsan Haryadi Putra

[26]: 0.9655419956927495
```

3) Pengenalan Precision dan Recall



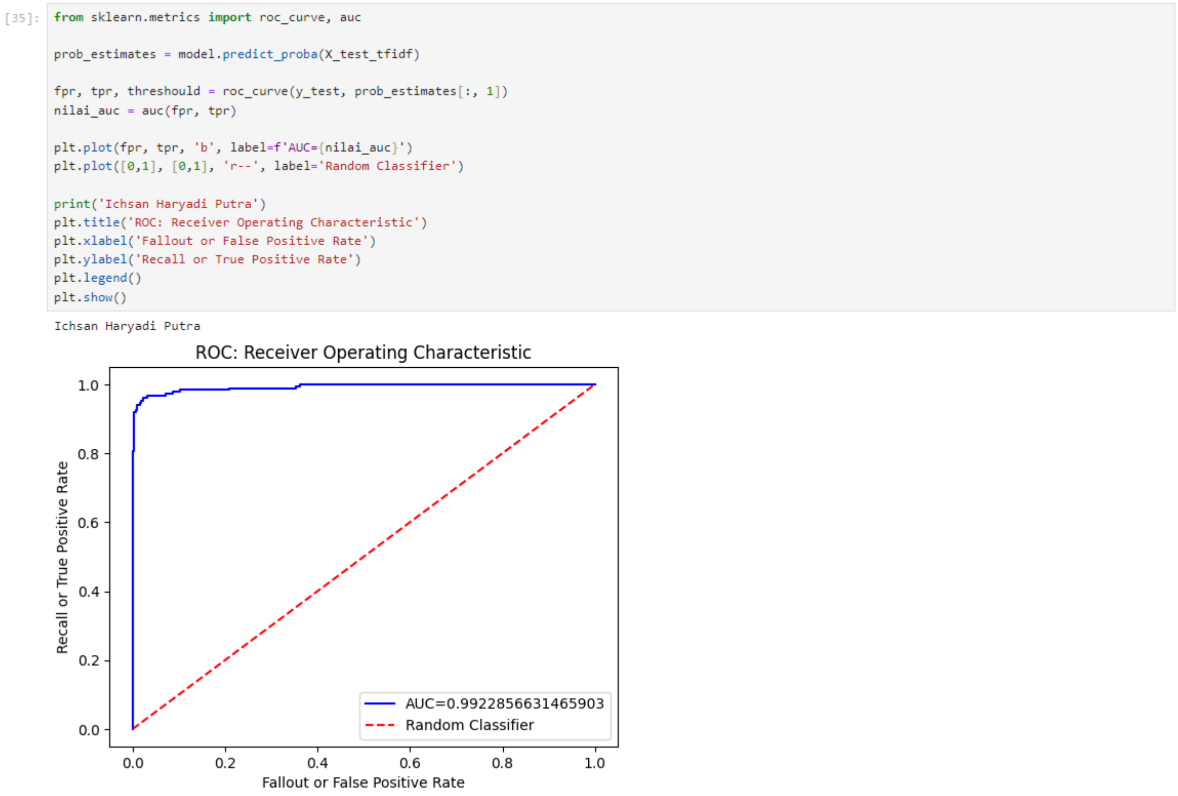
```
[28]: from sklearn.metrics import precision_score

      print('Ichsan Haryadi Putra')
      precision_score(y_test, y_pred)

      Ichsan Haryadi Putra

[28]: np.float64(0.9928057553956835)

[29]: from sklearn.metrics import recall_score

      recall_score(y_test, y_pred)

[29]: np.float64(0.745945945945946)
```

4) Pengenalan F1 Score | F1 Measure



```
[32]:  from sklearn.metrics import f1_score

       print('Ichsan Haryadi Putra')
       f1_score(y_test, y_pred)

       Ichsan Haryadi Putra
[32]:  np.float64(0.8518518518518519)
```

5) Pengenalan ROC | Receiver Operating Characteristic



```
[35]:  from sklearn.metrics import roc_curve, auc

       prob_estimates = model.predict_proba(X_test_tfidf)

       fpr, tpr, threshould = roc_curve(y_test, prob_estimates[:, 1])
       nilai_auc = auc(fpr, tpr)

       plt.plot(fpr, tpr, 'b', label=f'AUC={nilai_auc}')
       plt.plot([0,1], [0,1], 'r--', label='Random Classifier')

       print('Ichsan Haryadi Putra')
       plt.title('ROC: Receiver Operating Characteristic')
       plt.xlabel('Fallout or False Positive Rate')
       plt.ylabel('Recall or True Positive Rate')
       plt.legend()
       plt.show()

       Ichsan Haryadi Putra
```

ROC: Receiver Operating Characteristic
Recall or True Positive Rate
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0
Fallout or False Positive Rate
AUC=0.9922856631465903
Random Classifier