Nama : Triansyah Amarullah Ahmad Prayoga

NPM : 41155050210034

Kelas : TIF-A2

Matkul : Machine Learning

1.0. Lakukan praktek dari https://youtu.be/lcjq7-2zMSA?si=f4jWJR6lY8y0BZKl dan buat screen shot hasil run dengan nama anda pada hasil run tersebut. Praktek tersebut yaitu:

```
print('Triansyah Amarullah Ahmad Prayoga' '41155050210034')
```

```
Triansyah Amarullah Ahmad Prayoga41155050210034
```

1.1. Sample dataset

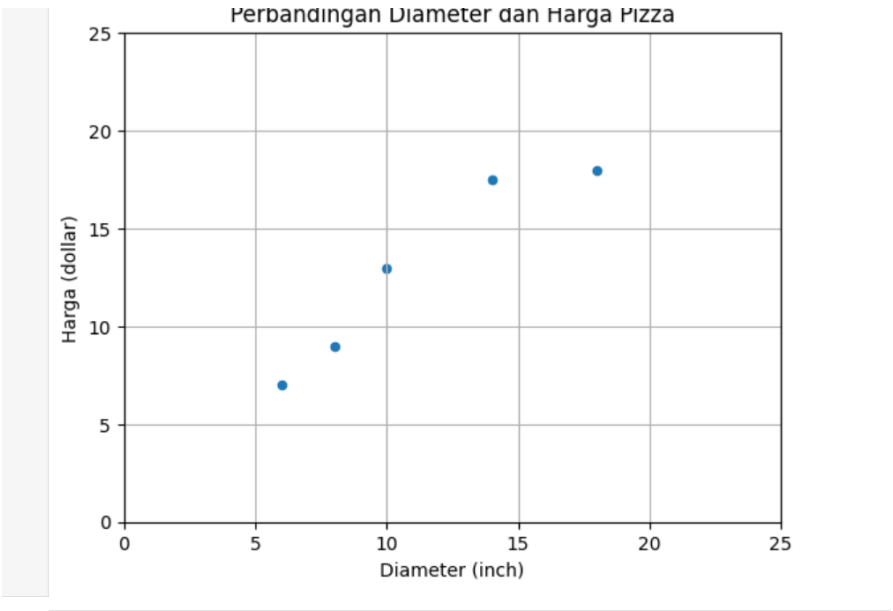
```
[3]: import pandas as pd

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

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

[3]:

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

1.2. Visualisasi dataset

```
import matplotlib.pyplot as plt

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

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()
```



1.3. Transformasi dataset

```
import numpy as np

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

print(f'X: {x}')
print(f'y: {y}')
```

```
X: [ 6  8 10 14 18]
y: [ 7.   9.  13.  17.5 18. ]
```

```
X = x.reshape(-1, 1)
X.shape
```

```
(5, 1)
```

```
X
```

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

1.4. Training Simple Linear Regression Model

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

```
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()
```

1.5. Visualisasi Simple Linear Regression Model | Penjelasan persamaan garis linear

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

```
intercept: 1.965517241379315
slope: [0.9762931]
```

1.6. Kalkulasi nilai slope

```
print(f'X:\n{X}\n')
print(f'X flatten: {X.flatten()}\n')
print(f'y: {y}')
```

```
X:
[[ 6]
 [ 8]
 [10]
 [14]
 [18]]

X flatten: [ 6  8 10 14 18]

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

```
variance_x = np.var(X.flatten(), ddof=1)

print(f'variance: {variance_x}')
```

```
variance: 23.2
```

```
np.cov(X.flatten(), y)
```

```
array([[23.2 , 22.65],
       [22.65, 24.3 ]])
```

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

print(f'covariance: {covariance_xy}')
```

```
covariance: 22.650000000000002
```

```
slope = covariance_xy / variance_x

print(f'slope: {slope}')
```

```
slope: 0.976293103448276
```

1.7. Kalkukasi nilai intercept

```
intercept = np.mean(y) - slope * np.mean(X)

print(f'intercept: {intercept}')
```

```
intercept: 1.9655172413793096
```

1.8. Prediksi harga pizza dengan Simple Linear Regression Model

```
diameter_pizza = np.array([12, 20, 23]).reshape(-1, 1)
diameter_pizza
```

```
array([[12],
       [20],
       [23]])
```

```
prediksi_harga = model.predict(diameter_pizza)
prediksi_harga
```

```
array([13.68103448, 21.49137931, 24.42025862])
```

```
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
```

1.9. Evaluasi model dengan Coefficient of Determination | R Squared

```
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: 0.7226457665620656
```

1.10. Kalkulasi nilai R Squared | Coefficient of Determination

```
ss_res = 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(f'ss_res: {ss_res}')
```

```
ss_res: 15.753720459274675
```

```
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
```

```
r_squared = 1 - (ss_res / ss_tot)

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

```
R-squared: 0.7226457665620656
```

2.0. Lakukan praktek dari https://youtu.be/nWJUJenAyB8?si=BQDzWwrMnr8jtzpV dan buat screen shot hasil run dengan nama anda pada hasil run tersebut. Praktek tersebut yaitu:

2.1. Persiapan sample dataset

```
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]}
train_pizza_df = pd.DataFrame(pizza)
train_pizza_df
```

	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

```
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
```

	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

2.2. Preprocessing dataset

```
import numpy as np

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

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

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

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

```
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. ]
```

2.3. Pengenalan Multiple Linear Regression | Apa itu Multiple Linear Regression?

```
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(f'r_squared: {r2_score(y_test, y_pred)}')
```

```
r_squared: 0.7701677731318468
```

2.4. Pengenalan Polynomial Regression | Apa itu Polynomial Regression?

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

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

```
X_train:
[[ 6]
 [ 8]
 [10]
 [14]
 [18]]

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

2.5. Quadratic Polynomial Regression

```
from sklearn.preprocessing import PolynomialFeatures

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

print(f'X_train_quadratic:\n{X_train_quadratic}\n')
```

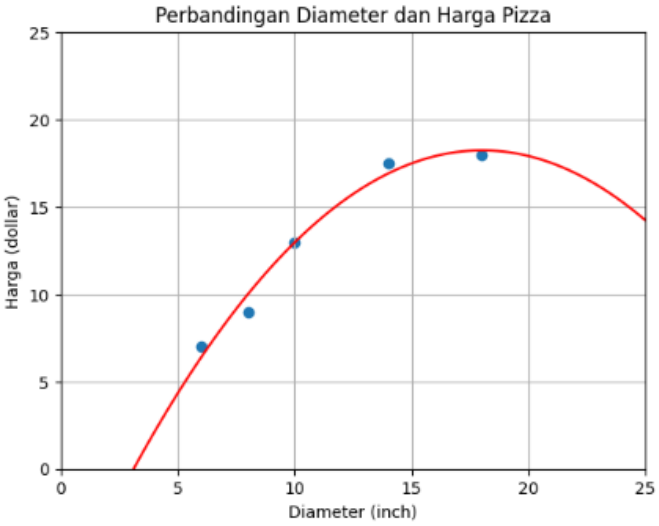
```
X_train_quadratic:
[[  1.   6.  36.]
 [  1.   8.  64.]
 [  1.  10. 100.]
 [  1.  14. 196.]
 [  1.  18. 324.]]
```

```
model = LinearRegression()
model.fit(X_train_quadratic, y_train)
```

LinearRegression

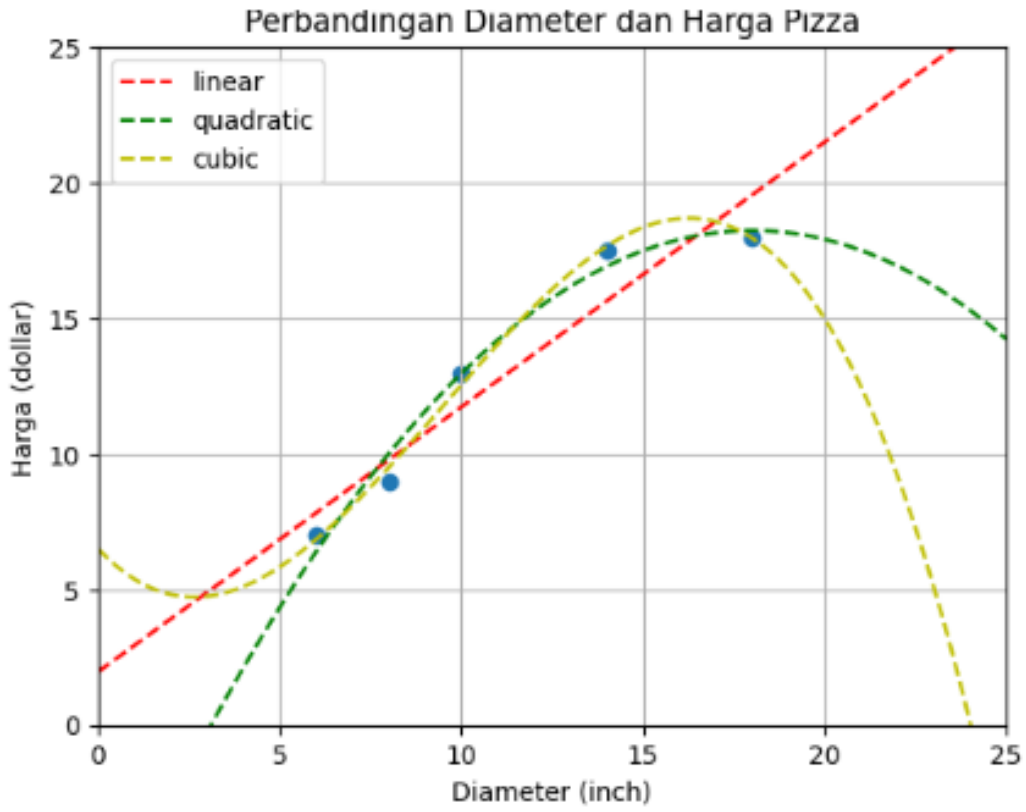
```
LinearRegression()
```

```
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()
```



2.6. Linear Regression vs Quadratic Polynomial Regression vs Cubic Polynomial Regression

```
#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.fit_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()
```

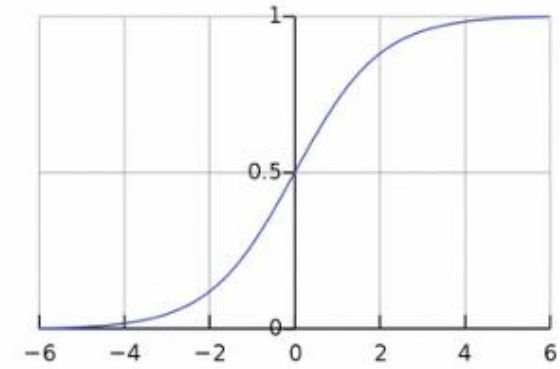


3.0. Lakukan praktek dari https://youtu.be/oe7DW4rSH1o?si=H-PZJ9rs9-Kab-Ln dan buat screen shot hasil run dengan nama anda pada hasil run tersebut. Praktek tersebut yaitu:

3.1. Formula dasar pembentuk Logistic Regression | Fungsi Sigmoid

Logistic Regression

- $g(X) = sigmoid(\alpha + \beta X)$
- $sigmoid(x) = \frac{1}{1+exp(-x)}$



3.2. Persiapan dataset | SMS Spam Collection Dataset

```
import pandas as pd

df = pd.read_csv('D:/Smester 7/MAchine learning/sms+spam+collection/SMSSpamCollection',
                 sep='\t',
                 header=None,
                 names=['label', 'sms'])
df.head()
```

	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...

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

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

3.3. Pembagian training dan testing set

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

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

      lb = LabelBinarizer()
      y = lb.fit_transform(y).ravel()
      lb.classes_
```

```
[14]: array(['ham', 'spam'], dtype='<U4')
```

```
[15]: 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]
```

3.4. Feature extraction dengan TF-IDF

```
[16]: 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(X_train_tfidf)
```

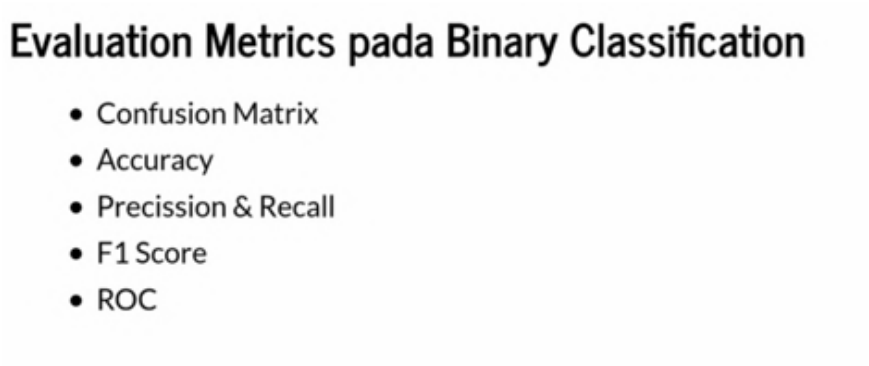
```
<Compressed Sparse Row sparse matrix of dtype 'float64'
        with 32656 stored elements and shape (4179, 7287)>
  Coords        Values
  (0, 2997)     0.23173982975834367
  (0, 3007)     0.21421364306658514
  (0, 5123)     0.308974289326673
  (0, 4453)     0.2297719954323795
  (0, 3926)     0.3126721340000456
  (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
```

3.5. Binary Classification dengan Logistic Regression

```
from sklearn.linear_model import LogisticRegression

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

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

```
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
knw 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 g
irlfrnd... 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..
```

3.6. Evaluation Metrics pada Binary Classification Task



3.7. Pengenalan Confusion Matrix

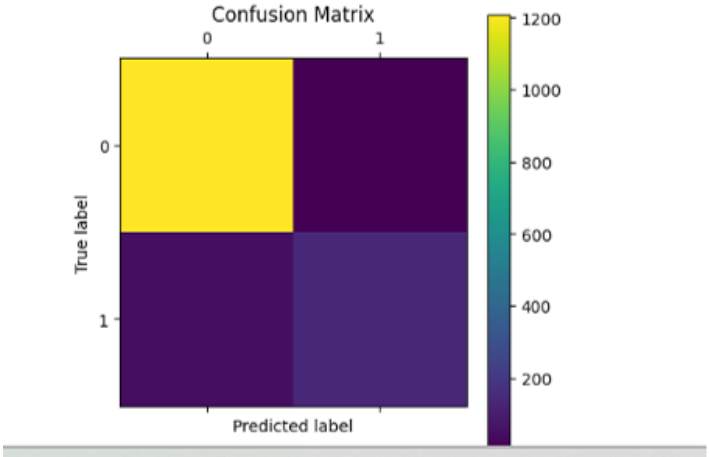
```
[14]: from sklearn.metrics import confusion_matrix

      matrix = confusion_matrix(y_test, y_pred)
      matrix
```

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

```
[15]: 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
```

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

      plt.matshow(matrix)
      plt.colorbar()

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



3.8. Pengenalan Accuracy Score

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

      accuracy_score(y_test, y_pred)
```

```
[18]: 0.9655419956927495
```

3.9. Pengenalan Precision dan Recall

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

      precision_score(y_test, y_pred)
```

```
[19]: np.float64(0.9928057553956835)
```

```
[20]: from sklearn.metrics import recall_score

      recall_score(y_test, y_pred)
```

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

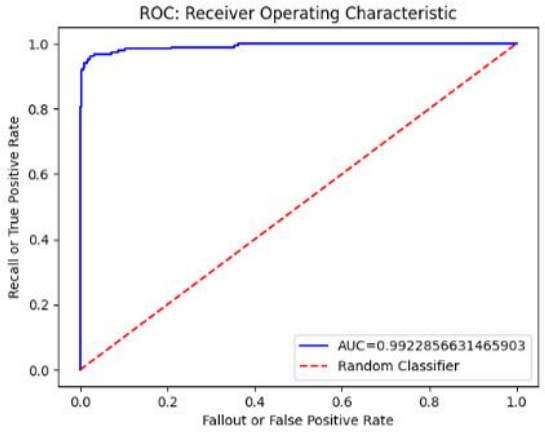
3.10. Pengenalan F1 Score | F1 Measure

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

      f1_score(y_test, y_pred)
```

```
[21]: np.float64(0.8518518518518519)
```

3.11. Pengenalan ROC | Receiver Operating Characteristic

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

prob_estimates = model.predict_proba(X_test_tfidf)

fpr, tpr, threshhold = 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')

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




```
[ ]:
```