UTS KECERDASAN BUATAN AI

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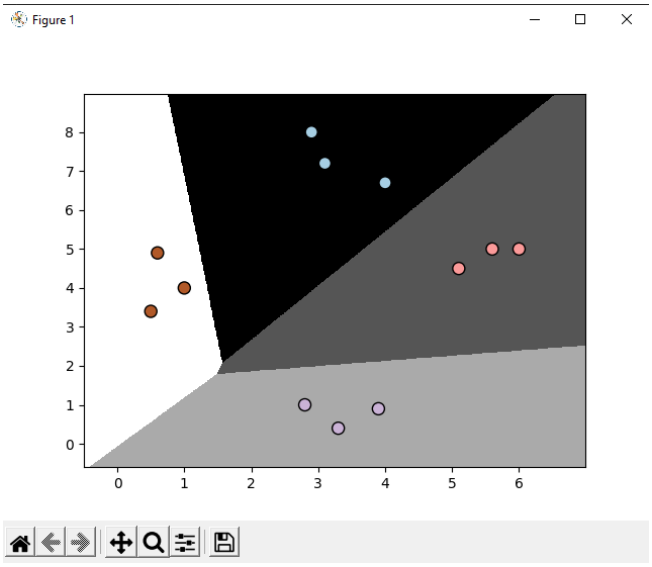
UTS Kecerdasan Buatan B

1. Analisa algoritma untuk *logistic_regression.py*. Dan analisa algoritmanya dan jalankan di komputer anda. (Untuk Chapter 2)

   Jawab :

```
import numpy as np
import matplotlib.pyplot as plt

def visualize_classifier(classifier, X, y):
    # Define the minimum and maximum values for X and Y
    # that will be used in the mesh grid
    min_x, max_x = X[:, 0].min() - 1.0, X[:, 0].max() + 1.0
    min_y, max_y = X[:, 1].min() - 1.0, X[:, 1].max() + 1.0

    # Define the step size to use in plotting the mesh grid
    mesh_step_size = 0.01

    # Define the mesh grid of X and Y values
    x_vals, y_vals = np.meshgrid(np.arange(min_x, max_x,
mesh_step_size), np.arange(min_y, max_y, mesh_step_size))

    # Run the classifier on the mesh grid
    output = classifier.predict(np.c_[x_vals.ravel(),
y_vals.ravel()])

    # Reshape the output array
    output = output.reshape(x_vals.shape)

    # Create a plot
    plt.figure()

    # Choose a color scheme for the plot
    plt.pcolormesh(x_vals, y_vals, output, cmap=plt.cm.gray)

    # Overlay the training points on the plot
    plt.scatter(X[:, 0], X[:, 1], c=y, s=75,
edgecolors='black', linewidth=1, cmap=plt.cm.Paired)

    # Specify the boundaries of the plot
    plt.xlim(x_vals.min(), x_vals.max())
    plt.ylim(y_vals.min(), y_vals.max())

    # Specify the ticks on the X and Y axes
```

```
    plt.xticks((np.arange(int(X[:, 0].min() - 1), int(X[:,
0].max() + 1), 1.0)))
    plt.yticks((np.arange(int(X[:, 1].min() - 1), int(X[:,
1].max() + 1), 1.0)))

    plt.show()

import numpy as np
from sklearn import linear_model
import matplotlib.pyplot as plt

# Define sample input data
X = np.array([[3.1, 7.2], [4, 6.7], [2.9, 8], [5.1, 4.5], [6,
5], [5.6, 5], [3.3, 0.4], [3.9, 0.9], [2.8, 1], [0.5, 3.4],
[1, 4], [0.6, 4.9]])
y = np.array([0, 0, 0, 1, 1, 1, 2, 2, 2, 3, 3, 3])

# Create the logistic regression classifier
classifier =
linear_model.LogisticRegression(solver='liblinear', C=1)
#classifier =
linear_model.LogisticRegression(solver='liblinear', C=100)

# Train the classifier
classifier.fit(X, y)

# Visualize the performance of the classifier
visualize_classifier(classifier, X, y)
```



Setelah kita melakukan kode pada program dapat diketahui bahwa program tersebut melakukan suatu plot data acak pada program berdasarkan areanya pada program ini kita melakukan regresi logistic. Pada gambar diatas dapat dilihat bahwa sistem regresi tersebut memiliki 4 buah data yang dimasukan

dalam berbagai border dengan warna yang berbeda-beda. Setiap data memiliki 3 buah data lagi yang terdapat pada segmentasi-segmentasi warna pada program yang ada. Dalam menunjukan ketajaman segmentasi, pada program logistic regression dipengaruhi oleh nilai kurvanya. Semakin besar nilai kurvanya, maka akan semakin bagus titik temu segmentasi logistic regression-nya. Sebaliknya, ketika nilai kurvanya dikecilkan maka yang akan terjadi adalah titik temu kurvanya akan semakin memburuk.

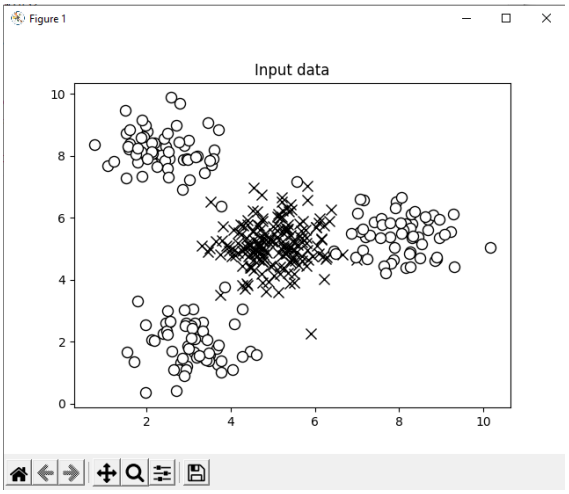
2. Analisa algoritma untuk *decision_trees.py*. Dan analisa algoritmanya dan jalankan di komputer anda. (Untuk Chapter 3)

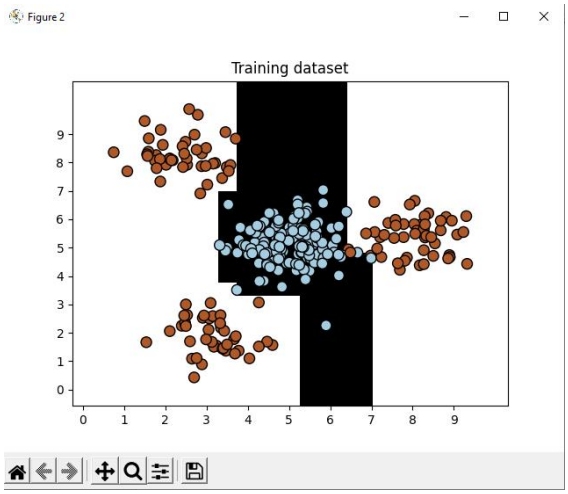
   Jawab :

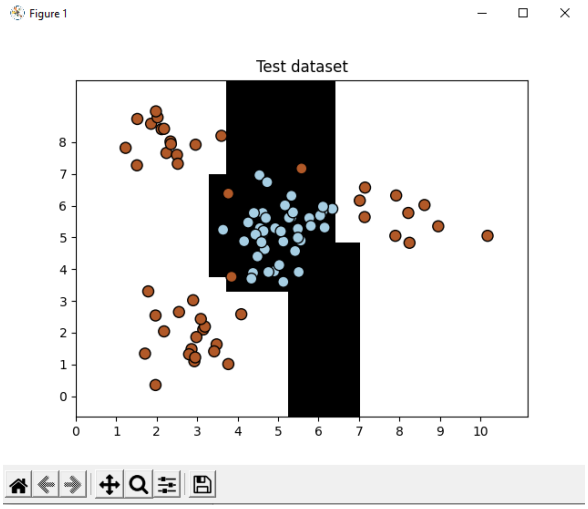
```
import numpy as np
import matplotlib.pyplot as plt

def visualize_classifier(classifier, X, y, title=''):
    # Define the minimum and maximum values for X and Y
    # that will be used in the mesh grid
    min_x, max_x = X[:, 0].min() - 1.0, X[:, 0].max() + 1.0
    min_y, max_y = X[:, 1].min() - 1.0, X[:, 1].max() + 1.0

    # Define the step size to use in plotting the mesh grid
    mesh_step_size = 0.01

    # Define the mesh grid of X and Y values
    x_vals, y_vals = np.meshgrid(np.arange(min_x, max_x,
mesh_step_size), np.arange(min_y, max_y, mesh_step_size))

    # Run the classifier on the mesh grid
    output = classifier.predict(np.c_[x_vals.ravel(),
y_vals.ravel()])

    # Reshape the output array
    output = output.reshape(x_vals.shape)

    # Create a plot
    plt.figure()
```

```
    # Specify the title
    plt.title(title)

    # Choose a color scheme for the plot
    plt.pcolormesh(x_vals, y_vals, output, cmap=plt.cm.gray)

    # Overlay the training points on the plot
    plt.scatter(X[:, 0], X[:, 1], c=y, s=75,
edgecolors='black', linewidth=1, cmap=plt.cm.Paired)

    # Specify the boundaries of the plot
    plt.xlim(x_vals.min(), x_vals.max())
    plt.ylim(y_vals.min(), y_vals.max())

    # Specify the ticks on the X and Y axes
    plt.xticks((np.arange(int(X[:, 0].min() - 1), int(X[:,
0].max() + 1), 1.0)))
    plt.yticks((np.arange(int(X[:, 1].min() - 1), int(X[:,
1].max() + 1), 1.0)))

    plt.show()
import numpy as np
import matplotlib.pyplot as plt
from sklearn.metrics import classification_report
#from sklearn import cross_validation
from sklearn.tree import DecisionTreeClassifier

from sklearn.model_selection import train_test_split

# Load input data
input_file = 'data_decision_trees.txt'
data = np.loadtxt(input_file, delimiter=',')
X, y = data[:, :-1], data[:, -1]

# Separate input data into two classes based on labels
class_0 = np.array(X[y==0])
class_1 = np.array(X[y==1])

# Visualize input data
```

```
plt.figure()
plt.scatter(class_0[:, 0], class_0[:, 1], s=75,
facecolors='black',
        edgecolors='black', linewidth=1, marker='x')
plt.scatter(class_1[:, 0], class_1[:, 1], s=75,
facecolors='white',
        edgecolors='black', linewidth=1, marker='o')
plt.title('Input data')

# Split data into training and testing datasets
X_train, X_test, y_train, y_test = train_test_split(
        X, y, test_size=0.25, random_state=5)

# Decision Trees classifier
params = {'random_state': 0, 'max_depth': 4}
classifier = DecisionTreeClassifier(**params)
classifier.fit(X_train, y_train)
visualize_classifier(classifier, X_train, y_train, 'Training
dataset')

y_test_pred = classifier.predict(X_test)
visualize_classifier(classifier, X_test, y_test, 'Test
dataset')

# Evaluate classifier performance
class_names = ['Class-0', 'Class-1']
print("\n" + "#"*40)
print("\nClassifier performance on training dataset\n")
print(classification_report(y_train,
classifier.predict(X_train), target_names=class_names))
print("#"*40 + "\n")

print("#"*40)
print("\nClassifier performance on test dataset\n")
print(classification_report(y_test, y_test_pred,
target_names=class_names))
print("#"*40 + "\n")

plt.show()
```








```
########################################

Classifier performance on training dataset

              precision    recall  f1-score   support

     Class-0       0.99      1.00      1.00       137
     Class-1       1.00      0.99      1.00       133

    accuracy                           1.00       270
   macro avg       1.00      1.00      1.00       270
weighted avg       1.00      1.00      1.00       270

########################################

########################################

Classifier performance on test dataset

              precision    recall  f1-score   support

     Class-0       0.93      1.00      0.97        43
     Class-1       1.00      0.94      0.97        47

    accuracy                           0.97        90
   macro avg       0.97      0.97      0.97        90
weighted avg       0.97      0.97      0.97        90

########################################
```

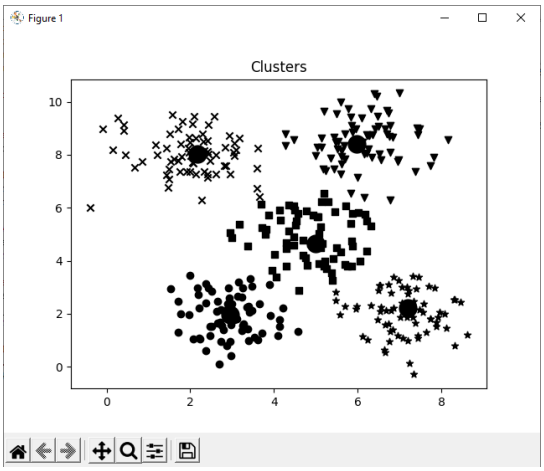
Berdasarkan percobaan diatas kita menggunakan decision tree yang menggunakan metode if (jika) dengan menggunakan metode pohon. Pada decision tree terdapat precision, recall, f1-score, dan support. Support merupakan jumlah data yang digunakan pada program, f1-score merupakan harmonic means, recal merupakan banyaknya data yang dipanggil kembali, dan precision merupakan ketepatan menempati plot yang seharusnya. Dilihat pada perfomra klasifikasinya pada training test terlihat pada f1-score memiliki nilai 1 yang mengartikan bahwa nilainya memiliki nilai yang baik. Sedangkan, pada saat test data test memiliki nilai 0.97 yang menandakan bahwa nilainya memiliki nilai yang baik karena pada setiap percobaan tidak ada percobaan yang benar-benar 100%. Data yang digunakan pada saat training test dengan test sangat berbeda.

3. Analisa algoritma untuk *mean_shift.py*. Dan analisa algoritmanya dan jalankan di komputer anda. (untuk Chapter 4)

   Jawab :

```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.cluster import MeanShift, estimate_bandwidth
from itertools import cycle

# Load data from input file
X = np.loadtxt('data_clustering.txt', delimiter=',')

# Estimate the bandwidth of X
bandwidth_X = estimate_bandwidth(X, quantile=0.1,
n_samples=len(X))

# Cluster data with MeanShift
meanshift_model = MeanShift(bandwidth=bandwidth_X,
bin_seeding=True)
meanshift_model.fit(X)

# Extract the centers of clusters
cluster_centers = meanshift_model.cluster_centers_
print('\nCenters of clusters:\n', cluster_centers)

# Estimate the number of clusters
labels = meanshift_model.labels_
num_clusters = len(np.unique(labels))
print("\nNumber of clusters in input data =", num_clusters)

# Plot the points and cluster centers
plt.figure()
markers = 'o*xvs'
for i, marker in zip(range(num_clusters), markers):
    # Plot points that belong to the current cluster
    plt.scatter(X[labels==i, 0], X[labels==i, 1],
marker=marker, color='black')

    # Plot the cluster center
    cluster_center = cluster_centers[i]
```

```
    plt.plot(cluster_center[0], cluster_center[1], marker='o',
             markerfacecolor='black', markeredgecolor='black',
             markersize=15)

plt.title('Clusters')
plt.show()
```




```
Centers of clusters:
 [[2.95568966 1.95775862]
 [7.20690909 2.20836364]
 [2.17603774 8.03283019]
 [5.97960784 8.39078431]
 [4.99466667 4.65844444]]

Number of clusters in input data = 5
```

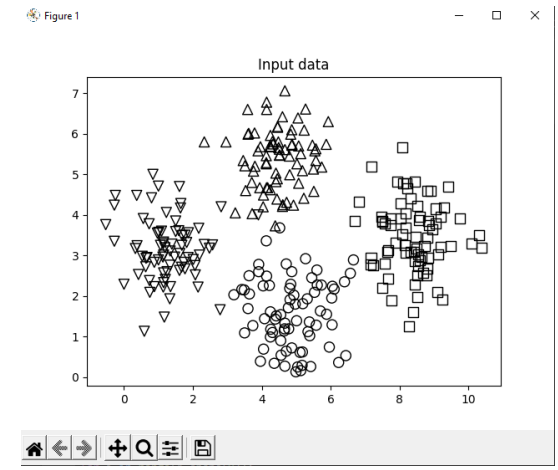
Berdasarkan program yang telah dijalankan didapati bahwa program ini bertujuan untuk mengklasifikasikan data yang ada pada program pada progam juga didapati bahwa terdapat 5 buah data. Bentuk data tersebut dibentuk dalam berbagai bentuk seperti segitiga, silang, bintang, lingkaran, dan kotak. Setiap data memiliki region-region-nya sendiri yang dimana pusat dari setiap region tersebut akan berbentuk lingkaran tepat ditengah region-nya. Fungsinya adalah untuk mengkelompokan suatu data berdasarkan kemiripan datanya.

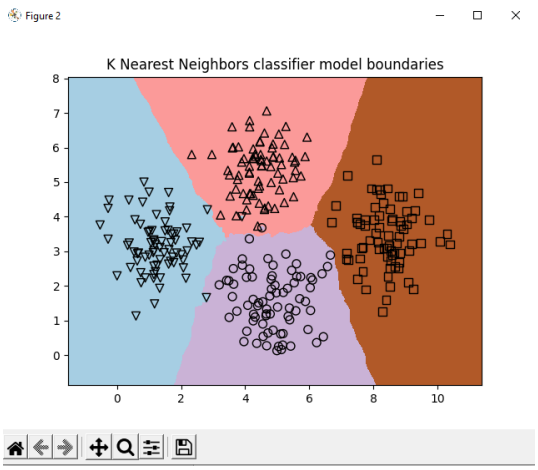
4. Analisa algoritma untuk *nearest_neighbors_classifier.py.* Dan analisa algoritmanya dan jalankan di komputer anda (untuk Chapter 5)

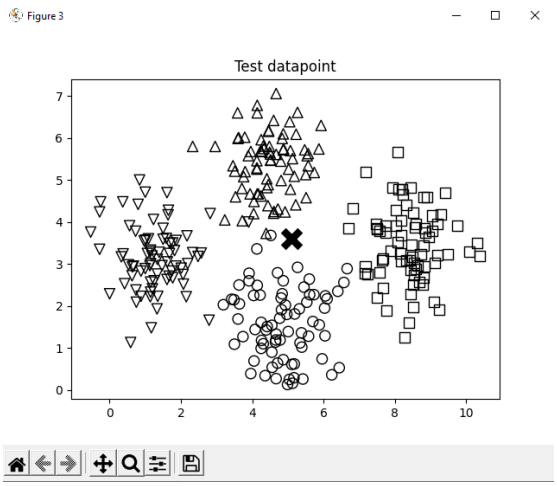
   Jawab :

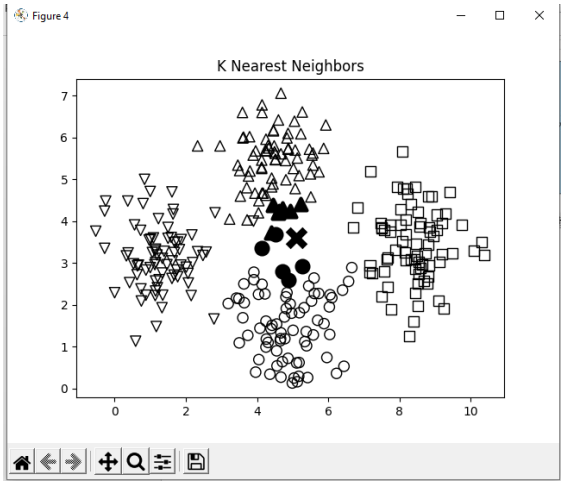
```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.neighbors import NearestNeighbors


# Input data
```

```
X = np.array([[2.1, 1.3], [1.3, 3.2], [2.9, 2.5], [2.7, 5.4],
[3.8, 0.9],
        [7.3, 2.1], [4.2, 6.5], [3.8, 3.7], [2.5, 4.1], [3.4,
1.9],
        [5.7, 3.5], [6.1, 4.3], [5.1, 2.2], [6.2, 1.1]])

# Number of nearest neighbors
k = 5

# Test datapoint
test_datapoint = [4.3, 2.7]

# Plot input data
plt.figure()
plt.title('Input data')
plt.scatter(X[:,0], X[:,1], marker='o', s=75, color='black')

# Build K Nearest Neighbors model
knn_model = NearestNeighbors(n_neighbors=k,
algorithm='ball_tree').fit(X)
distances, indices = knn_model.kneighbors([test_datapoint])

# Print the 'k' nearest neighbors
print("\nK Nearest Neighbors:")
for rank, index in enumerate(indices[0][:k], start=1):
    print(str(rank) + " ==>", X[index])

# Visualize the nearest neighbors along with the test
datapoint
plt.figure()
plt.title('Nearest neighbors')
plt.scatter(X[:, 0], X[:, 1], marker='o', s=75, color='k')
plt.scatter(X[indices][0][:][:, 0], X[indices][0][:][:, 1],
        marker='o', s=250, color='k', facecolors='none')
plt.scatter(test_datapoint[0], test_datapoint[1],
        marker='x', s=75, color='k')

plt.show()
```









Berdasarkan program yang dilakukan dapat diketahui bahwa program tersebut membuat klasifikasi bagian-bagian program yang ada dengan region-region yang ada berdasarkan tetangga terdekatnya. Program tersebut memiliki data dengan menggunakan klasifikasi tetangganya. Suatu data dapat memiliki nilai region dan data yang berbeda, kasus tersebut terjadi pada bentuk region pink dan region ungu dimana pada region pink terdapat data lingkaran. Hal ini menyebabkan data lingkaran tersebut dapat dinamakan data dari region pink dan data dari region ungu. Algoritma program tersebut dilihat pada kedekatan tetangganya, label, dan juga region-nya.

5. Analisa algoritma untuk *states.py*. Dan analisa algoritmanya dan jalankan di komputer anda (untuk Chapter 6)

   Jawab :

```
from logpy import run, fact, eq, Relation, var


adjacent = Relation()
coastal = Relation()
```

```
file_coastal = 'coastal_states.txt'
file_adjacent = 'adjacent_states.txt'

# Read the file containing the coastal states
with open(file_coastal, 'r') as f:
    line = f.read()
    coastal_states = line.split(',')

# Add the info to the fact base
for state in coastal_states:
    fact(coastal, state)

# Read the file containing the coastal states
with open(file_adjacent, 'r') as f:
    adjlist = [line.strip().split(',') for line in f if line and
line[0].isalpha()]

# Add the info to the fact base
for L in adjlist:
    head, tail = L[0], L[1:]
    for state in tail:
        fact(adjacent, head, state)

# Initialize the variables
x = var()
y = var()

# Is Nevada adjacent to Louisiana?
output = run(0, x, adjacent('Nevada', 'Louisiana'))
print('\nIs Nevada adjacent to Louisiana?:')
print('Yes' if len(output) else 'No')

# States adjacent to Oregon
output = run(0, x, adjacent('Oregon', x))
print('\nList of states adjacent to Oregon:')
for item in output:
    print(item)
```

```
# States adjacent to Mississippi that are coastal
output = run(0, x, adjacent('Mississippi', x), coastal(x))
print('\nList of coastal states adjacent to Mississippi:')
for item in output:
    print(item)

# List of 'n' states that border a coastal state
n = 7
output = run(n, x, coastal(y), adjacent(x, y))
print('\nList of ' + str(n) + ' states that border a coastal
state:')
for item in output:
    print(item)

# List of states that adjacent to the two given states
output = run(0, x, adjacent('Arkansas', x), adjacent('Kentucky',
x))
print('\nList of states that are adjacent to Arkansas and
Kentucky:')
for item in output:
    print(item)
```

```
Is Nevada adjacent to Louisiana?:
No

List of states adjacent to Oregon:
Nevada
California
Washington
Idaho

List of coastal states adjacent to Mississippi:
Alabama
Louisiana

List of 7 states that border a coastal state:
Georgia
Massachusetts
Arizona
Nevada
Vermont
Pennsylvania
Idaho

List of states that are adjacent to Arkansas and Kentucky:
Tennessee
Missouri
```

Berdasarkan program yang telah dijalankan, didapatti bahwa program tersebut merupakan program yang membentuk relasi antara program dan data yang ada pada suatu program. Pada program yang telah dilakukan data yang telah dipersiapkan akan dilakukan relasi program dengan bantuan data tersebut. Data tersebut dibandingkan antara data coastal_states dengan adjacent_states. Seperti pada program diatas yaitu

```
Is Nevada adjacent to Louisiana?:
No

List of states adjacent to Oregon:
Washington
Idaho
Nevada
California

List of coastal states adjacent to Mississippi:
Louisiana
Alabama
```