**Anggota Kelompok**

```
In [1]: import graphviz
        import itertools
        import matplotlib.pyplot as plt
        import numpy as np
        import pandas as pd
        from IPython.display import display
        from matplotlib.colors import ListedColormap
        from sklearn import neighbors
        from sklearn import datasets, tree, svm
        from sklearn.externals import joblib
        from sklearn.metrics import confusion_matrix
        from sklearn.metrics import accuracy_score
        from sklearn.metrics import precision_score
        from sklearn.metrics import recall_score
        from sklearn.model_selection import cross_val_score
        from sklearn.model_selection import train_test_split
        from sklearn.naive_bayes import GaussianNB
        from sklearn.neighbors import KNeighborsClassifier
        from sklearn.neural_network import MLPClassifier
```

# A. Membaca Data Iris & CSV

```
In [2]: iris = datasets.load_iris()

        print("Data Iris =")
        print(iris.data)
        print()
        print()
        print("Target Iris = ")
        print(iris.target)
```

```
Data Iris =
[[5.1 3.5 1.4 0.2]
 [4.9 3.  1.4 0.2]
 [4.7 3.2 1.3 0.2]
 [4.6 3.1 1.5 0.2]
 [5.  3.6 1.4 0.2]
 [5.4 3.9 1.7 0.4]
 [4.6 3.4 1.4 0.3]
 [5.  3.4 1.5 0.2]
 [4.4 2.9 1.4 0.2]
 [4.9 3.1 1.5 0.1]
 [5.4 3.7 1.5 0.2]
 [4.8 3.4 1.6 0.2]
 [4.8 3.  1.4 0.1]
 [4.3 3.  1.1 0.1]
 [5.8 4.  1.2 0.2]
 [5.7 4.4 1.5 0.4]
 [5.4 3.9 1.3 0.4]
 [5.1 3.5 1.4 0.3]
 [5.7 3.8 1.7 0.3]
 [5.1 3.8 1.5 0.3]
 [5.4 3.4 1.7 0.2]
 [5.1 3.7 1.5 0.4]
 [4.6 3.6 1.  0.2]
 [5.1 3.3 1.7 0.5]
 [4.8 3.4 1.9 0.2]
 [5.  3.  1.6 0.2]
 [5.  3.4 1.6 0.4]
 [5.2 3.5 1.5 0.2]
 [5.2 3.4 1.4 0.2]
 [4.7 3.2 1.6 0.2]
 [4.8 3.1 1.6 0.2]
 [5.4 3.4 1.5 0.4]
 [5.2 4.1 1.5 0.1]
 [5.5 4.2 1.4 0.2]
 [4.9 3.1 1.5 0.2]
 [5.  3.2 1.2 0.2]
 [5.5 3.5 1.3 0.2]
 [4.9 3.6 1.4 0.1]
 [4.4 3.  1.3 0.2]
 [5.1 3.4 1.5 0.2]
```

```
[5.  3.5 1.3 0.3]
[4.5 2.3 1.3 0.3]
[4.4 3.2 1.3 0.2]
[5.  3.5 1.6 0.6]
[5.1 3.8 1.9 0.4]
[4.8 3.  1.4 0.3]
[5.1 3.8 1.6 0.2]
[4.6 3.2 1.4 0.2]
[5.3 3.7 1.5 0.2]
[5.  3.3 1.4 0.2]
[7.  3.2 4.7 1.4]
[6.4 3.2 4.5 1.5]
[6.9 3.1 4.9 1.5]
[5.5 2.3 4.  1.3]
[6.5 2.8 4.6 1.5]
[5.7 2.8 4.5 1.3]
[6.3 3.3 4.7 1.6]
[4.9 2.4 3.3 1. ]
[6.6 2.9 4.6 1.3]
[5.2 2.7 3.9 1.4]
[5.  2.  3.5 1. ]
[5.9 3.  4.2 1.5]
[6.  2.2 4.  1. ]
[6.1 2.9 4.7 1.4]
[5.6 2.9 3.6 1.3]
[6.7 3.1 4.4 1.4]
[5.6 3.  4.5 1.5]
[5.8 2.7 4.1 1. ]
[6.2 2.2 4.5 1.5]
[5.6 2.5 3.9 1.1]
[5.9 3.2 4.8 1.8]
[6.1 2.8 4.  1.3]
[6.3 2.5 4.9 1.5]
[6.1 2.8 4.7 1.2]
[6.4 2.9 4.3 1.3]
[6.6 3.  4.4 1.4]
[6.8 2.8 4.8 1.4]
[6.7 3.  5.  1.7]
[6.  2.9 4.5 1.5]
[5.7 2.6 3.5 1. ]
[5.5 2.4 3.8 1.1]
[5.5 2.4 3.7 1. ]
[5.8 2.7 3.9 1.2]
[6.  2.7 5.1 1.6]
[5.4 3.  4.5 1.5]
[6.  3.4 4.5 1.6]
[6.7 3.1 4.7 1.5]
[6.3 2.3 4.4 1.3]
[5.6 3.  4.1 1.3]
[5.5 2.5 4.  1.3]
[5.5 2.6 4.4 1.2]
[6.1 3.  4.6 1.4]
[5.8 2.6 4.  1.2]
[5.  2.3 3.3 1. ]
[5.6 2.7 4.2 1.3]
[5.7 3.  4.2 1.2]
[5.7 2.9 4.2 1.3]
[6.2 2.9 4.3 1.3]
[5.1 2.5 3.  1.1]
[5.7 2.8 4.1 1.3]
[6.3 3.3 6.  2.5]
[5.8 2.7 5.1 1.9]
[7.1 3.  5.9 2.1]
[6.3 2.9 5.6 1.8]
[6.5 3.  5.8 2.2]
[7.6 3.  6.6 2.1]
[4.9 2.5 4.5 1.7]
[7.3 2.9 6.3 1.8]
[6.7 2.5 5.8 1.8]
[7.2 3.6 6.1 2.5]
[6.5 3.2 5.1 2. ]
[6.4 2.7 5.3 1.9]
[6.8 3.  5.5 2.1]
[5.7 2.5 5.  2. ]
[5.8 2.8 5.1 2.4]
[6.4 3.2 5.3 2.3]
[6.5 3.  5.5 1.8]
```

```
 [7.7 3.8 6.7 2.2]
 [7.7 2.6 6.9 2.3]
 [6.  2.2 5.  1.5]
 [6.9 3.2 5.7 2.3]
 [5.6 2.8 4.9 2. ]
 [7.7 2.8 6.7 2. ]
 [6.3 2.7 4.9 1.8]
 [6.7 3.3 5.7 2.1]
 [7.2 3.2 6.  1.8]
 [6.2 2.8 4.8 1.8]
 [6.1 3.  4.9 1.8]
 [6.4 2.8 5.6 2.1]
 [7.2 3.  5.8 1.6]
 [7.4 2.8 6.1 1.9]
 [7.9 3.8 6.4 2. ]
 [6.4 2.8 5.6 2.2]
 [6.3 2.8 5.1 1.5]
 [6.1 2.6 5.6 1.4]
 [7.7 3.  6.1 2.3]
 [6.3 3.4 5.6 2.4]
 [6.4 3.1 5.5 1.8]
 [6.  3.  4.8 1.8]
 [6.9 3.1 5.4 2.1]
 [6.7 3.1 5.6 2.4]
 [6.9 3.1 5.1 2.3]
 [5.8 2.7 5.1 1.9]
 [6.8 3.2 5.9 2.3]
 [6.7 3.3 5.7 2.5]
 [6.7 3.  5.2 2.3]
 [6.3 2.5 5.  1.9]
 [6.5 3.  5.2 2. ]
 [6.2 3.4 5.4 2.3]
 [5.9 3.  5.1 1.8]]

Target Iris =
[0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2
 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
 2 2]
```

```
In [3]: play_tennis = pd.read_csv('weather.nominal.csv')
        print(play_tennis)
```

```
     outlook temperature humidity  windy play
0      sunny         hot     high  False   no
1      sunny         hot     high   True   no
2   overcast         hot     high  False  yes
3      rainy        mild     high  False  yes
4      rainy        cool   normal  False  yes
5      rainy        cool   normal   True   no
6   overcast        cool   normal   True  yes
7      sunny        mild     high  False   no
8      sunny        cool   normal  False  yes
9      rainy        mild   normal  False  yes
10     sunny        mild   normal   True  yes
11  overcast        mild     high   True  yes
12  overcast         hot   normal  False  yes
13     rainy        mild     high   True   no
```

# B. Skema Full Training & Model

## Naive Bayes

```
In [4]: gnb = GaussianNB()
        gnb.fit(iris.data,iris.target)

        print("Model:")
        print("1. Probabilitas setiap kelas:")
        print(gnb.class_prior_)
```

```
        print()
        print("2. Rata-rata setiap fitur per kelas:")
        print(gnb.theta_)
        print()
        print("3. Variansi setiap fitur per kelas:")
        print(gnb.sigma_)
```

```
Model:
1. Probabilitas setiap kelas:
[0.33333333 0.33333333 0.33333333]

2. Rata-rata setiap fitur per kelas:
[[5.006 3.428 1.462 0.246]
 [5.936 2.77  4.26  1.326]
 [6.588 2.974 5.552 2.026]]

3. Variansi setiap fitur per kelas:
[[0.121764 0.140816 0.029556 0.010884]
 [0.261104 0.0965   0.2164   0.038324]
 [0.396256 0.101924 0.298496 0.073924]]
```

## Decision Tree

```
In [5]: dtl = tree.DecisionTreeClassifier(criterion="entropy")
        dtl2 = dtl.fit(iris.data, iris.target)
        dtl2.predict(iris.data)

        #visualisasi data model
        dot_data = tree.export_graphviz(dtl, out_file=None,
                                  feature_names=iris.feature_names,
                                  class_names=iris.target_names,
                                  filled=True, rounded=False,
                                  special_characters=True)
        graph = graphviz.Source(dot_data)
        graph
```

## k-Nearest Neighbors (kNN)

```
In [6]: knn = KNeighborsClassifier(n_neighbors=5)
        knn.fit(iris.data, iris.target)

        print("knn tidak menghasilkan model")

        knn.get_params()
```

```
knn tidak menghasilkan model
{'algorithm': 'auto',
 'leaf_size': 30,
 'metric': 'minkowski',
 'metric_params': None,
 'n_jobs': None,
 'n_neighbors': 5,
 'p': 2,
 'weights': 'uniform'}
```

## Neural Network MLP

```
In [7]: neuron = MLPClassifier(solver='lbfgs', alpha = 1e-5,
                               hidden_layer_sizes=(5, 5), random_state = 1)
        neuron.fit(iris.data, iris.target)

        # Menampilkan model
        print("Model:")

        # Elemen ke-i di list merepresentasikan weight matrix untuk layer ke-i
        print("1. Weight Matrices:")
```

```
        print(neuron.coefs_)
        print()

        # Elemen ke-i di list merepresentasikan bias vector untuk layer ke-(i + 1)
        print("2. Bias Vectors:")
        print(neuron.intercepts_)
```

```
Model:
1. Weight Matrices:
[array([[-0.13549525, -0.70617706, -0.81626616, -0.09739896, -0.57681437],
       [-0.66567269, -1.6961518 , -0.25218479, -3.35497358,  0.06338407],
       [-0.13194775,  2.34263865, -0.48260165,  5.42458316, -0.77173156],
       [ 0.27835739,  5.10344605,  0.09583496,  2.64869349, -0.49297184]]), array([[ 0.61128933, -0.642812
       [ 0.75593885, -0.81813288,  0.86290273,  3.14252919, -0.31296947],
       [-0.28578667,  0.28891055,  0.51837214, -0.74622469,  0.38750119],
       [ 5.02436472,  2.134994  , -1.17861411,  6.93488334, -0.53995981],
       [-0.08071869,  0.63295959, -0.31971449, -0.32875945, -0.57312663]]), array([[-6.06077396,  1.954595
       [ 2.64312353, -0.09791849, -2.7332986 ],
       [ 6.75812341,  0.83855361, -7.55747343],
       [-6.76559417,  3.06675859,  3.26523033],
       [ 3.32995678,  1.06134833, -3.44558854]])]

2. Bias Vectors:
[array([ 0.49111382, -1.20240816, -0.30467704,  0.22950199,  0.61464091]), array([ 2.20332389,  8.676083113
```

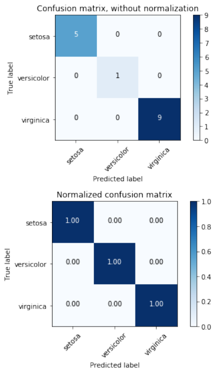
# C. Pembelajaran dengan split train 90%, test 10% dan confusion matrix

## Naive Bayes

```
In [8]: class_names = iris.target_names

        X_train,X_test,y_train,y_test = train_test_split(iris.data, iris.target, test_size=0.1)
        y_temp = gnb.fit(X_train,y_train)
        y_pred = y_temp.predict(X_test)

        print("Model:")
        print("1. Probabilitas setiap kelas:")
        print(gnb.class_prior_)
        print()
        print("2. Rata-rata setiap fitur per kelas:")
        print(gnb.theta_)
        print()
        print("3. Variansi setiap fitur per kelas:")
        print(gnb.sigma_)
        print()
        print("Kinerja:")
        print("Akurasi:")
        print(accuracy_score(y_test, y_pred))
        print()
        print("Presisi:")
        print(precision_score(y_test, y_pred, average='macro'))
        print()
        print("Recall:")
        print(recall_score(y_test, y_pred, average='macro'))
        print()

        def plot_confusion_matrix(cm, classes,
                                  normalize=False,
                                  title='Confusion matrix',
                                  cmap=plt.cm.Blues):
            """
            Normalization can be applied by `normalize=True`.
            This function display confusion matrix.
            """
            if normalize:
                cm = cm.astype('float') / cm.sum(axis=1)[:, np.newaxis]
                print("Normalized confusion matrix")
            else:
                print('Confusion matrix, without normalization')
```

```
            print(cm)

            plt.imshow(cm, interpolation='nearest', cmap=cmap)
            plt.title(title)
            plt.colorbar()
            tick_marks = np.arange(len(classes))
            plt.xticks(tick_marks, classes, rotation=45)
            plt.yticks(tick_marks, classes)

            fmt = '.2f' if normalize else 'd'
            thresh = cm.max() / 2.
            for i, j in itertools.product(range(cm.shape[0]), range(cm.shape[1])):
                plt.text(j, i, format(cm[i, j], fmt),
                         horizontalalignment="center",
                         color="white" if cm[i, j] > thresh else "black")

            plt.ylabel('True label')
            plt.xlabel('Predicted label')
            plt.tight_layout()


        # Compute confusion matrix
        cnf_matrix = confusion_matrix(y_test, y_pred)
        np.set_printoptions(precision=2)

        # Plot non-normalized confusion matrix
        plt.figure()
        plot_confusion_matrix(cnf_matrix, classes=class_names,
                              title='Confusion matrix, without normalization')

        print()

        # Plot normalized confusion matrix
        plt.figure()
        plot_confusion_matrix(cnf_matrix, classes=class_names, normalize=True,
                              title='Normalized confusion matrix')

        plt.show()
```

```
Model:
1. Probabilitas setiap kelas:
[0.33333333 0.36296296 0.3037037 ]

2. Rata-rata setiap fitur per kelas:
[[5.00666667 3.40888889 1.45555556 0.24222222]
 [5.94285714 2.7755102  4.26734694 1.33061224]
 [6.63902439 2.9804878  5.57073171 1.99512195]]

3. Variansi setiap fitur per kelas:
[[0.12017778 0.14080988 0.02424692 0.01043951]
 [0.26408164 0.09695127 0.21811745 0.03804249]
 [0.4082332  0.10303391 0.32158239 0.07363474]]

Kinerja:
Akurasi:
1.0

Presisi:
1.0

Recall:
1.0

Confusion matrix, without normalization
[[5 0 0]
 [0 1 0]
 [0 0 9]]

Normalized confusion matrix
[[1. 0. 0.]
 [0. 1. 0.]
 [0. 0. 1.]]
```

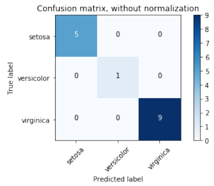


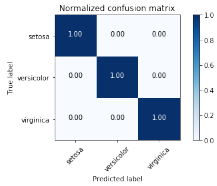

## Decision Tree

```
In [9]: y_temp = dtl.fit(X_train,y_train)
        y_pred = y_temp.predict(X_test)

        print("Kinerja:")
        print("Akurasi:")
        print(accuracy_score(y_test, y_pred))
        print()
        print("Presisi:")
        print(precision_score(y_test, y_pred, average='macro'))
        print()
        print("Recall:")
        print(recall_score(y_test, y_pred, average='macro'))
        print()

        # Compute confusion matrix
        cnf_matrix = confusion_matrix(y_test, y_pred)
        np.set_printoptions(precision=2)

        # Plot non-normalized confusion matrix
        plt.figure()
        plot_confusion_matrix(cnf_matrix, classes=class_names,
                              title='Confusion matrix, without normalization')

        # Plot normalized confusion matrix
        plt.figure()
        plot_confusion_matrix(cnf_matrix, classes=class_names, normalize=True,
                              title='Normalized confusion matrix')

        plt.show()

        # Visualization Tree
        dtl.fit(X_train, y_train)
        dot_data = tree.export_graphviz(dtl, out_file = None,
                                        feature_names = iris.feature_names,
                                        class_names = iris.target_names,
                                        filled = True, rounded = False,
                                        special_characters = True)
        graph = graphviz.Source(dot_data)

        # Graphviz
        graph
```

```
Kinerja:
Akurasi:
1.0

Presisi:
1.0

Recall:
1.0

Confusion matrix, without normalization
[[5 0 0]
 [0 1 0]
```

```
 [0 0 9]]
Normalized confusion matrix
[[1. 0. 0.]
 [0. 1. 0.]
 [0. 0. 1.]]
```

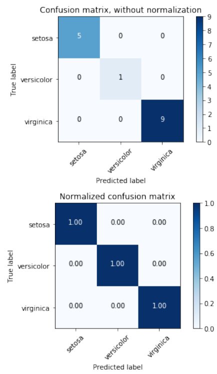



# k-Nearest Neighbors (kNN)

In [10]:
```python
y_temp = knn.fit(X_train,y_train)
y_pred = y_temp.predict(X_test)

print("Kinerja:")
print("Akurasi:")
print(accuracy_score(y_test, y_pred))
print()
print("Presisi:")
print(precision_score(y_test, y_pred, average='macro'))
print()
print("Recall:")
print(recall_score(y_test, y_pred, average='macro'))
print()

# Compute confusion matrix
cnf_matrix = confusion_matrix(y_test, y_pred)
np.set_printoptions(precision=2)

# Plot non-normalized confusion matrix
plt.figure()
plot_confusion_matrix(cnf_matrix, classes=class_names,
                      title='Confusion matrix, without normalization')

# Plot normalized confusion matrix
plt.figure()
plot_confusion_matrix(cnf_matrix, classes=class_names, normalize=True,
                      title='Normalized confusion matrix')

plt.show()
```

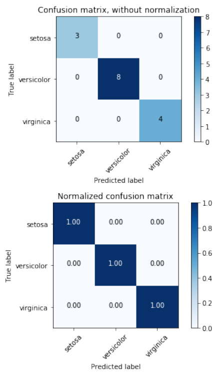
```
Kinerja:
Akurasi:
1.0

Presisi:
1.0

Recall:
1.0

Confusion matrix, without normalization
[[5 0 0]
 [0 1 0]
 [0 0 9]]
Normalized confusion matrix
[[1. 0. 0.]
 [0. 1. 0.]
 [0. 0. 1.]]
```




## Neural Network MLP

```
In [11]: X_train,X_test,y_train,y_test = train_test_split(iris.data, iris.target, test_size=0.1, random_st
         y_temp = neuron.fit(X_train,y_train)
         y_pred = y_temp.predict(X_test)

         print("Kinerja:")
         print("Akurasi:")
         print(accuracy_score(y_test, y_pred))
         print()
         print("Presisi:")
         print(precision_score(y_test, y_pred, average='macro'))
         print()
         print("Recall:")
         print(recall_score(y_test, y_pred, average='macro'))
         print()

         # Compute confusion matrix
         cnf_matrix = confusion_matrix(y_test, y_pred)
         np.set_printoptions(precision=2)

         # Plot non-normalized confusion matrix
         plt.figure()
         plot_confusion_matrix(cnf_matrix, classes=class_names,
                               title='Confusion matrix, without normalization')

         # Plot normalized confusion matrix
         plt.figure()
         plot_confusion_matrix(cnf_matrix, classes=class_names, normalize=True,
                               title='Normalized confusion matrix')

         plt.show()
```

```
Kinerja:
Akurasi:
1.0

Presisi:
1.0

Recall:
1.0

Confusion matrix, without normalization
[[3 0 0]
 [0 8 0]
 [0 0 4]]
Normalized confusion matrix
[[1. 0. 0.]
 [0. 1. 0.]
 [0. 0. 1.]]
```



# D. Pembelajaran dengan skema 10-fold cross validation beserta kinerja

## Naive Bayes

```
In [12]: score = cross_val_score(gnb, iris.data, iris.target, cv=10)

         # Menampilkan kinerja
         print("Kinerja:")
         print()
         for i in range(10):
             print("Fold " + str(i + 1) + ":", score[i])
         print()
         print("Rata-rata:", np.mean(score))
```

```
Kinerja:

Fold 1: 0.9333333333333333
Fold 2: 0.9333333333333333
Fold 3: 1.0
Fold 4: 0.9333333333333333
Fold 5: 0.9333333333333333
Fold 6: 0.9333333333333333
Fold 7: 0.8666666666666667
Fold 8: 1.0
Fold 9: 1.0
Fold 10: 1.0

Rata-rata: 0.9533333333333334
```

## Decision Tree

```
In [13]: score = cross_val_score(dtl, iris.data, iris.target, cv=10)

         # Menampilkan kinerja
         print("Kinerja:")
         for i in range(10):
             print("Fold-" + str(i + 1) + ":", score[i])
         print()
         print("Rata-rata:", np.mean(score))
```

```
Kinerja:
Fold-1: 1.0
Fold-2: 0.9333333333333333
Fold-3: 1.0
Fold-4: 0.9333333333333333
Fold-5: 0.9333333333333333
Fold-6: 0.8666666666666667
Fold-7: 0.9333333333333333
```

```
Fold-8: 0.9333333333333333
Fold-9: 1.0
Fold-10: 1.0

Rata-rata: 0.9533333333333334
```

## k-Nearest Neighbors (kNN)

```
In [14]: score = cross_val_score(knn, iris.data, iris.target, cv=10)

         # Menampilkan kinerja
         print("Kinerja:")
         for i in range(10):
             print("Fold-" + str(i + 1) + ":", score[i])
         print()
         print("Rata-rata:", np.mean(score))
```

```
Kinerja:
Fold-1: 1.0
Fold-2: 0.9333333333333333
Fold-3: 1.0
Fold-4: 1.0
Fold-5: 0.8666666666666667
Fold-6: 0.9333333333333333
Fold-7: 0.9333333333333333
Fold-8: 1.0
Fold-9: 1.0
Fold-10: 1.0

Rata-rata: 0.9666666666666668
```

## Neural Network MLP

```
In [15]: score = cross_val_score(neuron, iris.data, iris.target, cv=10)

         # Menampilkan kinerja
         print("Kinerja:")
         for i in range(10):
             print("Fold-" + str(i + 1) + ":", score[i])
         print()
         print("Rata-rata:", np.mean(score))
```

```
Kinerja:
Fold-1: 1.0
Fold-2: 1.0
Fold-3: 1.0
Fold-4: 1.0
Fold-5: 0.9333333333333333
Fold-6: 1.0
Fold-7: 0.9333333333333333
Fold-8: 0.9333333333333333
Fold-9: 1.0
Fold-10: 1.0

Rata-rata: 0.9800000000000001
```

# E. Menyimpan Hipotesis

```
In [16]: print("Test Score with Naive Bayes", gnb.score(X_test,y_test))
         joblib.dump(gnb, 'iris_NB.mdl')
         print("Test Score with Decision Tree", dtl.score(X_test,y_test))
         joblib.dump(dtl, 'iris_DT.mdl')
         print("Test Score with k-Nearest Neighbor", knn.score(X_test,y_test))
         joblib.dump(knn, 'iris_kNN.mdl')
         print("Test Score with MLP", neuron.score(X_test,y_test))
         joblib.dump(neuron, 'iris_MLP.mdl')
```

```
Test Score with Naive Bayes 0.9333333333333333
Test Score with Decision Tree 1.0
Test Score with k-Nearest Neighbor 1.0
Test Score with MLP 1.0
['iris_MLP.mdl']
```

# F. Membaca Hipotesis dari File Eksternal

```
In [17]: gnb = joblib.load('iris_NB.mdl')
         result_gnb = gnb.score(X_test, y_test)
         print("Test Score with Naive Bayes =", result_gnb)
         dtl = joblib.load('iris_DT.mdl')
         result_dtl = dtl.score(X_test, y_test)
         print("Test Score with Decision Tree =", result_dtl)
         knn = joblib.load('iris_kNN.mdl')
         result_knn = knn.score(X_test, y_test)
         print("Test Score with k-Nearest Neighbor =", result_knn)
         neuron = joblib.load('iris_MLP.mdl')
         result_neuron = neuron.score(X_test, y_test)
         print("Test Score with MLP =", result_neuron)
```

```
Test Score with Naive Bayes = 0.9333333333333333
Test Score with Decision Tree = 1.0
Test Score with k-Nearest Neighbor = 1.0
Test Score with MLP = 1.0
```

# G. Membuat Instance Baru

```
In [18]: new_instance = [1, 2, 3, 4]
         new_instance = np.array([new_instance])

         print("Instance baru:")
         for i in range(4):
             print(iris.feature_names[i] + ":", new_instance[0][i])
```

```
Instance baru:
sepal length (cm): 1
sepal width (cm): 2
petal length (cm): 3
petal width (cm): 4
```

# H. Klasifikasi Dari Hipotesis

```
In [19]: #Hasil klasifikasi NaiveBayes untuk instans baru
         print("Menurut Naive Bayes, Intance ini tergolong =", iris.target_names[gnb.predict(new_instance

         #Hasil klasifikasi Decisiontree untuk instans baru
         print("Menurut Decision Tree, Intance ini tergolong =", iris.target_names[dtl.predict(new_instanc

         #Hasil klasifikasi kNN untuk instans baru
         print("Menurut k-Nearest Neighbor, Intance ini tergolong =", iris.target_names[knn.predict(new_in

         #Hasil klasifikasi MLP untuk instans baru
         print("Menurut MLP, Intance ini tergolong =", iris.target_names[neuron.predict(new_instance)][0]
```

```
Menurut Naive Bayes, Intance ini tergolong = virginica
Menurut Decision Tree, Intance ini tergolong = versicolor
Menurut k-Nearest Neighbor, Intance ini tergolong = versicolor
Menurut MLP, Intance ini tergolong = virginica
```