

# eksperimen

October 30, 2017

## 1 Eksperimen data Census

Oleh : Bervianto Leo P - 13514047 dan Muhammad Reifiza - 13514103

### 1.1 Fungsi *Plot Confusion Matrix*

Fungsi ini digunakan nanti, untuk memplot *confusion matrix* dalam bentuk grafik.

Diambil dari [http://scikit-learn.org/stable/auto\\_examples/model\\_selection/plot\\_confusion\\_matrix.html](http://scikit-learn.org/stable/auto_examples/model_selection/plot_confusion_matrix.html)

```
In [1]: %matplotlib inline
import matplotlib.pyplot as plt
import itertools
import numpy as np
def plot_confusion_matrix(cm, classes,
                           normalize=False,
                           title='Confusion matrix',
                           cmap=plt.cm.Blues):
    """
    This function prints and plots the confusion matrix.
    Normalization can be applied by setting `normalize=True`.
    """
    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.tight_layout()  
plt.ylabel('True label')  
plt.xlabel('Predicted label')
```

## 1.2 Mempersiapkan data dari csv

Data census harus ada di dalam folder yang sama dengan *script* ini dijalankan.

```
In [2]: from sklearn import datasets
        from sklearn.model_selection import cross_val_score
        import pandas

        namesCensus = ['age', 'workclass', 'fnlwgt', 'education', 'education-num', 'marital-stat

        census_train_raw = pandas.read_csv("CencusIncome.data.txt", index_col=False, header = 0,
        census_train = pandas.DataFrame(census_train_raw)

        census_test_raw = pandas.read_csv("CencusIncome.test.txt", index_col=False, header = 0,
        census_test = pandas.DataFrame(census_test_raw)
```

### 1.3 Preproses data

Karena nilai data semuanya dalam bentuk string, kalau langsung dimasukkan akan menyebabkan sklearn tree dan seaborn terbingung-bingung. Oleh karena itu, data mesti dipreproses dulu dengan meng-*encode* nya nilai datanya menjadi float.

```
In [3]: from sklearn import preprocessing
encoder = preprocessing.LabelEncoder()
for col in ["workclass", "education", "marital-status", "occupation", "relationship", "r
census_train[col] = encoder.fit_transform(census_train[col])
census_test[col] = encoder.fit_transform(census_test[col])
```

## 1.4 Visualisasi data

Data divisualisasikan dengan menggunakan *library* seaborn

```
In [ ]: import seaborn
        seaborn.set(color_codes=True)
        g = seaborn.PairGrid(census_train, hue="class")
        g.map_diag(plt.hist)
        g.map_offdiag(plt.scatter)
        g.add_legend();
```

## 1.5 Membuat Classifier Decision Tree dan ANN.

Skema *Full Training*.

```
In [4]: census_train_train = census_train.drop("class", axis=1)
        census_train_classes = census_train.iloc[:, -1]

        census_test_data = census_test.drop("class", axis=1)
        census_test_classes = census_test.iloc[:, -1]
```

## 1.6 Model Terbaik 1

Ini adalah model terbaik

```
In [5]: #Tree params 1
        myMaxDepth = 5
```

```
        #ANN params 1
        myAlpha = 1e-6
        myhiddenLayer = (10,10)
        myRandomState = 1
```

```
        myDTLCrossFold = 10
        myANNCrossFold = 10
```

```
In [9]: from sklearn import tree
        dtl = tree.DecisionTreeClassifier(max_depth = myMaxDepth)
        dtl.fit(census_train_train, census_train_classes)
```

```
Out[9]: DecisionTreeClassifier(class_weight=None, criterion='gini', max_depth=5,
                               max_features=None, max_leaf_nodes=None,
                               min_impurity_decrease=0.0, min_impurity_split=None,
                               min_samples_leaf=1, min_samples_split=2,
                               min_weight_fraction_leaf=0.0, presort=False, random_state=None,
                               splitter='best')
```

```
In [10]: from sklearn.neural_network import MLPClassifier
         ann = MLPClassifier(alpha=myAlpha, hidden_layer_sizes=myhiddenLayer, random_state=myRandomState)
         ann.fit(census_train_train, census_train_classes)
```

```
Out[10]: MLPClassifier(activation='relu', alpha=1e-06, batch_size='auto', beta_1=0.9,
                       beta_2=0.999, early_stopping=False, epsilon=1e-08,
                       hidden_layer_sizes=(10, 10), learning_rate='constant',
                       learning_rate_init=0.001, max_iter=200, momentum=0.9,
                       nesterovs_momentum=True, power_t=0.5, random_state=1, shuffle=True,
                       solver='adam', tol=0.0001, validation_fraction=0.1, verbose=False,
                       warm_start=False)
```

## 1.7 Ukuran Kinerja Model 1

Ukuran kinerja yang kami gunakan.

```
In [11]: from sklearn.model_selection import cross_val_score
         scores = cross_val_score(dtl, census_test_data, census_test_classes, cv=myDTLCrossFold)
         print("Accuracy: %0.2f (+/- %0.2f)" % (scores.mean(), scores.std() * 2))
```

Accuracy: 0.85 (+/- 0.01)

```
In [12]: scores = cross_val_score(ann, census_test_data, census_test_classes, cv=myANNCrossFold)
         print("Accuracy: %0.2f (+/- %0.2f)" % (scores.mean(), scores.std() * 2))
```

Accuracy: 0.79 (+/- 0.03)

## 1.8 Model Terbaik 2

```
In [13]: #Tree params 1
         myMaxDepth = 4
```

```
         #ANN params 1
         myAlpha = 1e-6
         myhiddenLayer = (10,3)
         myRandomState = 1
```

```
         myDTLCrossFold = 10
         myANNCrossFold = 10
```

```
In [16]: dtl = tree.DecisionTreeClassifier(max_depth = myMaxDepth)
         dtl.fit(census_train_train, census_train_classes)
```

```
Out[16]: DecisionTreeClassifier(class_weight=None, criterion='gini', max_depth=4,
                                max_features=None, max_leaf_nodes=None,
                                min_impurity_decrease=0.0, min_impurity_split=None,
                                min_samples_leaf=1, min_samples_split=2,
                                min_weight_fraction_leaf=0.0, presort=False, random_state=None,
                                splitter='best')
```

```
In [17]: ann = MLPClassifier(alpha=myAlpha, hidden_layer_sizes=myhiddenLayer, random_state=myRandomState)
         ann.fit(census_train_train, census_train_classes)
```

```
Out[17]: MLPClassifier(activation='relu', alpha=1e-06, batch_size='auto', beta_1=0.9,
                        beta_2=0.999, early_stopping=False, epsilon=1e-08,
                        hidden_layer_sizes=(10, 3), learning_rate='constant',
                        learning_rate_init=0.001, max_iter=200, momentum=0.9,
                        nesterovs_momentum=True, power_t=0.5, random_state=1, shuffle=True,
                        solver='adam', tol=0.0001, validation_fraction=0.1, verbose=False,
                        warm_start=False)
```

## 1.9 Ukuran Kinerja Model 2

Ukuran kinerja yang kami gunakan.

```
In [18]: scores = cross_val_score(dtl, census_test_data, census_test_classes, cv=myDTLCrossFold)
        print("Accuracy: %0.2f (+/- %0.2f)" % (scores.mean(), scores.std() * 2))
```

Accuracy: 0.84 (+/- 0.01)

```
In [19]: scores = cross_val_score(ann, census_test_data, census_test_classes, cv=myANNCrossFold)
        print("Accuracy: %0.2f (+/- %0.2f)" % (scores.mean(), scores.std() * 2))
```

Accuracy: 0.76 (+/- 0.00)

## 1.10 Kesimpulan

Tidak ada penanganan khusus terhadap data.

Skenario yang kami gunakan adalah mencoba membandingkan kinerja model menggunakan parameter yang diubah satu per satu dengan parameter yang ditemukan paling baik. Model yang paling pertama paling baik dianggap model dengan parameter default. Ketika kami mencoba sebuah parameter tidak berpengaruh, maka kami langsung mengabaikan parameter tersebut dan berganti dengan parameter lain.

2 Konfigurasi model terbaik dari hasil eksperimen bisa dilihat di atas.

Kami menemukan bahwa hasil kinerja model dtl konsisten, namun model ann kami tidak menemukan konsistensinya. Untuk dtl, model terbaik memiliki max depth yang lebih rendah daripada model terbaik kedua. Bisa dibilang untuk dtl, model terbaik lebih general daripada model terbaik kedua, namun untuk ann, model terbaik tidak lebih general daripada model terbaik kedua.