

ML0101EN-Clas-Decision-Trees-drug-py-v1

September 17, 2021

1 Decision Trees

Estimated time needed: **15** minutes

1.1 Objectives

After completing this lab you will be able to:

- Develop a classification model using Decision Tree Algorithm

In this lab exercise, you will learn a popular machine learning algorithm, Decision Trees. You will use this classification algorithm to build a model from the historical data of patients, and their response to different medications. Then you will use the trained decision tree to predict the class of a unknown patient, or to find a proper drug for a new patient.

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```

Import the Following Libraries:

numpy (as np)

pandas

DecisionTreeClassifier from sklearn.tree

```
[ ]: import numpy as np
import pandas as pd
from sklearn.tree import DecisionTreeClassifier
```

<h2>About the dataset</h2>

Imagine that you are a medical researcher compiling data for a study. You have collected data a

Part of your job is to build a model to find out which drug might be appropriate for a future patient.

It is a sample of multiclass classifier, and you can use the training part of the dataset to build a decision tree, and then use it to predict the class of a unknown patient, or to predict the class of a new patient.

<h2>Downloading the Data</h2>

To download the data, we will use `!wget` to download it from IBM Object Storage.

```
[ ]: !wget -O drug200.csv https://cf-courses-data.s3.us.cloud-object-storage.  
      ↪appdomain.cloud/IBMDeveloperSkillsNetwork-ML0101EN-SkillsNetwork/labs/  
      ↪Module%203/data/drug200.csv
```

Did you know? When it comes to Machine Learning, you will likely be working with large datasets. As a business, where can you host your data? IBM is offering a unique opportunity for businesses, with 10 Tb of IBM Cloud Object Storage: [Sign up now for free](#)

Now, read the data using pandas dataframe:

```
[ ]: my_data = pd.read_csv("drug200.csv", delimiter=",")  
      my_data[0:5]
```

<h3>Practice</h3>

What is the size of data?

```
[ ]: # write your code here
```

Click here for the solution

```
my_data.shape
```

<h2>Pre-processing</h2>

Using `my_data` as the Drug.csv data read by pandas, declare the following variables:

X as the Feature Matrix (data of `my_data`)

y as the response vector (target)

Remove the column containing the target name since it doesn't contain numeric values.

```
[ ]: X = my_data[['Age', 'Sex', 'BP', 'Cholesterol', 'Na_to_K']].values  
      X[0:5]
```

As you may figure out, some features in this dataset are categorical, such as **Sex** or **BP**. Unfortunately, Sklearn Decision Trees does not handle categorical variables. We can still convert these features to numerical values using `pandas.get_dummies()` to convert the categorical variable into dummy/indicator variables.

```
[ ]: from sklearn import preprocessing  
      le_sex = preprocessing.LabelEncoder()  
      le_sex.fit(['F','M'])
```

```

X[:,1] = le_sex.transform(X[:,1])

le_BP = preprocessing.LabelEncoder()
le_BP.fit([ 'LOW', 'NORMAL', 'HIGH'])
X[:,2] = le_BP.transform(X[:,2])

le_Chol = preprocessing.LabelEncoder()
le_Chol.fit([ 'NORMAL', 'HIGH'])
X[:,3] = le_Chol.transform(X[:,3])

X[0:5]

```

Now we can fill the target variable.

```

[ ]: y = my_data["Drug"]
     y[0:5]

```

<h2>Setting up the Decision Tree</h2>

We will be using train/test split on our decision tree. Let's import train_test_split

```

[ ]: from sklearn.model_selection import train_test_split

```

Now `train_test_split` will return 4 different parameters. We will name them: `X_trainset`, `X_testset`, `y_trainset`, `y_testset`. The `train_test_split` will need the parameters: `X`, `y`, `test_size=0.3`, and `random_state=3`. The `X` and `y` are the arrays required before the split, the `test_size` represents the ratio of the testing dataset, and the `random_state` ensures that we obtain the same splits.

```

[ ]: X_trainset, X_testset, y_trainset, y_testset = train_test_split(X, y,
    ↪test_size=0.3, random_state=3)

```

Practice

Print the shape of `X_trainset` and `y_trainset`. Ensure that the dimensions match.

```

[ ]: # your code

```

[Click here for the solution](#)

```
print('Shape of X training set {}'.format(X_trainset.shape), '&', 'Size of Y training set {}'.format(y_trainset.shape))
```

Print the shape of `X_testset` and `y_testset`. Ensure that the dimensions match.

```

[ ]: # your code

```

[Click here for the solution](#)

```
print('Shape of X training set {}'.format(X_testset.shape), '&', 'Size of Y training set {}'.format(y_testset.shape))
```

Modeling

We will first create an instance of the `DecisionTreeClassifier` called `drugTree`. Inside of the classifier, specify `criterion="entropy"` so we can see the information g

```
[ ]: drugTree = DecisionTreeClassifier(criterion="entropy", max_depth = 4)
      drugTree # it shows the default parameters
```

Next, we will fit the data with the training feature matrix `X_trainset` and training response vector `y_trainset`

```
[ ]: drugTree.fit(X_trainset,y_trainset)
```

Prediction

Let's make some `predictions` on the testing dataset and store it into a variable called `predTree`

```
[ ]: predTree = drugTree.predict(X_testset)
```

You can print out `predTree` and `y_testset` if you want to visually compare the predictions to the actual values.

```
[ ]: print (predTree [0:5])
      print (y_testset [0:5])
```

Evaluation

Next, let's import `metrics` from `sklearn` and check the accuracy of our model.

```
[ ]: from sklearn import metrics
      import matplotlib.pyplot as plt
      print("DecisionTrees's Accuracy: ", metrics.accuracy_score(y_testset, predTree))
```

Accuracy classification score computes subset accuracy: the set of labels predicted for a sample must exactly match the corresponding set of labels in `y_true`.

In multilabel classification, the function returns the subset accuracy. If the entire set of predicted labels for a sample strictly match with the true set of labels, then the subset accuracy is 1.0; otherwise it is 0.0.

Visualization

Let's visualize the tree

```
[ ]: # Notice: You might need to uncomment and install the pydotplus and graphviz
      ↪ libraries if you have not installed these before
      #!conda install -c conda-forge pydotplus -y
      #!conda install -c conda-forge python-graphviz -y
```

```
[ ]: from io import StringIO
      import pydotplus
      import matplotlib.image as mpimg
      from sklearn import tree
      %matplotlib inline
```

```
[ ]: dot_data = StringIO()
filename = "drugtree.png"
featureNames = my_data.columns[0:5]
out=tree.export_graphviz(drugTree,feature_names=featureNames,
    ↳out_file=dot_data, class_names= np.unique(y_trainset), filled=True,
    ↳special_characters=True,rotate=False)
graph = pydotplus.graph_from_dot_data(dot_data.getvalue())
graph.write_png(filename)
img = mpimg.imread(filename)
plt.figure(figsize=(100, 200))
plt.imshow(img,interpolation='nearest')
```

Want to learn more?

IBM SPSS Modeler is a comprehensive analytics platform that has many machine learning algorithms. It has been designed to bring predictive intelligence to decisions made by individuals, by groups, by systems – by your enterprise as a whole. A free trial is available through this course, available here: [SPSS Modeler](#)

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1.1.1 Thank you for completing this lab!

1.2 Author

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1.2.1 Other Contributors

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1.3 Change Log

Date (YYYY-MM-DD)	Version	Changed By	Change Description
2020-11-20	2.2	Lakshmi	Changed import statement of StringIO
2020-11-03	2.1	Lakshmi	Changed URL of the csv
2020-08-27	2.0	Lavanya	Moved lab to course repo in GitLab

##

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