

Machine Learning Algorithms: exercise 5 20.04.2023

1. Let us consider the observation table below. It contains information whether a person has played tennis or not (P,N) under weather conditions Outlook, Temperature, Humidity and Wind. Create a decision tree for the data using information gain in the selection of splitting variable in each stage.

Outlook	Temperature	Humidity	Windy	Class
sunny	hot	high	false	N
sunny	hot	high	true	N
overcast	hot	high	false	P
rain	mild	high	false	P
rain	cool	normal	false	P
rain	cool	normal	true	N
overcast	cool	normal	true	P
sunny	mild	high	false	N
sunny	cool	normal	false	P
rain	mild	normal	false	P
sunny	mild	normal	true	P
overcast	mild	high	true	P
overcast	hot	normal	false	P
rain	mild	high	true	N

2. Split Iris data into training and test sets such that training set contains 25 first cases of each class {0,1,2} and test set contains the remaining 25 cases from respective classes. Build a decision tree using the training data and test the performance of your tree using the test set. (fitctree). Present your result in a confusion matrix or confusion chart.

3. Recognition and classification of digital images is highly plagued by “curse of dimensionality”. Dimensions of images have successfully been reduced using deep convolutional neural networks. Internal working of such a network can be divided into two parts. (1) Series of image processing stages are applied. After each stage image size is reduced. After the last stage each image is presented as a feature vector. This vector is similar than an individual row in iris data. (2) After image features are extracted, some selected machine learning algorithm is used in classification of images. The most common algorithm is softmax, that closely resembles to that of multivariate logistic regression.

Download 101 object categories image data from <https://data.caltech.edu/records/20086>. Extract and reduce it such your image data is organized according to Fig. 1. You need for instance 7-zip archiver that can handle zip, tar.gz and tar files.

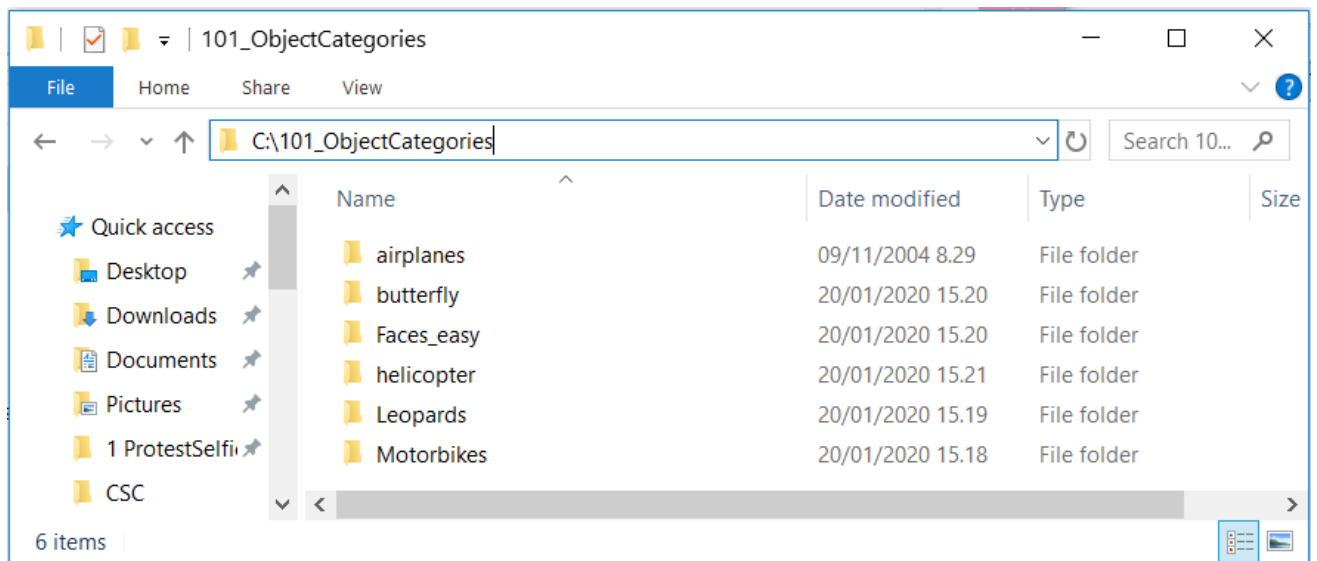


Figure 1. Root folder for subset of 101 object categories image set.

4. According to Fig. 2. Use Add-Ons and install Deep Learning toolbox. Install also pre trained resnet50 deep convolutional neural network to your computer.

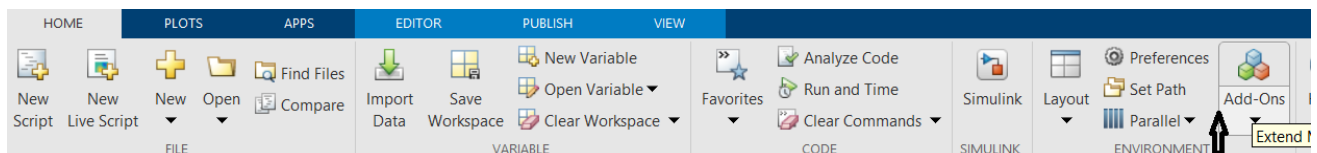


Figure 2. Using Add-Ons button you can add variety of toolboxes to your Matlab installation.

5. Study the dnnexample.m file and load in the reduced 101 object categories image data. Train a decision tree using 80% of data. Test your tree using the remaining 20% of data.

6. Repeat previous task using a support vector machine.