

CLUSTERING

M – Artificial Intelligence – Machine Learning Part II

1. CONTEXT

Images are considered as one of the most important medium of conveying information. Understanding images and extracting the information from them such that the information can be used for other tasks is an important aspect of Machine learning. One of the first steps in direction of understanding images is to segment them and find out different objects in them. Thus image segmentation plays a vital role towards conveying information that is represented by an image and also assists in understanding the image. Image segmentation is the process of dividing the given image into regions homogenous with respect to certain features, and which hopefully correspond to real objects in the actual scene. Segmentation plays a vital role to extract information from an image to create homogenous regions by classifying pixels into groups thus forming regions of similarity. The homogenous regions formed as a result of segmentation indwell pixels having similarity in each region according to particular selection criteria (Intensity, color etc.). Segmentation plays an important role in image understanding, image analysis and image processing. Because of its simplicity and efficiency, clustering approaches were one of the first techniques used for the segmentation of (textured) natural images. After the selection and the extraction of the image features [usually based on color and or texture and computed on (possibly) overlapping small windows centered around the pixel to be classified], the feature samples, handled as vectors, are grouped together in compact but well-separated clusters corresponding to each class of the image. The set of connected pixels belonging to each estimated class thus defined the different regions of the scene. The applications of Image segmentation are widely in many fields such as image compression, image retrieval, object detection, image enhancement etc.

2. GOALS

For this project, you will have to produce a program which takes an image and a number of clusters, and retrieve different zones present on the image.

For example, let's take this image:



After you gave it to your program and specifies you want 3 layers, you should have something like that:



Cluster 1



Cluster 2



Cluster 3

We invite you to deploy some tool to estimate the ideal number of clusters.

We expect you to generate several clusters, depending of the base image. Save them so we can see them for your defense.

As usual every point of your design should be reflected.

We invite you to test several approaches to reach your goal, and overall, to expose your thinking progress.

Every document you can provide in order to present your work is strongly recommended: charts, design explanations, scientific papers, benchmarks, etc.

3. STEPS AND DATA SETS

We won't give you any tests for this project. Find your own images set to test your program. Choose your images wisely. Otherwise your result won't be relevant.

We will use bitmap and jpeg for the test, make sure you will be able to use them in your program.

You will be evaluated mainly on your results: the more you detect objects and human-logical zones, the more you will be granted. Refer to the mighty lizard example shown in 2.

4. AUTHORIZATIONS AND RESTRICTIONS

You are allowed to use every library which can help you.
Of course, you are not allowed to directly use an image segmentation tool! You will have to design yourself your algorithm.