

## Written Examination – Module 3

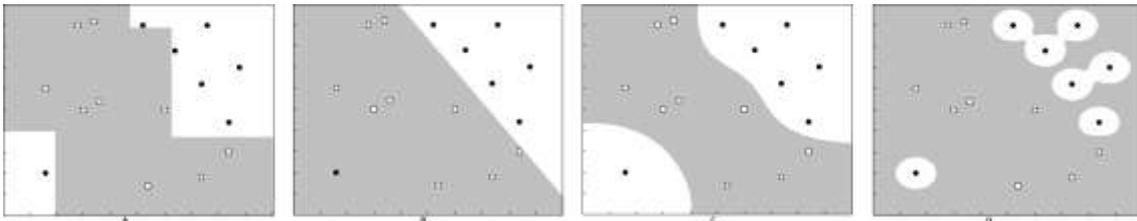
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Duration: 30 mins.

Date: 11/05/2009

*Guideline: Keep your answers short. Do not use more than two paragraphs for each answer.*

1. Consider a classification problem with two real valued inputs. For each of the following algorithms, specify all of the separators below that it could have generated and explain why. If it could not have generated any of the separators, explain why not.



- A. nearest neighbour
  - B. SVM with linear kernel
  - C. SVM with Gaussian kernel
  - D. neural network with no hidden units and one sigmoidal output unit, run until convergence of training error
  - E. neural network with 4 hidden units and one sigmoidal output unit, run until convergence of training error
2. What is back-propagation on a Multi-Layer Feed-forward Network?
    - A. It is the transfer of error back through the network to adjust the inputs.
    - B. It is the transfer of error back through the network to allow the weights to be adjusted.
    - C. It is the transfer of error back through the network using a set of recurrent connections.
    - D. It is the transfer of outputs back from the hidden layer to the input layer using a set of recurrent connections.

**Give a brief description** of the back-propagation algorithm.

3. Given the task of image recognition within a certain application different features should be used, they should be extracted with different scopes. Consider the following tasks, features and feature extraction scopes. Explain what methodology would you use for feature extraction and which features you would extract in each task and why:

DATA and TASKS:

a) Landscape image recognition

Classes: mountains, city, beach, forest

Task: classify each image into one of the given classes

b) Object recognition in images

Classes: faces, pedestrians, cars

Task: indicate the location, number and type for all objects in the image (objects of the classes related to the task).

FEATURES:

a) Colour histograms

b) Edge direction histograms

c) Wavelet decomposition coefficients

FEATURE EXTRACTION SCOPE

a) Global image feature.

b) Fixed grid image spatial division.

c) Overlap grid image spatial division.

d) Exhaustive image search

4. Taking as example the Viola Jones face detecting algorithm:  
What do you point out as the most important advantages of using Adaboost for classification?