Pattern Recognition And Image Processing

Notes For Final Exam

Prepared By

Noor Mohammed Anik

Final Exam

Pattern Recognition And Image Processing

Segment - 8

Prepared by -
Noor Mohammed Anik
10-03-2017

1 What is pattern Recognition? Write down the application of pattern recognition.

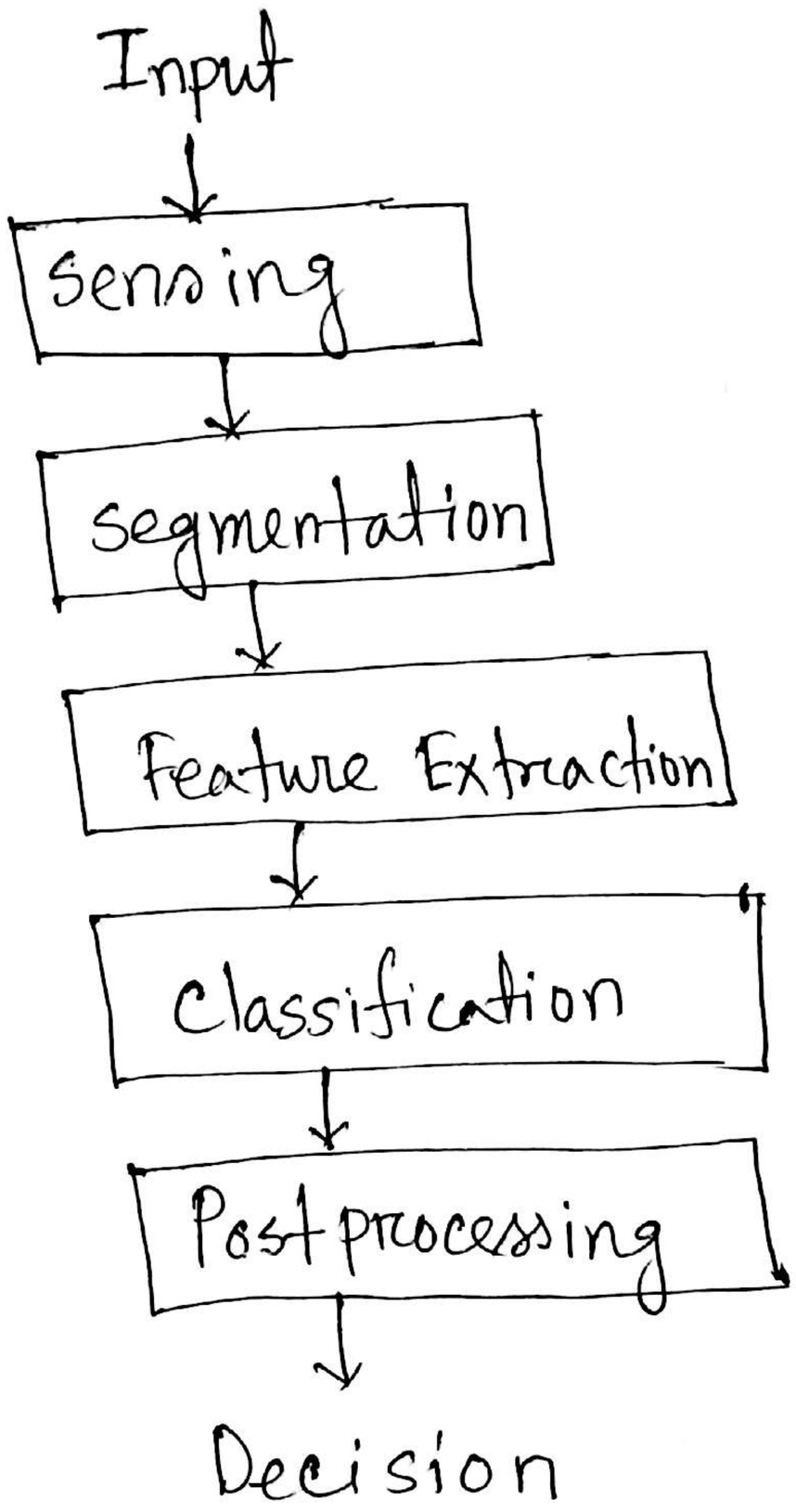
Ans: Pattern recognition is the science that concerns the description and classification of measurement of an object.

Application:

(i) Automated analysis of medical images.
(ii) Human speech recognition.
(iii) Automated analysis of salellite image.
(iv) Automatic inspection of parts on a assembly line.
(v) Identification of people handwriting and finger print.

[2] Draw the system diagram of pattern recognition?

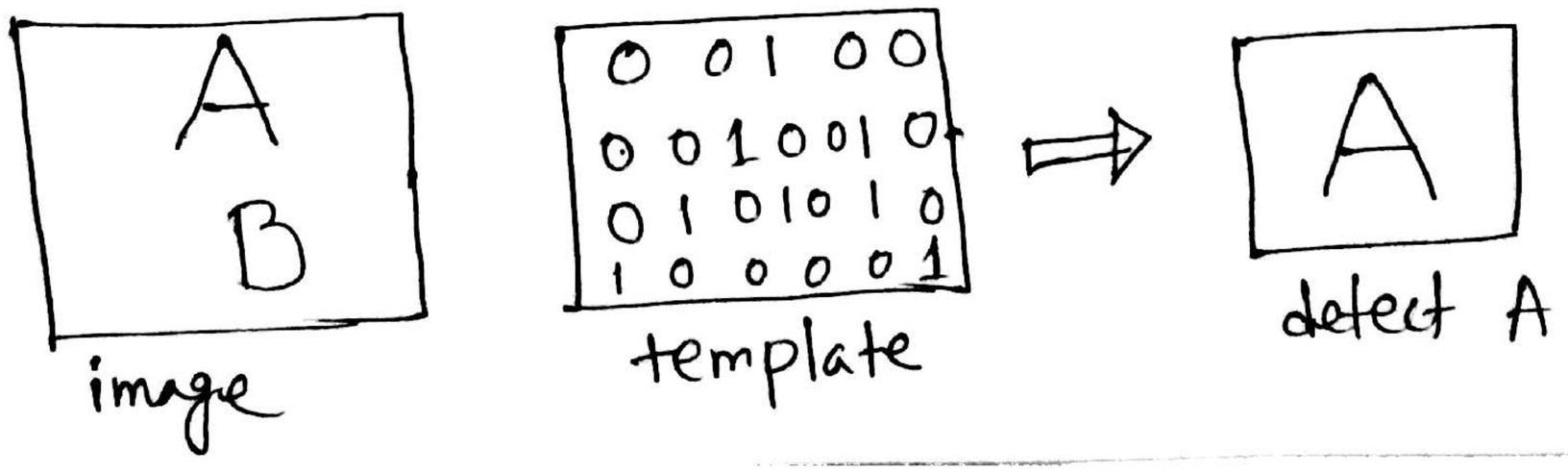
Ans:



[3] Define Template matching with example.

Ans: Template matching is a technique in digital image processing for finding small parts of an image which match a template image.

Example:



[4] What is Artificial Neural Network?

Ans: An artificial neural network (ANN) is a computational model based on the structure and functions of biological neural networks.

[5] Discuss different types of Artificial Neural Network.

Ans: Two types of ANN. They are—

(i) Feed forward neural network:

A feed forward neural network is an artificial neural network where connections between units do not form a directed cycle.

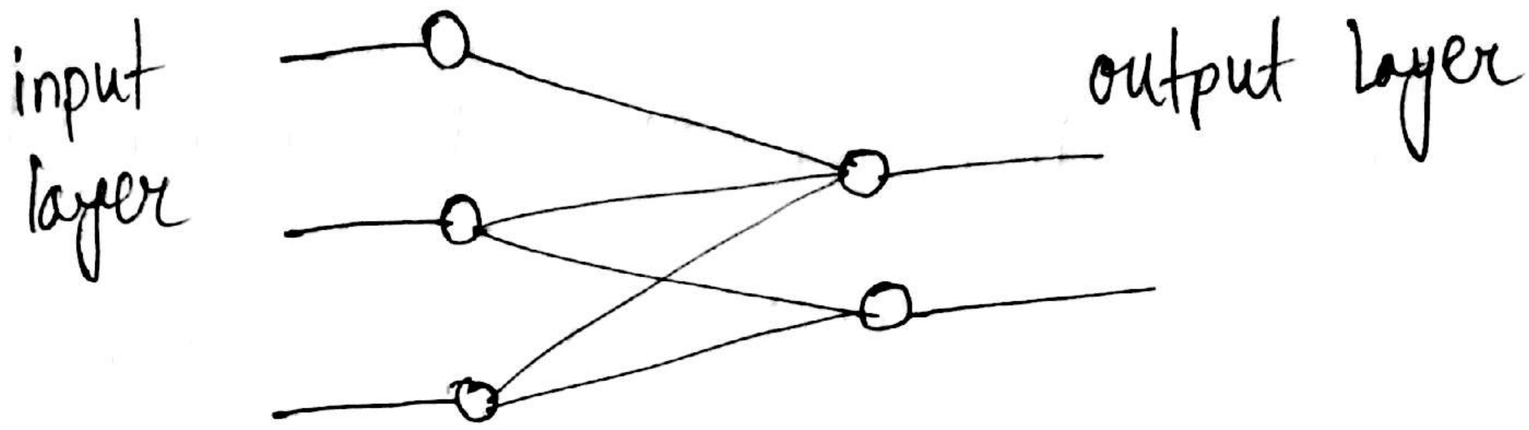
(ii) Feedback neural network:

Feed back neural network can have signal travelling in both directions by introducing loops in the network.

Two types of ANN based on layer.

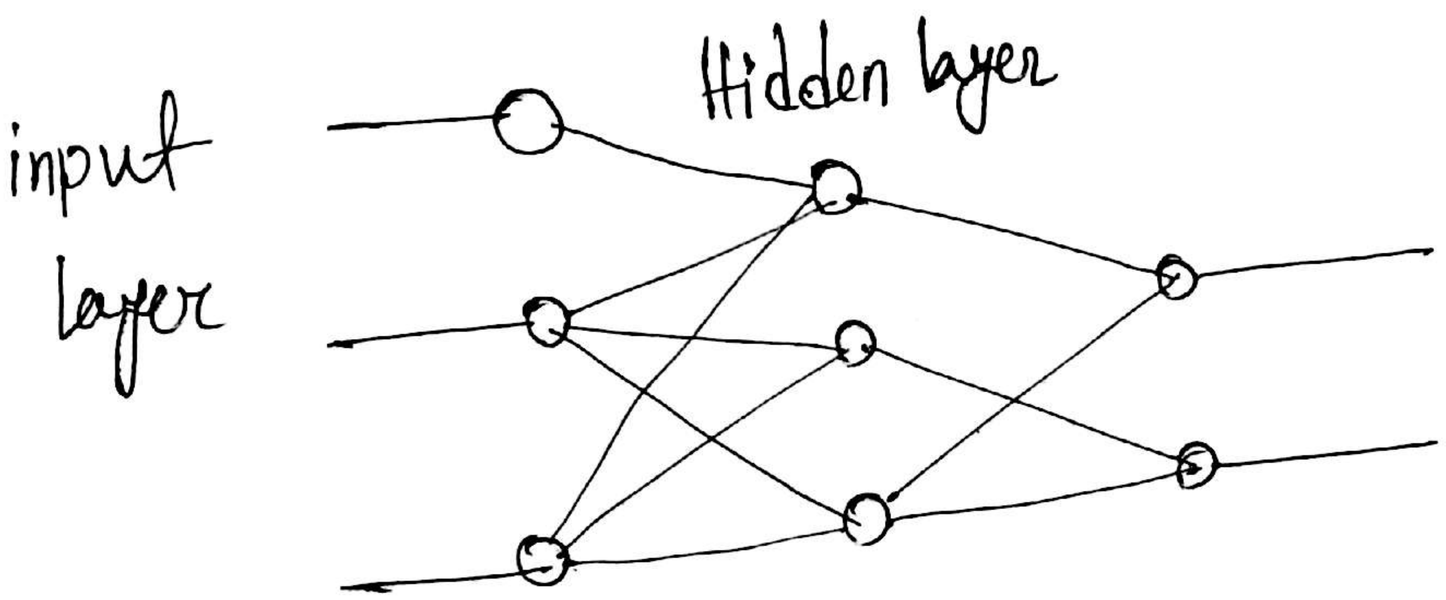
(i) Single layer

Single layer has only input layer and output layer.



(ii) Multi layer

Multi layer has input layer output layer and hidden layer



[6] Write down the advantage and disadvantage of ANN.

Ans: Advantage

(i) Reletively easy to use.

(ii) Great for complex problem like image recognition.

(iii) Can approximate any function.

Disadvantage:

(i) Requires a shit load of training and cases.

(ii) Often abused in case where simpler Solution like linear regression would be best.

7 Build the decision function and decision boundary for two pattern classes ω_1 and ω_2. Two classes IRIS, Versicolor and Iris setosa, denoted ω_1 and ω_2 where two mean vector $m_1 = (4.3, 1.3)^T$ and $m_2 = (1.5, 0.3)^T$

Am: Given.

$$m_1 = \begin{pmatrix} 4.3 \\ 1.3 \end{pmatrix}$$

$$m_2 = \begin{pmatrix} 1.5 \\ 0.3 \end{pmatrix}$$

$$x = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$$

$$d_{(x)} = x\, m_1 - \frac{1}{2} m_1 m_1$$

The decision functions —

$$d_1(x) = (x_1 \; x_2) \begin{pmatrix} 4.3 \\ 1.3 \end{pmatrix} - \frac{1}{2} (4.3 \;\; 1.3) \begin{pmatrix} 4.3 \\ 1.3 \end{pmatrix}$$

$$= 4.3x_1 + 1.3x_2 - \frac{1}{2}(18.49 + 1.69)$$

$$\therefore \; d_1(x) = 4.3x_1 + 1.3x_2 - 10.1$$

$$d_2(x) = (x_1 \; x_2) \begin{pmatrix} 1.5 \\ 0.3 \end{pmatrix} - \frac{1}{2} (1.5 \;\; 0.3) \begin{pmatrix} 1.5 \\ 0.3 \end{pmatrix}$$

$$= 1.5x_1 + 0.3x_2 - 1.17$$

The equation of decision boundary —

$$d_{12}(x) = d_1(x) - d_2(x)$$

$$\therefore \; d_{12}(x) = 2.8x_1 + 1.0x_2 - 8.9 \quad \text{(Am)}$$

[8] Define pattern, pattern class and classifier.

Ans: Pattern

Pattern means quantative or structural description of an image.

Pattern class

Pattern class refer to a family of pattern that share common patterns.

classifier :

A pattern class that classifies something.

[9] Define decision boundary.

Ans: A decision boundary is the region of a problem space in which the output label of a classifier is ambiguous.