

Code: 9A10805

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B. Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

ARTIFICIAL NEURAL NETWORKS

(Common to E.Con.E & EIE)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

- 1 (a) What are Artificial neural networks? What are their characteristics?
(b) Draw the structure and explain the function of biological neuron.
- 2 (a) What are the basic supervised learning laws? Explain the weight updation rules in each learning law.
(b) Explain in detail about Boltzmann learning.
- 3 (a) Discuss the working of single layer perceptron and multi layer perceptron with relevant algorithm and compare them.
(b) Give the architecture and explain the training algorithm for radial basis function network.
- 4 (a) Give the details on the development of ADALINE network.
(b) With the architecture explain the MRI training algorithm.
- 5 (a) Give brief description of Counter propagation network. How is CPN used for data compression?
(b) What are the self organizing maps? Explain the architecture and the training algorithm used for Kohonen's SOMs.
- 6 (a) What is pattern association? Give the architecture of Hopfield network and explain the training algorithm.
(b) What is gradient type Hopfield network? Differentiate between discrete time Hopfield network and gradient type Hopfield network.
- 7 (a) Define Bidirectional associative memory. Draw the architecture and discuss in detail the training algorithm.
(b) What is Adaptive resonance theory? Explain stability plasticity dilemma in neural networks.
- 8 Explain in brief any two applications of neural networks in Image processing.

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Answer any FIVE questions
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- 1 (a) Explain the historical development of Artificial neural networks.
(b) What is meant by an activation function in an artificial neuron model? Describe the characteristics of various activation functions that are employed.
- 2 (a) Explain McCulloch Pitts Neuron model with examples.
(b) What is perceptron? Explain perceptron learning rule with an example.
- 3 (a) State and prove perceptron convergence theorem.
(b) Give the architecture and explain back propagation training algorithm. Derive the expressions for weight modification.
- 4 (a) Give the architecture and explain the training and application algorithm of ADALINE.
(b) Discuss in detail the MRIL training algorithm.
- 5 (a) Differentiate between Kohonen and Grossberg learning rules.
(b) Draw the architecture and explain the training algorithm of Full counter propagation networks.
- 6 (a) What are the modes of operation of a Hopfield network? Explain the algorithm for storage of information in Hopfield network. Similarly explain the recall algorithm.
(b) Use a Hopfield net to store four vectors as follows:
(i) $A = (+1, -1, -1, +1, +1, -1, -1)$
(ii) $B = (+1, +1, -1, +1, +1, +1, -1)$
(iii) $C = (+1, +1, +1, -1, +1, -1, -1)$
(iv) $D = (+1, -1, -1, -1, -1, -1, -1)$
Evaluate the synaptic weight matrix.
- 7 (a) Explain how ART networks can overcome stability plasticity dilemma.
(b) Give the significance of vigilance parameter in ART networks.
- 8 Explain how neural networks can be used to solve the following:
(i) Simultaneous linear equations
(ii) Optimization problems

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Answer any FIVE questions
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- 1 (a) Compare and contrast the biological neuron and artificial neuron.
(b) Explain about the important architectures of neural network.
- 2 (a) Discuss the requirements of learning laws. What are different types of Hebbian learning? Explain basic Hebbian learning.
(b) How is "winner takes all" process executed by competitive learning?
- 3 (a) Explain in detail about forward pass and backward pass of back-propagation.
(b) What are the limitations of back propagation algorithm?
(c) Compare radial basis network with multiplayer perceptron. Give suitable example.
- 4 (a) Explain in detail about the methods which are useful in improving back propagation algorithm.
(b) Give the architecture and explain the training algorithm of ADALINE.
- 5 (a) What are the salient features of the Kohonen's self organizing learning algorithm?
(b) What is learning vector quantizer? Explain.
- 6 (a) What is Hopfield model? Describe energy function for discrete Hopfield network and explain how it can be minimized?
(b) Taking a three-node net, determine the weight matrix to store the following states $V_1 V_2 V_3 = 000, 011, 110$ and 101 using Hebb's rule.
- 7 Write short note on the following:
(i) Bidirectional Associative Memories
(ii) Boltzmann Machines
- 8 Describe how a neural network can be trained for pattern recognition task. Illustrate with an example.

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Answer any FIVE questions
All questions carry equal marks

- 1 (a) What is Neural Learning? Distinguish between supervised and unsupervised learning with examples.
(b) Define activation function and state few functions which are used in neural networks.
(c) Explain in brief the criteria for performance evaluation of neural networks.
- 2 (a) Explain Delta learning rule with an example.
(b) Write in detail about memory based learning.
- 3 (a) State and explain the Ex-OR problem. Also explain how to overcome it.
(b) Explain the significance of learning rate and momentum term in back propagation algorithm.
- 4 (a) What are the limitations and extensions of back propagation algorithm?
(b) Explain in brief applications of ADALINE.
(c) What is minimum disturbance principle? Discuss in detail the MRI training algorithm.
- 5 (a) Draw the architecture and explain the training algorithm of forward only counter propagation networks.
(b) Explain the following properties of feature map:
(i) Topological ordering
(ii) Feature selection
- 6 (a) What is pattern association? Explain different types.
(b) Write down the steps involved in the retrieval phase of operation of a Hopfield network and explain each step in detail.
(c) What are the limitations of Hopfield network?
- 7 (a) Give the architecture and explain training algorithm of ART network with relevant expressions for weight modification.
(b) Construct a BAM to establish the following associations between four dimensional and two dimensional patterns:

$$(+1, +1, -1, -1) - (+1, +1)$$

$$(+1, +1, +1, +1) - (+1, -1)$$

$$(-1, -1, +1, +1) - (-1, +1)$$
- 8 (a) Describe how Hopfield network can be used as Analog to Digital converter.
(b) Explain traveling salesman problem.
