Unit-4

1. Self-Organizing Map (SOM) was developed by:

A) McCulloch
B) Hebb
C) Kohonen
D) Rosenblatt

Answer: C) Kohonen

2. SOM is a _____ learning network.

A) Supervised
B) Reinforcement
C) Unsupervised
D) Deep

Answer: C) Unsupervised

3. The main objective of SOM is:

A) Sorting numbers
B) Topology-preserving mapping
C) Encryption
D) Error correction

Answer: B) Topology-preserving mapping

4. SOM mainly performs:

A) Classification
B) Clustering
C) Compression only
D) Prediction only

Answer: B) Clustering

5. In SOM, the neuron with minimum distance from the input is called:

A) Dead neuron
B) Hidden neuron
C) Winning neuron
D) Output neuron

Answer: C) Winning neuron

6.The distance measure commonly used in SOM is:

A) Manhattan distance
B) Euclidean distance
C) Hamming distance
D) Chebyshev distance

Answer: B) Euclidean distance

7. During SOM learning, the weights of:

A) Only losing neurons are updated
B) Only output neurons are updated
C) Winner and neighboring neurons are updated
D) Input neurons are updated

Answer: C) Winner and neighboring neurons are updated

8. SOM reduces:

A) Processor speed
B) Data redundancy only
C) Dimensionality of data
D) Number of neurons

Answer: C) Dimensionality of data

9. The neighborhood radius in SOM:

A) Remains constant
B) Increases continuously
C) Decreases with training
D) Is always zero

Answer: C) Decreases with training

10. SOM preserves:

A) Frequency information
B) Topological relationships
C) Error values
D) Memory locations

Answer: B) Topological relationships

11.Learning Vector Quantization (LVQ) is:

A) Unsupervised learning
B) Supervised learning
C) Reinforcement learning
D) Genetic learning

Answer: B) Supervised learning

12. LVQ uses:

A) Labeled data
B) Unlabeled data
C) Random data only
D) Noise data

Answer: A) Labeled data

13. In LVQ, classification is based on:

A) Mean value
B) Nearest prototype vector
C) Random selection
D) Median value

Answer: B) Nearest prototype vector

14. If classification is correct in LVQ, the prototype vector moves:

A) Away from input
B) Toward input
C) Randomly
D) Becomes zero

Answer: B) Toward input

15. If classification is incorrect in LVQ, the prototype vector moves:

A) Toward input
B) Away from input
C) To origin
D) To infinity

Answer: B) Away from input

16. Which of the following uses labeled training samples?

A) SOM
B) LVQ
C) Hebbian Network
D) ART1

Answer: B) LVQ

17. A feature map is mainly used for:

A) Data storage
B) Pattern representation
C) Encryption
D) Coding

Answer: B) Pattern representation

18. Adaptive pattern classification means:

A) Fixed classification rules
B) Learning and adjusting classification boundaries
C) No learning process
D) Manual classification

Answer: B) Learning and adjusting classification boundaries

19. SOM neurons are generally arranged in:

A) Circular structure only
B) Grid structure
C) Tree structure
D) Ring structure

Answer: B) Grid structure

20. Which one is an application of SOM?

A) Market segmentation
B) Compiler design
C) Operating system scheduling
D) Database normalization

Answer: A) Market segmentation

Fill in the blanks

1. One basic feature mapping model is _____ Quantization.
   Answer: Vector
2. The second feature mapping model is the _____ Preserving Feature Map.
   Answer: Topology
3. Vector Quantization uses _____ vectors to represent data.
   Answer: Prototype
4. SOM is a _____ preserving feature map.
   Answer: Topology

5. SOM was developed by _____.
   Answer: Kohonen
6. SOM is a type of _____ learning network.
   Answer: Unsupervised
7. The neuron that best matches the input is called the _____ neuron.
   Answer: Winning
8. SOM converts high-dimensional data into _____ dimensional maps.
   Answer: Low

9. The first step in SOM is weight _____.
   Answer: Initialization
10. Input patterns are represented as _____.
    Answer: Vectors
11. The neuron with minimum distance becomes the _____.
    Answer: Winner
12. Weight _____ occurs after selecting the winner.
    Answer: Updating

13. A feature map preserves _____ relationships.
    Answer: Topological
14. Feature maps perform dimensionality _____.
    Answer: Reduction
15. SOM automatically performs _____.
    Answer: Clustering
16. Feature maps provide data _____.
    Answer: Visualization

17. Initially, SOM weights are assigned _____.
    Answer: Randomly
18. During training, clusters begin to _____.
    Answer: Emerge
19. Color clustering is a common SOM _____.
    Answer: Simulation
20. Similar colors are grouped into the same _____.
    Answer: Cluster

21. LVQ stands for Learning Vector _____.
    Answer: Quantization
22. LVQ is a _____ learning technique.
    Answer: Supervised

23. Each class is represented by a _____ vector.
    Answer: Prototype
24. Classification is based on the _____ prototype.
    Answer: Nearest

25. Adaptive pattern classification learns decision _____ automatically.
    Answer: Boundaries
26. Adaptive classifiers improve through _____.
    Answer: Experience
27. Pattern classification begins with feature _____.
    Answer: Extraction
28. The final output of a classifier is a class _____.
    Answer: Label

21. Backpropagation works by propagating:

A) Inputs backward
B) Error backward
C) Outputs backward
D) Weights backward

Answer: B) Error backward

22. Overfitting occurs when a network:

A) Learns training data too closely
B) Learns very little
C) Has no hidden layer
D) Has fewer neurons

Answer: A) Learns training data too closely

23. Which technique improves generalization?

A) Overtraining
B) Cross-validation
C) Increasing error
D) Random pruning

Answer: B) Cross-validation

24. Hessian-based methods belong to:

A) First-order optimization
B) Second-order optimization
C) Competitive learning
D) Hebbian learning

Answer: B) Second-order optimization

25. Backpropagation is most commonly associated with:

A) Multilayer Perceptrons
B) Single-Layer Perceptrons
C) SOM Networks
D) Boltzmann Machines

Answer: A) Multilayer Perceptrons

Fill in the Blanks

1. Backpropagation is used for training _____ networks.
   Answer: Multilayer
2. Backpropagation learning is based on _____ correction.
   Answer: Error
3. The gradient is computed using _____.
   Answer: Differentiation
4. The Hessian Matrix contains _____ order derivatives.
   Answer: Second
5. Hessian Matrix describes the _____ of the error surface.
   Answer: Curvature
6. The ability to perform well on unseen data is called _____.
   Answer: Generalization
7. Cross-validation uses a _____ dataset.
   Answer: Validation

8. Cross-validation helps reduce _____.
   Answer: Overfitting
9. Network pruning removes unnecessary _____ and connections.
   Answer: Neurons
10. Pruning reduces network _____.
    Answer: Complexity
11. A major virtue of backpropagation is learning _____ mappings.
    Answer: Nonlinear
12. A major limitation of backpropagation is _____ convergence.
    Answer: Slow
13. Momentum helps achieve _____ convergence.
    Answer: Faster
14. Supervised learning requires _____ outputs.
    Answer: Target
15. Training data in supervised learning consists of input-output _____.
    Answer: Pairs
16. Error is propagated in the _____ direction.
    Answer: Backward
17. Overfitting reduces _____ performance.
    Answer: Generalization
18. Hessian-based optimization methods are _____ order methods.
    Answer: Second
19. Backpropagation uses _____ descent for optimization.
    Answer: Gradient
20. Hidden layers help learn complex _____.
    Answer: Patterns
21. Validation data is not used for _____ updates.
    Answer: Weight
22. The error surface should ideally reach a global _____.
    Answer: Minimum
23. Momentum reduces oscillations during _____.
    Answer: Training
24. Network pruning improves computational _____.
    Answer: Efficiency
25. Backpropagation is a _____ learning algorithm.
    Answer: Supervised