

Advanced Concepts in Artificial Intelligence

Artificial Intelligence · Answer Key · 10 Questions

1. Which specific activation function is commonly used in hidden layers of deep neural networks to mitigate the vanishing gradient problem?

- A) Sigmoid
- B) Tanh
- C) Rectified Linear Unit (ReLU)**
- D) Softmax

2. In the context of supervised learning, what does the 'bias-variance tradeoff' primarily describe?

- A) The relationship between model complexity and generalisation error**
- B) The parity between training time and memory usage
- C) The balance between supervised and unsupervised data inputs
- D) The ratio of categorical features to numerical features

3. Which algorithm is defined as an ensemble learning method that constructs multiple decision trees during training and outputs the mode of the classes?

- A) Gradient Boosting
- B) Random Forest**
- C) Support Vector Machine
- D) K-Nearest Neighbours

4. What is the primary function of the 'backpropagation' algorithm in a neural network?

- A) To cluster input data into unlabeled categories
- B) To compute the gradient of the loss function with respect to weights**
- C) To initialise weights to zero before training
- D) To determine the optimal learning rate automatically

5. In Natural Language Processing, what do word embeddings such as Word2Vec represent?

- A) A dictionary-based lookup for synonyms
- B) Dense vector representations of words in a high-dimensional space**
- C) A heuristic for checking grammatical correctness
- D) A method for compressing long documents into single tokens

6. What is the main advantage of a Convolutional Neural Network (CNN) when processing image data compared to a standard Feedforward Network?

- A) It requires significantly less training data
- B) It uses sparse connectivity and weight sharing to reduce parameters**
- C) It ignores spatial hierarchies to focus on pixel intensity
- D) It eliminates the need for any pre-processing steps

7. Which term describes the phenomenon where a model performs exceptionally well on training data but fails to generalize to unseen test data?

- A) Underfitting
- B) Feature engineering
- C) Overfitting**
- D) Gradient descent

8. What role does a 'Kernel' play in a Support Vector Machine (SVM)?

- A) It reduces the number of dimensions in the input set
- B) It maps input data into a higher-dimensional feature space to allow linear separation**
- C) It calculates the average distance between clusters
- D) It optimizes the neural network architecture

9. Which mathematician and computer scientist proposed the 'imitation game' as a criterion for machine intelligence?

- A) John McCarthy
- B) Marvin Minsky
- C) Alan Turing**
- D) Claude Shannon

10. In reinforcement learning, what is the 'exploration-exploitation' dilemma?

- A) The choice between using supervised or unsupervised training data
- B) The balance between testing new actions to discover rewards and choosing known actions to maximize reward**
- C) The trade-off between processor speed and battery consumption
- D) The decision between using hardware acceleration or software emulation