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Answer Key: Westworld Tactics: 11th Grade Neural Network Synthesis Quiz

Synthesize complex AI concepts including GANs and backpropagation through 10 advanced scenarios to master the architecture of machine intelligence.

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1. In the context of Generative Adversarial Networks (GANs), the 'Generator' and 'Discriminator' engage in a zero-sum game. What specific mathematical concept describes the point where the Generator produces perfect replicas and the Discriminator can no longer distinguish them?

Answer: B) Nash Equilibrium

In game theory and GANs, a Nash Equilibrium is reached when neither player (the Generator nor the Discriminator) can improve their position, representing a state of optimal training.

2. The 'Vanishing Gradient Problem' primarily occurs in deep neural networks because the repetitive multiplication of small derivatives during backpropagation causes the weight updates to become infinitesimally small.

Answer: A) True

This is a core challenge in deep learning; as gradients are backpropagated, they are multiplied by values < 1, causing them to shrink and preventing early layers from learning effectively.

3. When building a model to predict protein folding patterns for pharmaceutical research, a developer uses _____ to prevent the model from memorizing training data too closely, ensuring it generalizes to new biological structures.

Answer: C) Regularization

Regularization techniques (like Dropout or L2) are used specifically to prevent 'overfitting,' where a model learns noise rather than the underlying pattern.

4. Which architecture is most associated with the breakthrough in Large Language Models (LLMs) due to its 'Self-Attention' mechanism, allowing it to process entire sequences of text simultaneously rather than word-by-word?

Answer: C) Transformer Architecture

The Transformer architecture, introduced in the 'Attention Is All You Need' paper, revolutionized NLP by using self-attention to replace sequential processing.

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5. In the development of AI for high-frequency trading, a system is rewarded with 'points' for profitable trades and penalized for losses. This specific paradigm of machine learning is known as _____.

Answer: B) Reinforcement Learning

Reinforcement Learning (RL) relies on an agent interacting with an environment and receiving rewards or penalties to learn an optimal policy.

6. Convolutional Neural Networks (CNNs) are primarily preferred for Computer Vision tasks because they use 'pooling' layers to reduce spatial dimensions while retaining critical features.

Answer: A) True

CNNs utilize filters and pooling to achieve translation invariance, making them the standard for identifying objects regardless of their position in an image.

7. Consider an AI designed for autonomous deep-sea exploration. If the system encounters a completely unknown species and classifies it based only on shared data similarities without prior labels, it is performing:

Answer: A) Clustering (Unsupervised)

Clustering is an unsupervised learning task where the machine finds patterns and groups in data that has no pre-existing labels or categories.

8. The ethical concern regarding 'black box' AI models in the legal system—where a model's specific reasoning for a sentencing recommendation cannot be understood by humans—is a failure of _____.

Answer: B) Explainability (XAI)

Explainable AI (XAI) is a field focused on making the internal logic and decision-making processes of complex AI models transparent to human users.

9. In a neural network, the 'Activation Function' (such as ReLU or Sigmoid) is necessary because it introduces non-linearity, allowing the network to model complex relationships beyond simple straight lines.

Answer: A) True

Without non-linear activation functions, a neural network (regardless of how many layers it has) would behave like a single-layer linear regression model.

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10. Which term describes the phenomenon where a model performs exceptionally well on training data but fails to predict correctly on new, real-world data?

Answer: B) Overfitting

Overfitting occurs when a model is so complex that it creates a specific 'map' of its training data rather than learning general patterns, leading to poor validation performance.