

Student 4: Poor Performer

Question 1: Explain the differences between supervised, unsupervised, and reinforcement learning in machine learning. Provide examples of applications for each approach.

Answer:

Supervised learning is when the computer learns from labeled data. The data has inputs and outputs, and the computer learns to predict outputs for new inputs.

Examples include image classification and spam detection.

Unsupervised learning is when the computer learns from unlabeled data. It tries to find patterns or structure in the data. Examples include clustering and dimensionality reduction.

Reinforcement learning is when an agent learns by interacting with an environment. It gets rewards for good actions and penalties for bad actions. Examples include game playing and robotics.

Question 2: Describe the architecture and functioning of Convolutional Neural Networks (CNNs) and explain why they are particularly effective for image recognition tasks.

Answer:

CNNs are neural networks used for image processing. They have convolutional layers that apply filters to detect features in images. They also have pooling layers that reduce the size of the data.

CNNs are good for image recognition because they can detect patterns regardless of where they appear in the image. They use fewer parameters than regular neural networks, which makes them more efficient.

They're used for things like facial recognition and object detection in images.

Question 3: Discuss the ethical considerations and potential societal impacts of implementing artificial intelligence systems in critical decision-making processes.
Question 4: Explain the concept of transfer learning in deep neural networks and discuss its advantages and limitations.

Answer:

Transfer learning is using a model trained on one task for another task. Instead of training from scratch, you use a pre-trained model and adapt it.

Advantages:

Saves time

Needs less data

Can improve performance

Limitations:

Only works for similar tasks

Might not be optimal

Can transfer biases

Transfer learning is useful when you don't have much data or computing resources.

Question 5: Describe the principles of natural language processing (NLP) and how transformer-based models like BERT have revolutionized language understanding tasks.

Answer:

NLP is about making computers understand human language. It includes things like sentiment analysis, translation, and question answering.

BERT is a type of model that has improved NLP. It uses something called attention to look at all words in a sentence at once. This helps it understand context better than older models.

BERT is pre-trained on a lot of text data and then fine-tuned for specific tasks. It has improved performance on many NLP benchmarks.