Natural Language Processing (NLP)

1. What is tokenization in NLP?

Tokenization is the process of breaking text into smaller units like words, phrases, or symbols.

These tokens are the basic building blocks for NLP models.

It's crucial for tasks like parsing, translation, or sentiment analysis.

Common types include word, sentence, and subword tokenization.

2. How does a Transformer model work?

Transformers use self-attention mechanisms to weigh the importance of each word.

They process input data in parallel, unlike RNNs which are sequential.

This leads to faster training and better long-range dependency capture.

BERT and GPT are popular models based on this architecture.

3. What is word embedding, and why is it used?

Word embeddings are dense vector representations of words.

They capture semantic relationships based on context and usage.

Words with similar meanings have closer embeddings in the vector space.

Popular models include Word2Vec, GloVe, and FastText.

4. What is Named Entity Recognition (NER)?

NER is an NLP task that identifies and classifies entities in text.

Entities can include names, locations, dates, and organizations.

It's useful in information extraction, chatbots, and search engines.

Modern models use deep learning for higher accuracy.

5. How is sentiment analysis performed in NLP?

Sentiment analysis determines the emotional tone of a text.

It classifies text into categories like positive, negative, or neutral.

ML and deep learning models are trained on labeled sentiment data.

Applications include social media monitoring and customer feedback analysis.

6. What is convolution in CNNs?

Convolution is a mathematical operation that extracts features from images.

It uses filters to detect edges, textures, and patterns.

These features help in identifying objects and understanding images.

CNNs stack multiple layers to build complex representations.

7. What is image classification?

Image classification is assigning a label to an image from a set of categories.

It involves feature extraction followed by a classifier like softmax.

CNNs are widely used for this task due to their spatial awareness.

Applications include face recognition and medical image analysis.

8. How does object detection differ from classification?

Classification labels the entire image, while detection locates and labels objects.

Object detection provides bounding boxes around identified items.

It combines localization and classification in one model.

Popular algorithms include YOLO, SSD, and Faster R-CNN.

9. What are the challenges in computer vision?

CV faces challenges like lighting variation, occlusion, and viewpoint changes.

Large, diverse datasets are needed to train robust models.

Generalization across environments is often difficult.

Real-time performance and efficiency are also concerns in deployment.

10. What is transfer learning in CV?

Transfer learning uses pre-trained models on new, similar tasks.

It saves time and resources, especially when data is limited.

Only the final layers are retrained for the new dataset.

Models like ResNet, VGG, and EfficientNet are commonly reused.