

## **1. Define Natural Language Processing (NLP)**

Natural Language Processing (NLP) is a subfield of Artificial Intelligence (AI) that focuses on enabling computers to understand, interpret, process, and generate human language in a meaningful way.

## **2. History and Evolution of NLP**

NLP began with rule-based systems and symbolic approaches in the 1950s–1980s. It evolved into statistical methods using machine learning in the 1990s–2000s and now primarily relies on deep learning and transformer-based models such as BERT and GPT.

## **3. Key Challenges and Applications of NLP**

Challenges include ambiguity, context understanding, sarcasm, multiple languages, and noisy data. Applications include chatbots, machine translation, sentiment analysis, speech recognition, information retrieval, and question answering systems.

## **4. Language, Knowledge, and Grammar in NLP**

Language refers to the structure and vocabulary of human communication. Knowledge involves world understanding and context. Grammar defines syntactic and semantic rules that help machines understand sentence structure and meaning.

## **5. Stages of NLP**

The stages include lexical analysis, syntactic analysis, semantic analysis, discourse integration, and pragmatic analysis, each contributing to deeper language understanding.