

# Introduction to NLP

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# What is NLP?

- Natural Language Processing (NLP) is a branch of AI that enables computers to understand, interpret, and generate human language.
- It bridges the gap between human communication and machine understanding.

# Why NLP is Needed?

- Human language is ambiguous and unstructured
- Machines traditionally understand structured data
- NLP converts unstructured text into structured representations

# Components of NLP

NLP consists of two major components:

- Natural Language Understanding (NLU)
- Natural Language Generation (NLG)

# Natural Language Understanding (NLU)

- NLU focuses on understanding the meaning of text.

Key tasks include:

- Tokenization
- POS Tagging
- Named Entity Recognition
- Parsing
- Semantic Analysis

# NLU Example

- Input: 'Book a flight from Bhubaneswar to Delhi tomorrow'
- Intent: Book Flight
- Entities: Source, Destination, Date

# Natural Language Generation (NLG)

- NLG focuses on generating human-like text from data.

Key steps:

- Content Planning
- Sentence Planning
- Text Realization

# NLG Example

- Input Data: Flight AI203, Time 10:30 AM, Price ₹4500
- Generated Text: Your flight AI203 departs at 10:30 AM costing ₹4500.



# NLU vs NLG

NLU:

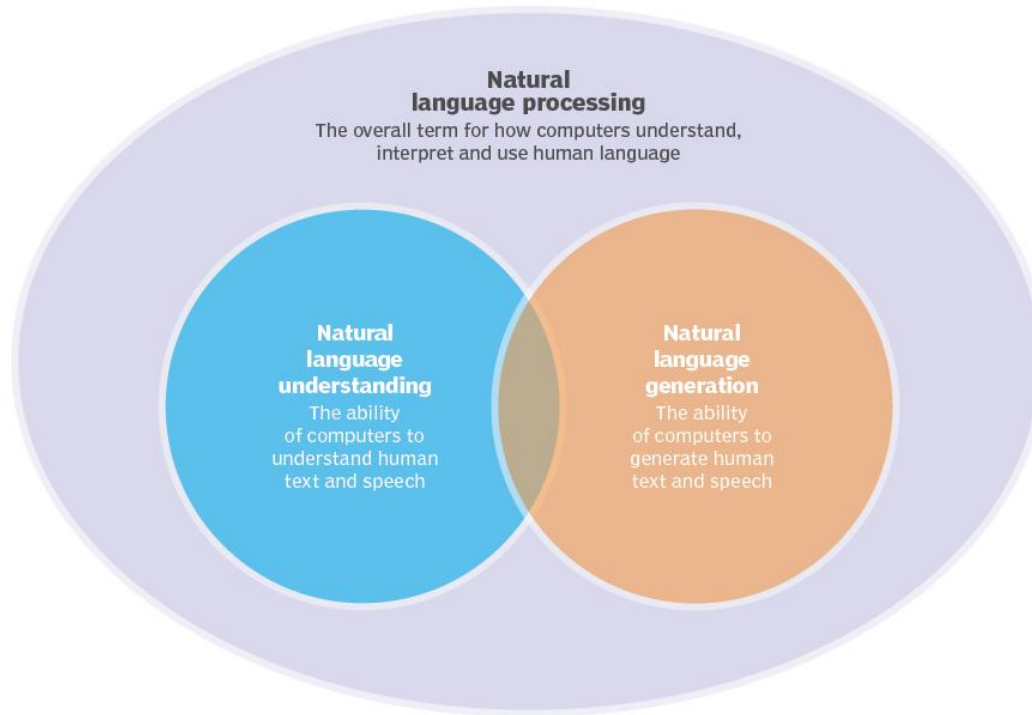
- Understands language
- Input: Human text
- Output: Meaning

NLG:

- Generates language
- Input: Data
- Output: Text

$$\text{NLP} = \text{NLU} + \text{NLG}$$

## How NLP, NLU and NLG are related



# Motivation for NLP

- Explosion of textual data
- Need for natural human-computer interaction
- Automation of tasks
- Decision making from text data

# Significance of NLP

- Improves efficiency
- Enables intelligent systems
- Reduces human effort
- Supports multilingual communication

# Applications of NLP

- Chatbots and Virtual Assistants
- Machine Translation
- Sentiment Analysis
- Search Engines

# More NLP Applications

- Healthcare systems
- Text Summarization
- Spam Detection
- Educational Tools

# End-to-End NLP System

- User Input → NLU → Processing → NLG → Response

# Conclusion

- NLP enables machines to understand and generate human language.
- NLU and NLG together power modern AI applications.
- In this NLP course we will focus on NLU