

AI 5th ✓

NLP-4

NLP - ✓
CVS - ✓

Predicate Argument Structure, (Meaning Representation)

AI 5th ✓

Systems, Software

FPS.

1) Predicate Argument Structure:

- Predicate Argument Structure is a key concept in NLP.
- It focuses on the relationship between Predicate (verb) and Arguments (Subject, object) ...
- It helps in Semantic labelling, Machine translation, Information extraction.
- Here's the breakdown of key concepts:

1) Predicate:

Def: The main action in the sentence is described by a Verb or verb phrase.

Eg: She ate an apple, ate is an predicate.

2) Argument:

def: The people involved in the action.

Types of Arguments:

Subject: The one doing Action. She

object: The thing receiving the action. an apple

Indirect object: The one who benefits from action.
him? as she gave him an apple

Adjuncts: Extra details like time, place or manner.

Ex: In the morning in she ate an apple in the morning.

3. Semantic Rules:-

defn:- The labels which describe the function of each argument

Common Rules:-

Agent:- The entity performing action

Theme:- The thing affected by the action

Experiencer:- The one feeling something

Beneficiary:- The one who getting benefit from action

Instrument:- The tools used for the action.

Parsing PAs:-

- Methods:-

- Rule-based:- Using grammar rules to find the parts of the sentence

- Machine Learning:- Using statistical computer orgs. recognize patterns in sentence.

- Neural-networks:- Using advanced AI models to understand sentences.

Applications of PAs

- Semantic Role Labeling (SRL):-

It helps us to understand sentences better by knowing who is doing what.

- Information Extraction

- Machine Translation

- Question Answering

Tools:-

- PropBank and FrameNet

- SpaCy and Allen NLP

2) Meaning Representation Systems :

- Meaning Representation Systems are used for capturing the meaning of sentences or text in a way that computer can understand and process.
- This systems translate the human language into a structured format that reflects the meaning & relationships between them. different parts of the text.
- Here's a simple breakdown :

1) Purpose :

MRS aims to convert the natural language into a form that a computer can understand the text & perform tasks like question answering & translating languages or summarizing information.

2) Components :

Entities? Objects or concepts mentioned in the text

eg. John, "apple"

Relationships? How these entities are connected

eg. "John eats an apple" shows a relationship between John and apple.

3) Representation Methods :

1) Semantic Networks :

Use nodes & edges

↓
entities

↓
relationships

eg. (John) — eats — (apple)

2) Frames :

Fills the details of a particular situation

eg. "buying" frame includes all the details of who bought.

3) Logical Forms:-
Captures the meaning

Eg:- eat(John, apple)
to represent

John eats an apple.

Applications:-

1) Question Answering 2) Machine Translation

3) Text Summarization

3) Software in NLP

It refers to the tools, libraries and frameworks designed to help developers build applications that can understand, interpret and generate human languages.

Popular NLP Libraries and Frameworks:

1) NLTK (Natural Language Toolkit)?

- Most widely used library for NLP in Python

- Features: Tokenization, parsing, stemming, tagging, classification and semantic reasoning

- Use Cases: Educational purpose, research, basic NLP tasks.

2) SpaCy?

- It is also a library designed for performance and ease of use.

- Features:

Fast tokenization, part-of-speech tagging, named entity recognition, dependency parsing, pre-trained word vectors.

- Use Cases: Large-scale NLP Projects, production-level applications.

4) Feature Structures:

Sets of attributes & their values to describe entities and relationships

Eg:- It includes subject, object, and tense.

act as predicates. Then, it can guess the predicate in a new sentence.

3. Deep Learning Models:

- Uses complex algorithms that mimic human language brain to understand language.

Eg: Tools like BERT read sentences and understand the content to figure out which part is the predicate, even in tricky sentences.

4. dependency parsing:

- Analyzes the grammatical structure of sentences to find how words are related.

Eg: The cat sits on the mat,

It figures out that "sits" is the main action (predicate) because now it's connected to "cat" & "on the mat"

5. Semantic Role Labeling (SRL):

- Identify the predicate and labels other parts of the sentence to show their roles.

Eg: In "The chef cooked a meal," it identifies "cooked" as the predicate and labels "The chef" as the doer and "a meal" as what is being cooked.

7) Difference between Predicate and Predicator.

1. Predicate:

- Predicate is a part of a sentence that tells us what the subject does or what is done to the subject.

It typically includes the verb and everything that follows it.

Eg: "The dog barked loudly."

Predicate: barked loudly. It includes the verb "barked" and the adverb "loudly".

2. Predicator:

- The predicator is specially the main verb or verb phrase within the predicate. It is the core of the predicate that expresses the action or state of the subject.

Eg: The dog barked loudly

predicator: barked. It is the main verb that carries the action.

Key Differences

Scope:

- The predicate encompasses everything that provides information about the subject including the verb, objects, and modifiers.
- The predicator is just the main verb or verb phrase within the predicate.

Function:

- The predicate provides a complete description of what the subject is doing or experiencing.
- The predicator is the central element that directly expresses the action or state.

Examples:-

1) Simple sentence : She runs

predicate : runs , predicator : runs

2) Complex sentence : The cat is sleeping on the mat

predicate : is sleeping on the mat

predicator : sleeping.