Assignment 5

Name: Adhija Satish Bachhav

Roll No: 381053

PRN: 22311656

Problem Statement

To use WordNet for identifying semantic relationships such as synonymy, antonymy, and hypernymy in given text data, and to analyze the semantic structure of words using lexical databases.

Objective

The objective of this assignment is to understand semantic relationships between words and to explore how lexical resources like WordNet help in capturing meaning, hierarchy, and relationships between words in Natural Language Processing (NLP).

Introduction to WordNet

WordNet is a large lexical database of the English language developed at Princeton University. It groups words into sets of cognitive synonyms called *synsets*, each expressing a distinct concept. WordNet connects these synsets through various semantic relations such as synonymy, antonymy, hypernymy, and hyponymy.

Terminologies Used

1. Synonymy

Synonymy refers to the relationship between words that have similar or identical meanings. In WordNet, synonyms are grouped together in synsets.

2. Antonymy

Antonymy represents the relationship between words with opposite meanings, such as *good* and *bad*.

3. Hypernymy

Hypernymy is a semantic relationship where a word represents a broader or more general category. For example, *vehicle* is a hypernym of *car*.

4. Hyponymy

Hyponymy is the opposite of hypernymy and represents a more specific instance of a word. For example, *car* is a hyponym of *vehicle*.

5. Synset

A synset is a set of synonymous words that share the same meaning and represent a single concept in WordNet.

Methodology

The experiment was conducted using two sample words: **"good"** and **"cool"**, to demonstrate semantic relationship extraction using WordNet.

Methodology

The following steps were performed:

1. WordNet lexical database was accessed using the NLTK library.
2. A target word was selected from the text data.
3. All synsets related to the word were retrieved.
4. Synonyms were extracted from synsets.
5. Antonyms were identified using lemma relationships.
6. Hypernyms and hyponyms were obtained to analyze semantic hierarchy.

Output Description

- **Synonyms**: Words having similar meaning to the target word.
- **Antonyms**: Words having opposite meaning to the target word.
- **Hypernyms**: Broader category terms related to the target word.
- **Hyponyms**: More specific terms derived from the target word.

These outputs help in understanding the semantic context and relationships of words in text data.

Applications

- Word sense disambiguation
- Information retrieval
- Question answering systems
- Text summarization
- Semantic search engines

Conclusion

This assignment demonstrates how WordNet can be effectively used to identify semantic relationships between words. Understanding synonymy, antonymy, and hypernymy is essential for building intelligent NLP systems that require semantic awareness.

Result

Semantic relationships such as synonyms, antonyms, hypernyms, and hyponyms were successfully extracted using WordNet, fulfilling the objectives of the assignment.