APPLIED ARTIFICIAL INTELLIGENCE

EXPERIMENT – 10

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# Install spacy if not already installed (uncomment the next line if needed)

# pip install spacy
# python -m spacy download en_core_web_sm

import spacy

# Load a small English language model that contains vocabulary, syntax, and NER
nlp = spacy.load("en_core_web_sm")

# Input sentence (can be from chatbot, search, email, etc.)
text = "Google acquired DeepMind in 2014 for developing artificial intelligence."

# Step 1: Process the text using the NLP pipeline
doc = nlp(text)

# Step 2: Print each word and its Part-of-Speech (POS) tag and dependency relation
print("🔍 Word-Level Semantic and Syntactic Information:\n")
for token in doc:
    print(f"Text: {token.text:15} | POS: {token.pos_:10} | Dependency: {token.dep_:15} | Head: {token.head.text}")

# Step 3: Named Entity Recognition (NER)
print("\n🏷️ Named Entities (Real-world concepts recognized):\n")
for ent in doc.ents:
   print(f"Entity: {ent.text:25} | Label: {ent.label_} | Explanation: {spacy.explain(ent.label_)}")

# Step 4: Print root verb and its subject and object — basic semantic role labeling
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print("\n🔗 Semantic Roles (Who did what to whom?):\n")

for token in doc:

   if token.dep_ == "ROOT":  # main verb

      subject = [w for w in token.lefts if w.dep_ in ("nsubj", "nsubjpass")]

      obj = [w for w in token.rights if w.dep_ in ("dobj", "pobj")]

      print(f"Action: {token.text}")

      print(f"Subject(s): {[w.text for w in subject]}")

      print(f"Object(s): {[w.text for w in obj]}")
```

output:

```
🔍 Word-Level Semantic and Syntactic Information:

Text: Google          | POS: PROPN      | Dependency: nsubj          | Head: acquired
Text: acquired        | POS: VERB       | Dependency: ROOT           | Head: acquired
Text: DeepMind        | POS: PROPN      | Dependency: dobj           | Head: acquired
Text: in              | POS: ADP        | Dependency: prep           | Head: acquired
Text: 2014            | POS: NUM        | Dependency: pobj           | Head: in
Text: for             | POS: ADP        | Dependency: prep           | Head: acquired
Text: developing      | POS: VERB       | Dependency: pcomp          | Head: for
Text: artificial      | POS: ADJ        | Dependency: amod           | Head: intelligence
Text: intelligence    | POS: NOUN       | Dependency: dobj           | Head: developing
Text: .               | POS: PUNCT      | Dependency: punct          | Head: acquired

🏷️   Named Entities (Real-world concepts recognized):

Entity: Google                  | Label: ORG | Explanation: Companies, agencies, institutions, etc.
Entity: DeepMind                | Label: ORG | Explanation: Companies, agencies, institutions, etc.
Entity: 2014                    | Label: DATE | Explanation: Absolute or relative dates or periods

🔗 Semantic Roles (Who did what to whom?):

Action: acquired
Subject(s): ['Google']
Object(s): ['DeepMind']
```

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