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## **Experiment 8**

### **IMPLEMENTATION OF FORWARD CHAINING**

#### **Aim:**

To implement forward Chaining.

#### **Scenario:**

A diagnostic expert system helps determine whether a patient has a disease based on observed symptoms. The system uses forward chaining, where it starts with known facts (symptoms) and applies rules to infer new facts until it reaches a conclusion (diagnosis).

#### **Procedure:**

1. Initialize a knowledge base containing IF-THEN rules.
2. Define the initial facts (observed symptoms or given conditions).
3. Repeat until no new facts are inferred:
  - Iterate through each rule in the knowledge base.
  - Check if all conditions (IF part) of a rule exist in the known facts.
  - If true and the conclusion (THEN part) is not already in facts, add it to the facts. ■ Mark that a new fact was inferred and continue.
4. Stop when no new facts are derived in an iteration.
5. Check if the final goal or diagnosis is in the inferred facts.
6. Output the conclusion based on derived facts.

#### **Program:**

# Knowledge Base: Rules in IF-THEN format

```
knowledge_base = [  
    (["cough", "fever"], "flu"),  
    (["sore_throat", "runny_nose"], "cold"),  
    (["sore_throat"], "fever") # Sore throat can lead to fever  
]
```

# Given initial facts

```
facts = {"cough", "sore_throat"}

# Forward Chaining Function
def forward_chaining():

    inferred = True # Keep looping as long as new facts are added
    while inferred:
        inferred = False # Stop if no new fact is added in an iteration

        for conditions, conclusion in knowledge_base:
            if all(condition in facts for condition in conditions) and conclusion not
            in facts: facts.add(conclusion) # Add the inferred fact
            inferred = True # Mark that we inferred a new fact

# Run forward chaining
forward_chaining()

# Check if flu or cold is inferred
if "flu" in facts:
    print("The patient is diagnosed with flu.")
elif "cold" in facts:
    print("The patient is diagnosed with cold.")
else:
    print("No conclusive diagnosis could be made.")
```

### Output:

```
The patient is diagnosed with flu.
```

```
File Edit Format Run Options Window Help
# Knowledge Base: Rules in IF-THEN format
knowledge_base = [
    (["cough", "fever"], "flu"),
    (["sore_throat", "runny_nose"], "cold"),
    (["sore_throat"], "fever") # Sore throat can lead to fever
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# Given initial facts
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# Forward Chaining Function
def forward_chaining():
    inferred = True # Keep looping as long as new facts are added
    while inferred:
        inferred = False # Stop if no new fact is added in an iteration
        for conditions, conclusion in knowledge_base:
            if all(condition in facts for condition in conditions) and conclusion not in facts:
                facts.add(conclusion) # Add the inferred fact
                inferred = True # Mark that we inferred a new fact

# Run forward chaining
forward_chaining()

# Check if flu or cold is inferred
if "flu" in facts:
    print("The patient is diagnosed with flu.")
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```
IDLE Shell 3.12.10
File Edit Shell Debug Options Window Help
Python 3.12.10 (tags/v3.12.10:0cc8128, Apr  8 2025, 12:21:36) [MSC v.1943 64 bit
(AMD64)] on win32
Enter "help" below or click "Help" above for more information.
>>>
- RESTART: C:\Users\ASUS\Documents\POAI Divya\hari\POAI\code\EX 8 IMPLEMENTATION O
P FORWARD CHAINING241501053.py
The patient is diagnosed with flu.
>>>
```