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Experiment 7

IMPLEMENTATION OF BACKWARD CHAINING

Aim:

To implement backward chaining.

Scenario:

A medical expert system is designed to diagnose diseases based on patient symptoms. The system uses backward chaining to infer whether a patient has a specific disease by checking rules and known facts.

Procedure:

1. Define the knowledge base with rules (causal relationships).

   - "flu": [["cough", "fever"]] → Flu occurs if both cough and fever exist.
   - "fever": [["sore_throat"]] → Fever occurs if sore throat exists.

2. Define known facts: {sore_throat, cough}.

3. Define the backward chaining function:

   - Check if the goal is in known facts. If so, return True.
   - Check if rules exist for the goal in the knowledge base.
   - For each rule, verify all conditions recursively using backward chaining.
   - If all conditions can be proven, return True.
   - Otherwise, return False.

4. Query whether the patient has flu (flu).

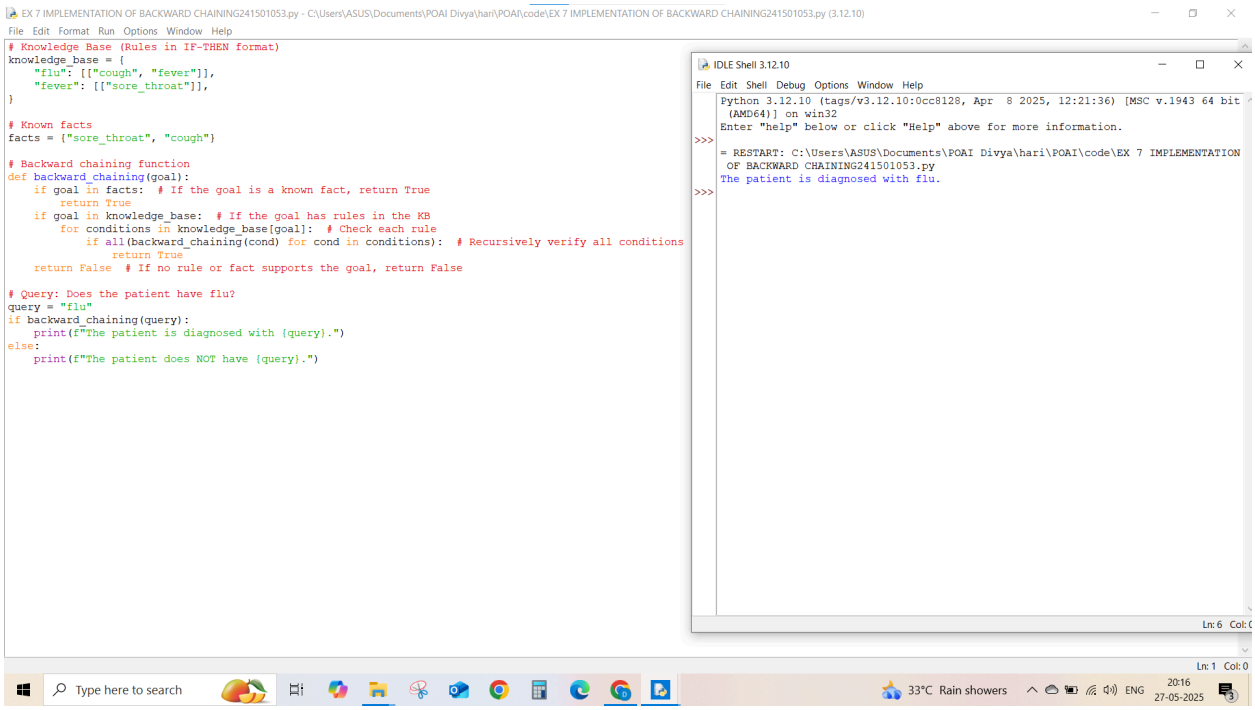
5. Execution:

   - flu requires cough and fever.
   - cough is a fact → True
   - fever needs sore_throat.
   - sore_throat is a fact → True
   - Since both cough and fever are proven flu is diagnosed.

Program:

```
# Knowledge Base (Rules in IF-THEN format)
knowledge_base = {
 "flu": [["cough", "fever"]],
 "fever": [["sore_throat"]],
}
# Known facts
facts = {"sore_throat", "cough"}
# Backward chaining function
def backward_chaining(goal):
 if goal in facts: # If the goal is a known fact, return True
 return True
 if goal in knowledge_base: # If the goal has rules in KB
 for conditions in knowledge_base[goal]: # Check each rule
 if all(backward_chaining(cond) for cond in conditions): #
Recursively verify   return True
 return False # If no rule or fact supports the goal, return False
# Query: Does the patient have flu?
query = "flu"
if backward_chaining(query):
 print(f"The patient is diagnosed with {query}.")
else:
 print(f"The patient does NOT have {query}.")
```

Output:


EX 7 IMPLEMENTATION OF BACKWARD CHAINING241501053.py - C:\Users\ASUS\Documents\POAI Divya\hari\POAI\code\EX 7 IMPLEMENTATION OF BACKWARD CHAINING241501053.py (3.12.10)
File Edit Format Run Options Window Help
# Knowledge Base (Rules in IF-THEN format)
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"fever": [["sore_throat"]],
}
# Known facts
facts = {"sore_throat", "cough"}
# Backward chaining function
def backward_chaining(goal):
if goal in facts: # If the goal is a known fact, return True
return True
if goal in knowledge_base: # If the goal has rules in the KB
for conditions in knowledge_base[goal]: # Check each rule
if all(backward_chaining(cond) for cond in conditions): # Recursively verify all conditions
return True
return False # If no rule or fact supports the goal, return False
# Query: Does the patient have flu?
query = "flu"
if backward_chaining(query):
print(f"The patient is diagnosed with {query}.")
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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 7 IMPLEMENTATION OF BACKWARD CHAINING241501053.py
The patient is diagnosed with flu.
>>>
Ln: 6 Col: 0
Ln: 1 Col: 0
Type here to search
33°C Rain showers
ENG
20:16
27-05-2025