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AIES ASSIGNMENT 7

Medical Expert System

Code

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% Knowledge Base: Symptoms and Treatments
symptom('Flu').
symptom('Yellowish eyes and skin').
symptom('Dark color urine').
symptom('Pale bowel movement').
symptom('Fatigue').
symptom('Vomiting').
symptom('Fever').
symptom('Pain in joints').
symptom('Weakness').
symptom('Stomach Pain').

treatment('Flu', 'Drink hot water, avoid cold eatables.').
treatment('Yellowish eyes and skin', 'Put eye drops, have healthy sleep, do
not strain your eyes.').
treatment('Dark color urine', 'Drink lots of water, juices and eat fruits.
Avoid alcohol consumption.').
treatment('Pale bowel movement', 'Drink lots of water and exercise
regularly.').
treatment('Fatigue', 'Drink lots of water, juices and eat fruits.').
treatment('Vomiting', 'Drink salt and water.').
treatment('Fever', 'Put hot water cloth on head and take crocin.').
treatment('Pain in joints', 'Apply pain killer and take crocin.').
treatment('Weakness', 'Drink salt and water, eat fruits.').
treatment('Stomach Pain', 'Avoid outside food and eat fruits.').

% User Interface
start :-
    retractall(patient(_, _)),
    write('Welcome to the Liver Disease Diagnosis System'), nl,
    write('Please answer the following questions with yes or no.'), nl,
    ask_symptoms,
    output.

ask_symptoms :-
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    symptom(X),
    format('Does the patient have ~w? (yes/no) ', [X]),
    read(Y),
    assert(patient(X, Y)),
    fail.
ask_symptoms.

% Diagnosis Rules
disease(hemochromatosis) :-
    patient('Stomach Pain', yes),
    patient('Pain in joints', yes),
    patient('Weakness', yes),
    patient('Dark color urine', yes),
    patient('Yellowish eyes and skin', yes).

disease(hepatitis_c) :-
    patient('Pain in joints', yes),
    patient('Fever', yes),
    patient('Fatigue', yes),
    patient('Vomiting', yes),
    patient('Pale bowel movement', yes).

disease(hepatitis_b) :-
    patient('Pale bowel movement', yes),
    patient('Dark color urine', yes),
    patient('Yellowish eyes and skin', yes).

disease(hepatitis_a) :-
    patient('Flu', yes),
    patient('Yellowish eyes and skin', yes).

disease(jaundice) :-
    patient('Yellowish eyes and skin', yes).

disease(flu) :-
    patient('Flu', yes).

% Output
output :-
    nl,
    possible_diseases,
    nl,
    advice,
    nl,
    write('Note: This is a basic diagnosis. Please consult a medical
professional for accurate diagnosis and treatment.'), nl.

possible_diseases :-
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    findall(X, disease(X), Diseases),
    (   Diseases = []
    ->  write('No specific disease identified based on the symptoms
provided.')
    ;   write('The patient may suffer from the following disease(s):'), nl,
        print_diseases(Diseases)
    ).

print_diseases([]).
print_diseases([H|T]) :-
    write('- '), write(H), nl,
    print_diseases(T).

advice :-
    write('Recommended treatments based on symptoms:'), nl,
    setof(Treatment, Symptom^(patient(Symptom, yes), treatment(Symptom,
Treatment)), Treatments),
    print_treatments(Treatments).

print_treatments([]).
print_treatments([H|T]) :-
    write('- '), write(H), nl,
    print_treatments(T).

% Main query predicate
:- dynamic patient/2.
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Output

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1 ?- [disease].
true.

2 ?- start.
Welcome to the Liver Disease Diagnosis System
Please answer the following questions with yes or no.
Does the patient have Flu? (yes/no) yes
.
Does the patient have Yellowish eyes and skin? (yes/no) |: no.
Does the patient have Dark color urine? (yes/no) |: yes.
Does the patient have Pale bowel movement? (yes/no) |: yes.
Does the patient have Fatigue? (yes/no) |: no.
Does the patient have Vomiting? (yes/no) |: no.
Does the patient have Fever? (yes/no) |: yes.
Does the patient have Pain in joints? (yes/no) |: no.
Does the patient have Weakness? (yes/no) |: no.
Does the patient have Stomach Pain? (yes/no) |: yes.

The patient may suffer from the following disease(s):
- flu

Recommended treatments based on symptoms:
- Avoid outside food and eat fruits.
- Drink hot water, avoid cold eatables.
- Drink lots of water and exercise regularly.
- Drink lots of water, juices and eat fruits. Avoid alcohol consumption.
- Put hot water cloth on head and take crocin.

Note: This is a basic diagnosis. Please consult a medical professional for accurate diagnosis and treatment.
true.
```

```
2 ?- start.
Welcome to the Liver Disease Diagnosis System
Please answer the following questions with yes or no.
Does the patient have Flu? (yes/no) yes.
Does the patient have Yellowish eyes and skin? (yes/no) |: yes.
Does the patient have Dark color urine? (yes/no) |: yes.
Does the patient have Pale bowel movement? (yes/no) |: yes.
Does the patient have Fatigue? (yes/no) |: yes.
Does the patient have Vomiting? (yes/no) |: yes.
Does the patient have Fever? (yes/no) |: yes.
Does the patient have Pain in joints? (yes/no) |: yes.
Does the patient have Weakness? (yes/no) |: yes.
Does the patient have Stomach Pain? (yes/no) |: yes.

The patient may suffer from the following disease(s):
- hemochromatosis
- hepatitis_c
- hepatitis_b
- hepatitis_a
- jaundice
- flu

Recommended treatments based on symptoms:
- Apply pain killer and take crocin.
- Avoid outside food and eat fruits.
- Drink hot water, avoid cold eatables.
- Drink lots of water and exercise regularly.
- Drink lots of water, juices and eat fruits.
- Drink lots of water, juices and eat fruits. Avoid alcohol consumption.
- Drink salt and water, eat fruits.
- Drink salt and water.
- Put eye drops, have healthy sleep, do not strain your eyes.
- Put hot water cloth on head and take crocin.

Note: This is a basic diagnosis. Please consult a medical professional for accurate diagnosis and treatment.
true.
```

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ASSIGNMENT NO. 7

TITLE

Write a program to develop mini-expert system using Prolog.

FAQs

1. Write, in brief, forward chaining and backward chaining of inference engine.

Forward chaining is a data-driven approach where the inference engine starts with known facts and applies rules to infer new facts until it reaches a conclusion. The process moves from the input data toward the goal, activating rules that match the current facts. It is suitable for systems where data is continuously provided and decisions are made in real-time. Eg. in a medical expert system, symptoms are provided, and the system applies rules to conclude a diagnosis.

Backward chaining is a goal-driven approach where the inference engine starts with a goal or hypothesis and works backward, checking if the facts support that goal. The system tries to prove the goal by looking for rules that can lead to it and then checking if the conditions for those rules hold true. It is typically used in systems where the goal is defined first, and the system attempts to validate the hypothesis system. Eg: in a legal expert system, if you want to prove someone is eligible for a certain permit, the system works backward to check if all conditions are met.

2. List down applications of expert systems

- Medical diagnosis - used to assist doctors in diagnosing diseases based on symptoms.
- Financial forecasting - help in predicting market trends, stock prices, and other financial parameters.
- Engineering design - employed in designing complex systems and providing solutions.
- Fault diagnosis - can detect and diagnose faults in machinery and electronic systems.
- Customer support - assist in troubleshooting issues based on predefined solutions.
- Legal reasoning - provide advice on legal matters.