Advanced Medical Diagnosis System in Prolog

The following Prolog code simulates an expert system that diagnoses multiple diseases based on an extensive list of symptoms, including interactions between symptoms, diagnostic procedures, and advanced Prolog features.

This system handles disease diagnosis, critical symptom detection, symptom combinations, and provides treatment recommendations based on user inputs.

The code is detailed, complex, and designed to impress HR professionals at top tech companies like MAANG.

Prolog Code: Advanced Medical Diagnosis System

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% Advanced Expert System for Medical Diagnosis

% --- FACTS: Diseases and Symptoms ---

% Define Diseases
disease(flu).
disease(cold).
disease(pneumonia).
disease(malaria).
disease(covid_19).
disease(tonsillitis).
disease(allergy).
disease(gastroenteritis).

% Symptoms for Flu
symptom(flu, fever).
symptom(flu, cough).
symptom(flu, sore_throat).
symptom(flu, body_aches).
symptom(flu, chills).
symptom(flu, fatigue).
symptom(flu, congestion).

% Symptoms for Cold
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symptom(cold, cough).
symptom(cold, sore_throat).
symptom(cold, runny_nose).
symptom(cold, sneezing).
symptom(cold, mild_fever).
symptom(cold, headache).

% Symptoms for Pneumonia
symptom(pneumonia, fever).
symptom(pneumonia, cough).
symptom(pneumonia, chest_pain).
symptom(pneumonia, difficulty_breathing).
symptom(pneumonia, rapid_breathing).
symptom(pneumonia, fatigue).

% Symptoms for Malaria
symptom(malaria, fever).
symptom(malaria, chills).
symptom(malaria, sweating).
symptom(malaria, headache).
symptom(malaria, nausea).
symptom(malaria, fatigue).

% Symptoms for Covid-19
symptom(covid_19, fever).
symptom(covid_19, cough).
symptom(covid_19, shortness_of_breath).
symptom(covid_19, fatigue).
symptom(covid_19, loss_of_taste_or_smell).
symptom(covid_19, sore_throat).
symptom(covid_19, headache).

% Symptoms for Tonsillitis
symptom(tonsillitis, sore_throat).
symptom(tonsillitis, difficulty_swallowing).
symptom(tonsillitis, fever).
symptom(tonsillitis, swollen_glands).

% Symptoms for Allergy
symptom(allergy, sneezing).
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symptom(allergy, itchy_eyes).
symptom(allergy, runny_nose).
symptom(allergy, congestion).
symptom(allergy, coughing).

% Symptoms for Gastroenteritis
symptom(gastroenteritis, vomiting).
symptom(gastroenteritis, diarrhea).
symptom(gastroenteritis, abdominal_pain).
symptom(gastroenteritis, fever).
symptom(gastroenteritis, dehydration).

% --- RULES: Disease Diagnosis ---

% General rule for diagnosing based on symptoms
possible_disease(Disease) :-
    disease(Disease),
    findall(Symptom, symptom(Disease, Symptom), Symptoms),
    check_symptoms(Symptoms).

% Check if the symptoms match the patient's reported symptoms
check_symptoms([]).
check_symptoms([Symptom | Rest]) :-
    ask_user_for_symptom(Symptom),
    check_symptoms(Rest).

% Ask the user if they have the symptom
ask_user_for_symptom(Symptom) :-
    write('Do you have the symptom: '), write(Symptom), write('? (yes/no) '),
    read(Response),
    (Response == yes; Response == y).

% If the user has a severe symptom, check for critical conditions
critical_disease(Disease) :-
    findall(Symptom, symptom(Disease, Symptom), Symptoms),
    check_severe_symptoms(Symptoms).

% If any of the symptoms are critical, the disease is considered severe
check_severe_symptoms([Symptom | Rest]) :-
    severe_symptom(Symptom), !,  % Once a severe symptom is detected, skip further
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checks
    write('Warning! Based on your symptoms, the disease might be serious! Consider
immediate medical attention.'), nl.
check_severe_symptoms([Symptom | Rest]) :-
    check_severe_symptoms(Rest).
check_severe_symptoms([]).

% Define critical symptoms that require immediate medical attention
severe_symptom(fever).
severe_symptom(chest_pain).
severe_symptom(difficulty_breathing).
severe_symptom(rapid_breathing).
severe_symptom(vomiting).
severe_symptom(severe_headache).

% --- SYMPTOM COMBINATIONS FOR INFERRED DIAGNOSIS ---

% Special case rules for combined symptoms that might suggest certain diseases
combination(flu, sore_throat, fever) :- !.
combination(cold, runny_nose, sore_throat).
combination(pneumonia, chest_pain, difficulty_breathing) :- !.
combination(malaria, chills, sweating, headache) :- !.
combination(allergy, sneezing, itchy_eyes, congestion) :- !.

% --- RECOMMENDATION BASED ON DIAGNOSIS ---

% If diagnosis is found, recommend further actions
recommendation(Disease) :-
    write('Based on the symptoms provided, you may have: '), write(Disease), nl,
    treatment_plan(Disease).

% Treatment plans for different diseases
treatment_plan(flu) :-
    write('Treatment Plan for Flu: Rest, hydration, pain relievers, and antiviral
medications.'), nl.
treatment_plan(cold) :-
    write('Treatment Plan for Cold: Rest, hydration, over-the-counter pain relievers, and
decongestants.'), nl.
treatment_plan(pneumonia) :-
    write('Treatment Plan for Pneumonia: Seek medical care immediately. Antibiotics or
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antiviral treatment might be necessary.'), nl.
treatment_plan(malaria) :-
    write('Treatment Plan for Malaria: Antimalarial medications are required. Immediate consultation with a healthcare provider is recommended.'), nl.
treatment_plan(covid_19) :-
    write('Treatment Plan for Covid-19: Isolate, hydrate, and monitor symptoms. Seek medical attention if symptoms worsen.'), nl.
treatment_plan(tonsillitis) :-
    write('Treatment Plan for Tonsillitis: Pain relievers, warm saltwater gargles, and possibly antibiotics for bacterial infection.'), nl.
treatment_plan(allergy) :-
    write('Treatment Plan for Allergy: Antihistamines, avoid allergens, and consult an allergist for more specific care.'), nl.
treatment_plan(gastroenteritis) :-
    write('Treatment Plan for Gastroenteritis: Stay hydrated, rest, and consult a healthcare provider if symptoms are severe.'), nl.

% --- MAIN EXECUTION ---

% Start the expert system
start :-
    write('Welcome to the Advanced Medical Diagnosis System.
'),
    write('Please answer the following questions to help diagnose your condition.
'),
    write('You can respond with "yes" or "no".
'),
    nl,
    possible_disease(Disease),
    critical_disease(Disease),
    recommendation(Disease).

% Example: Testing diagnosis based on a set of symptoms
test_case_1 :-
    write('Testing Case 1: Fever, Cough, and Fatigue
'),
    assertz(symptom(test_case_1, fever)),
    assertz(symptom(test_case_1, cough)),
    assertz(symptom(test_case_1, fatigue)),
    possible_disease(test_case_1),

nl.

% Example: Another test case for pneumonia diagnosis
test_case_2 :-
    write('Testing Case 2: Chest Pain, Difficulty Breathing
'),
    assertz(symptom(test_case_2, chest_pain)),
    assertz(symptom(test_case_2, difficulty_breathing)),
    possible_disease(test_case_2),
    nl.

% --- RUN SYSTEM ---
run :- start.