Logic Programming Project
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Project Documentation: Symptom-Based Illness Diagnosis

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Introduction

The Symptom-Based Illness Diagnosis is a program designed to assist in diagnosing illnesses based on the symptoms presented by a patient. The program utilizes a knowledge base that maps symptoms to corresponding illnesses, and it provides a diagnosis by analyzing the symptoms reported by the patient. This documentation provides an overview of the program, its functionalities, and usage instructions.

Features

1.Diagnosis of Illness: Given a set of symptoms reported by a patient, the program determines the most likely illness that the patient is suffering from.

Knowledge Base

The program utilizes a knowledge base that consists of symptoms and their corresponding illnesses. The symptoms and illnesses are defined using facts and rules. The knowledge base includes symptoms and corresponding illnesses such as flu, measles, cold, food poisoning, and heart attack.

Program:

Facts:

symptom/2:

```
% Knowledge base with symptoms and corresponding illnesses

symptom(fever, flu).
symptom(cough, flu).
symptom(sore_throat, flu).
symptom(runny_nose, flu).
symptom(fatigue, flu).
symptom(headache, flu).
symptom(body_ache, flu).
symptom(chills, flu).

symptom(rash, measles).
symptom(high_fever, measles).
symptom(cough, measles).
symptom(conjunctivitis, measles).
symptom(runny_nose, measles).
symptom(koplik_spots, measles).

symptom(sore_throat, cold).
symptom(cough, cold).
symptom(runny_nose, cold).
symptom(sneezing, cold).
symptom(nasal_congestion, cold).
symptom(mild_fever, cold).
symptom(headache, cold).

symptom(stomach_pain, food_poisoning).
symptom(vomiting, food_poisoning).
symptom(diarrhea, food_poisoning).
symptom(nausea, food_poisoning).
symptom(abdominal_cramps, food_poisoning).

symptom(chest_pain, heart_attack).
symptom(shortness_of_breath, heart_attack).
symptom(dizziness, heart_attack).
symptom(fatigue, heart_attack).
symptom(nausea, heart_attack).
symptom(sweating, heart_attack).
```

---

has_symptom/2:

```
% Examples of patients and their symptoms
has_symptom(ali, fever).
has_symptom(ali, cough).
has_symptom(ali, sore_throat).
has_symptom(ali, runny_nose).
has_symptom(ali, fatigue).
has_symptom(ali, headache).
has_symptom(ali, body_ache).
has_symptom(ali, chills).

has_symptom(fatima, sore_throat).
has_symptom(fatima, cough).
has_symptom(fatima, runny_nose).
has_symptom(fatima, sneezing).
has_symptom(fatima, headache).
has_symptom(fatima, chills).
has_symptom(fatima, body_ache).
has_symptom(fatima, nasal_congestion).

has_symptom(mohammed, rash).
has_symptom(mohammed, high_fever).
has_symptom(mohammed, cough).
has_symptom(mohammed, conjunctivitis).
has_symptom(mohammed, runny_nose).
has_symptom(mohammed, koplik_spots).
has_symptom(mohammed, body_ache).
has_symptom(mohammed, chills).

has_symptom(aysha, sore_throat).
has_symptom(aysha, cough).
has_symptom(aysha, fatigue).
has_symptom(aysha, headache).
has_symptom(aysha, chills).
has_symptom(aysha, body_ache).
has_symptom(aysha, nasal_congestion).

has_symptom(nour, fever).
has_symptom(nour, headache).
has_symptom(nour, chills).
has_symptom(nour, body_ache).
has_symptom(nour, fatigue).
has_symptom(nour, nasal_congestion).

has_symptom(ahmed, fever).
has_symptom(ahmed, cough).
has_symptom(ahmed, headache).
has_symptom(ahmed, runny_nose).
has_symptom(ahmed, sneezing).
has_symptom(ahmed, chills).
has_symptom(ahmed, body_ache).
has_symptom(ahmed, nasal_congestion).
```

Rules:

```
% Rules for diagnosing illnesses based on symptoms


diagnose_illness(Patient, Illness, Likelihood) :-
   setof(Count-I, match_illness(Patient, I, Count), Illnesses),
   reverse(Illnesses, ReversedIllnesses),
   member(Count-Illness, ReversedIllnesses),
   count_total_symptoms(Patient, Total),
   Likelihood is (Count / Total) * 100.

match_illness(Patient, Illness, Count) :-
   symptom(S, Illness),
   has_symptom(Patient, S),
   count_matching_symptoms(Patient, Illness, Count).

count_matching_symptoms(Patient, Illness, Count) :-
   findall(S, (has_symptom(Patient, S), symptom(S, Illness)), Symptoms),
   length(Symptoms, Count).

count_total_symptoms(Patient, Total) :-
   findall(S, has_symptom(Patient, S), Symptoms),
   length(Symptoms, Total).

print_diagnosis(Patient) :-
   diagnose_illness(Patient, Illness, Likelihood),
   format("~w: ~1f% likelihood~n", [Illness, Likelihood]).
```

Usage and Instructions:

To use the Symptom-Based Illness Diagnosis program, follow these steps:

1. Load the program and the knowledge base into a Prolog environment.

2. Call the print_diagnosis(Patient) rule, passing the name of the patient as the argument.

3. The program will evaluate the symptoms reported by the patient and provide a diagnosis along with the likelihood of the illness.

Example usage:

```
print_diagnosis(ali).
```

Output:

```
flu: 100.0% likelihood
true ;
cold: 50.0% likelihood
true ;
measles: 25.0% likelihood
true ;
heart_attack: 12.5% likelihood
true.
```

Dependencies

The Symptom-Based Illness Diagnosis program requires a Prolog environment to run. It does not have any additional dependencies.

Limitations

The program relies on the accuracy and completeness of the knowledge base. If a symptom or illness is not defined in the knowledge base, the program may not be able to provide an accurate diagnosis.
The program assumes that symptoms reported by patients are reliable and accurately reflect their condition. Inaccurate or incomplete symptom reporting may affect the accuracy of the diagnosis.
The program does not take into account other factors such as medical history, age, or underlying conditions, which could affect the diagnosis. It solely relies on the symptoms provided.

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Conclusion

The Symptom-Based Illness Diagnosis program provides a simple and efficient way to diagnose illnesses based on reported symptoms. By utilizing a knowledge base and symptom matching algorithms, the program can provide a likely diagnosis for a given patient.

It can be used as a tool to assist medical professionals in the initial assessment of patients and to provide general guidance. However, it is important to note the limitations of the program and consult with a healthcare professional for accurate and comprehensive diagnosis and treatment.

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