

**CPCS-331 ARTIFICIAL INTELLGIENCE I**

**Project Two, 2019-12-7**

**Expert medical diagnosis System**

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**Problem statement**

Medical diagnosis expert system is an application written in Prolog language that help the user to determine the disease that he/she suffers based on given several symptoms. The user then answer as “yes” or “no” on each asked symptom. Later, the system will determine the expected disease that the user suffers. Note that our application has limited knowledge based and so it will not work for every disease. Hence we assume that the user will suffer only from these given diseases. The following diseases are provided in the system :

* Skin related diseases.
* Eye related diseases.
* Common diseases like : common cold , gastroenteritis, diabetes, acute pancreatitis, stroke.

**Algorithm**

for all facts do :

    add fact in knowledge base

for all diseases do :

    add disease rules with corresponding symptoms

hasDisease = false

for all d in diseases do :

    for all s in symptoms(d) do :

        if client suffers suffer from s:

        //Found answer "yes" from working memory.

            continue

        if client doesn't suffer from s:

            break

        u = Ask user if he suffer from s

        //Means it is not in the working memory before.

        updateWorkingMemory(u,s)

        if u = no:

            break

    if all symptoms(d) = true

        Print "You have disease d"

        hasDisease = true

        break

if hasDisease = false

    Print "You dont have any disease"

**Code Explanation**

a) Facts and rules are provided for all given diseases.

b) The goal will start from the rule “start” , it will print the welcoming messages. Then it will go to sub goal “checkfor” and “report” to check for all diseases one by one and report the expected disease. In case there’s no diseases found, it will fire “nothing” which basically will print a message indicating there’s no diseases found.

c) In “checkfor” rule, it will scan and fire all diseases rules top-down manner one by one. If one of diseases goal is satisfied , then it will return as True and report the disease.

d) In any disease rule -for example- “common\_cold” , it will look for new sub goal “checksymptoms” for all the symptoms related to this disease and check for all the symptoms of this particular disease.

e) In “checksymptoms” rule, simply it will check if the user had this disease before from the working memory. Here are the conditions that this rule will check :-

* Did the user mark this symptom as yes? (Means he had it before).
* Did the user mark this symptom as no? (Means he didn’t have it before).
* If none of previous conditions were true, then it will ask the user for the current symptom and store it in the working memory (Whether it yes or no).

f) The rule “symptom” will basically check the value of the of the chosen symptom if it’s true or false.

**Sample Runs**

Here are some sample runs of different inputs :

1. **Run for input that matches one disease (i.e: stroke):**

Welcome to our medical expert system, this system can no if you potentianlly -hopefully not- one of the follwoing Disease  
Skin related: allergie, eczema, psoriasis, or rash  
Eye related: eye\_cancer, amblyopia, eyestrain  
Other common diseases: common\_cold, gastroenteritis, diabetes, acute\_pancreatitis, stroke.  
By answering question by yes/no only!  
Do you have *symptom*(itchy\_nose)

*no*

Do you have *symptom*(inflamed\_skin)

*no*

Do you have *symptom*(itchy)

*no*

Do you have *symptom*(red\_skin)

*no*

Do you have *symptom*(cracked\_skin)

*no*

Do you have *symptom*(shadow\_in\_vision)

*no*

Do you have *symptom*(head\_tilting)

*no*

Do you have *symptom*(headache)

*yes*

Do you have *symptom*(red\_eye)

*no*

Do you have *symptom*(runny\_nose)

*no*

Do you have *symptom*(tummy\_pain)

*no*

Do you have *symptom*(diarrhoea)

*no*

Do you have *symptom*(urinating\_often)

*no*

Do you have *symptom*(loss\_of\_balance)

*yes*

Do you have *symptom*(blurred\_vision)

*yes*

Do you have *symptom*(arm\_weakness)

*yes*

Do you have *symptom*(slurred\_speech)

*no*

Do you have *symptom*(face\_drop)

*yes*

Based on our humble knowledge, we think you have stroke

**true**

1. **Run for input that doesn’t match any disease:**

Welcome to our medical expert system, this system can no if you potentianlly -hopefully not- one of the follwoing Disease  
Skin related: allergie, eczema, psoriasis, or rash  
Eye related: eye\_cancer, amblyopia, eyestrain  
Other common diseases: common\_cold, gastroenteritis, diabetes, acute\_pancreatitis, stroke.  
By answering question by yes/no only!  
Do you have *symptom*(itchy\_nose)

*no*

Do you have *symptom*(inflamed\_skin)

*no*

Do you have *symptom*(itchy)

*no*

Do you have *symptom*(red\_skin)

*no*

Do you have *symptom*(cracked\_skin)

*no*

Do you have *symptom*(shadow\_in\_vision)

*no*

Do you have *symptom*(head\_tilting)

*no*

Do you have *symptom*(headache)

*no*

Do you have *symptom*(runny\_nose)

*no*

Do you have *symptom*(tummy\_pain)

*no*

Do you have *symptom*(diarrhoea)

*no*

Do you have *symptom*(urinating\_often)

*no*

Do you have *symptom*(loss\_of\_balance)

*no*

Based on our knowledge, You don't have anything alhamdullah!

**true**

**Full code**

symptom(weak\_vision).

symptom(outward\_eye).

symptom(inward\_eye).

symptom(poor\_depth\_perception).

symptom(head\_tilting).

symptom(bluging\_eye).

symptom(eye\_lump).

symptom(eye\_pain).

symptom(shadow\_in\_vision).

symptom(runny\_nose).

symptom(itchy\_nose).

symptom(itchy\_eye).

symptom(red\_eye).

symptom(chest\_tightness).

symptom(swollen\_lips).

symptom(swollen\_tongue).

symptom(swollen\_eyes).

symptom(dry\_skin).

symptom(red\_skin).

symptom(cracked\_skin).

symptom(inflamed\_skin).

symptom(itchy).

symptom(dark\_patches).

symptom(rough\_skin).

symptom(scaly\_patches).

symptom(oozing).

symptom(crusting).

symptom(swelling).

symptom(whitish\_silver\_scales).

symptom(itchy\_patches).

symptom(thick\_nails).

symptom(pitted\_nails).

symptom(swollen\_joints).

symptom(crusting\_rash).

symptom(high\_temperature).

symptom(sneezing).

symptom(cough).

symptom(sore\_throat).

symptom(low\_temprature).

symptom(diarrhoea).

symptom(tummy\_pain).

symptom(vomiting).

symptom(headache).

symptom(urinating\_often).

symptom(feel\_thirsty).

symptom(feel\_hungry).

symptom(blurred\_vision).

symptom(wounds\_are\_slow\_to\_heal).

symptom(weight\_loss).

symptom(fever).

symptom(oily\_stool).

symptom(loss\_of\_balance).

symptom(arm\_weakness).

symptom(slurred\_speech).

symptom(face\_drop).

start:- welcome, nl, (checkfor(Disease), report(Disease),!) ; nothing, !.

% start welcoming page, start questioning, if programe doesn't conculde any diesease, print nothing rule, else reprot the disease%

nothing:-  write("Based on our knowledge, You don't have anything alhamdullah!").

report(Disease):- write("Based on our humble knowledge, we think you have "), write(Disease), nl, !.

welcome:- write("Welcome to our medical expert system, this system can no if you potentianlly -hopefully not- one of the follwoing Disease "), nl,

write("Skin related: allergie, eczema, psoriasis, or rash "), nl,

write("Eye related: eye\_cancer, amblyopia, eyestrain"), nl,

write("Other common diseases: common\_cold, gastroenteritis,  diabetes, acute\_pancreatitis, stroke."), nl,

write("By answering question by yes/no only!").

checkfor(allegrie):- allegrie.

checkfor(eczema):- eczema.

checkfor(psoriasis):- psoriasis.

checkfor(rash):- rash.

checkfor(eye\_cancer):- eyecancer.

checkfor(amblyopia):- amblyopia.

checkfor(eyestrain):- eyestrain.

checkfor(common\_cold):- common\_cold.

checkfor(gastroenteritis):- gastroenteritis.

checkfor(diabetes):- diabetes.

checkfor(acute\_pancreatitis):- acute\_pancreatitis.

checkfor(stroke):- stroke.

common\_cold:- checksymptoms(symptom(runny\_nose)), checksymptoms(symptom(sneezing)),  ( checksymptoms(symptom(cough)) ; checksymptoms(symptom(sore\_throat))), checksymptoms(symptom(low\_temprature)).

gastroenteritis:- (checksymptoms(symptom(tummy\_pain)) ; checksymptoms(symptom(diarrhoea))), checksymptoms(symptom(vomiting)),  checksymptoms(symptom(headache)).

diabetes:- checksymptoms(symptom(urinating\_often)), checksymptoms(symptom(feel\_thirsty)), checksymptoms(symptom(feel\_hungry)),

checksymptoms(symptom(blurred\_vision)), checksymptoms(symptom(wounds\_are\_slow\_to\_heal)).

acute\_pancreatitis:- checksymptoms(symptom(tummy\_pain)), ( checksymptoms(symptom(vomiting)) ; checksymptoms(symptom(weight\_loss))),

checksymptoms(symptom(fever)), checksymptoms(symptom(oily\_stool)).

stroke:- checksymptoms(symptom(loss\_of\_balance)), checksymptoms(symptom(headache)), checksymptoms(symptom(blurred\_vision)),

checksymptoms(symptom(arm\_weakness)), (checksymptoms(symptom(slurred\_speech)) ; checksymptoms(symptom(face\_drop))).

eyecancer:- checksymptoms(symptom(shadow\_in\_vision)), checksymptoms(symptom(blurred\_vision)), checksymptoms(symptom(bluging\_eye)), nl.

amblyopia :- checksymptoms(symptom(head\_tilting)), (checksymptoms(symptom(outward\_eye)); checksymptoms(symptom(inward\_eye)) ) , checksymptoms(symptom(poor\_depth\_perception)), nl.

eyestrain:- checksymptoms(symptom(headache)), checksymptoms(symptom(red\_eye)), checksymptoms(symptom(itchy\_eye)), nl.

allegrie:-

    checksymptoms(symptom(itchy\_nose)),checksymptoms(symptom(red\_eye)),checksymptoms(symptom(chest\_tightness)),

    (checksymptoms(symptom(swollen\_lips)) ; checksymptoms(symptom(swollen\_tongue))), nl.

eczema:-

    (checksymptoms(symptom(inflamed\_skin));checksymptoms(symptom(itchy))),checksymptoms(symptom(dark\_patches)),checksymptoms(symptom(rough\_skin)),

    checksymptoms(symptom(scaly\_patches)),nl.

psoriasis:-

       (checksymptoms(symptom(inflamed\_skin)); checksymptoms(symptom(red\_skin))),checksymptoms(symptom(whitish\_silver\_scales)),checksymptoms(symptom(dry\_skin)),checksymptoms(symptom(crached\_skin)), nl.

rash:-

    checksymptoms(symptom(cracked\_skin)),checksymptoms(symptom(dry\_skin)),(checksymptoms(symptom(crusting\_rash));checksymptoms(symptom(swelling))),

    checksymptoms(symptom(high\_temperature)),nl.

checksymptoms(X):- ((have(X) ->   true); (doesnthave(X) ->   false) ; write("Do you have "), write(X), read(Y),

    ( Y == yes -> assert(have(X)), nl, true ; Y == no -> assert(doesnthave(X)), nl, false)).

% if symptom already being answered by yes or no, then no exit and no need to question the client again, if didn't answer before, update working memory with the answer %

% not that have means yes, doesnthave meanes no %

:- dynamic have/1, doesnthave/1.

%https://www.nhsinform.scot/illnesses-and-conditions/cancer/cancer-types-in-adults/eye-cancer%

%https://www.mayoclinic.org/diseases-conditions/lazy-eye/symptoms-causes/syc-20352391%

%https://www.mayoclinic.org/diseases-conditions/eyestrain/symptoms-causes/syc-20372397%

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