An Expert System to Identify the Stages of Ovarian Cancer

Problem Statement:

Ovarian cancer is the deadliest of gynecologic cancers. Mortality rates are slightly higher for African American women than for Caucasian women. The American Cancer Society estimates that in 2020, about 21,750 new cases of ovarian cancer will be diagnosed and 13,940 women will die of ovarian cancer in the United States. Mortality rates for ovarian cancer have declined only slightly in the forty years since the “War on Cancer” was declared. However, other cancers have shown a much greater reduction in mortality, due to many factors. The Surveillance, Epidemiology and End Results (SEER) Program reports that in 2016 in the United States approximately 229,875 women were alive who had been diagnosed with ovarian cancer (including those who had been cured of the disease). Ovarian cancer accounts for 2.5 percent of cancers in women. While the 11th most common cancer among women, ovarian cancer is the fifth leading cause of cancer-related death among women.

An expert system build in prolog can identify the stages of ovarian cancer. It will help a medical system as well as a patient to identify the type of ovarian cancer and prescribe as per symptoms.

Aim and Objectives:

- To identify the type of Ovarian Cancer.
- Sharing knowledge with mass people.
- Creating awareness about Ovarian Cancer
- Prescribe treatment and medicine according to the type of cancer.

Design:

Design describe how the expert system react according to commands given to prolog environment for identifying the types of Ovarian Cancer. Action performed by the commands is represented in circular form and arrows represent direction from one action to another action. When all conditions are satisfied according to characteristics then it shows the type of Ovarian Cancer as well as prescribe treatment according to the types. Design of the expert system is shown in Figure-1. Table -1 describes the stages of Ovarian Cancer during the surgery.

Table-1: Stages of Ovarian Cancer

Stage I The cancer is confined to the ovary(or fallopian tube)	IA – The cancer is confined to one ovary only	IB – The cancer is found on both ovary	IC – One or both ovary are found with cancer cells spilling out from the ovaries.
Stage II Growth of the cancer involves one or both ovary and pelvic extension	IIA – Extension of cancer to fallopian tube or uterus.	IIB – Extension of cancers to other pelvic organs.	
Stage II Growth of the cancer involves one or both ovary and the cancer has spread beyond the pelvis	IIIA – Microscopic cancer cells are found in upper abdomen or lymph nodes	IIIB- Visible tumor found in upper abdomen less than 2cm in size.	IIIC- Visible tumor found in upper abdomen greater than 2cm in size, including disease on surface of liver and spleen
Stage IV The cancer growth is widely spread throughout the body	IVA – Cancer is found in the fluid around lungs	IVB- Cancer is found inside the lungs, fluid or spleen.	

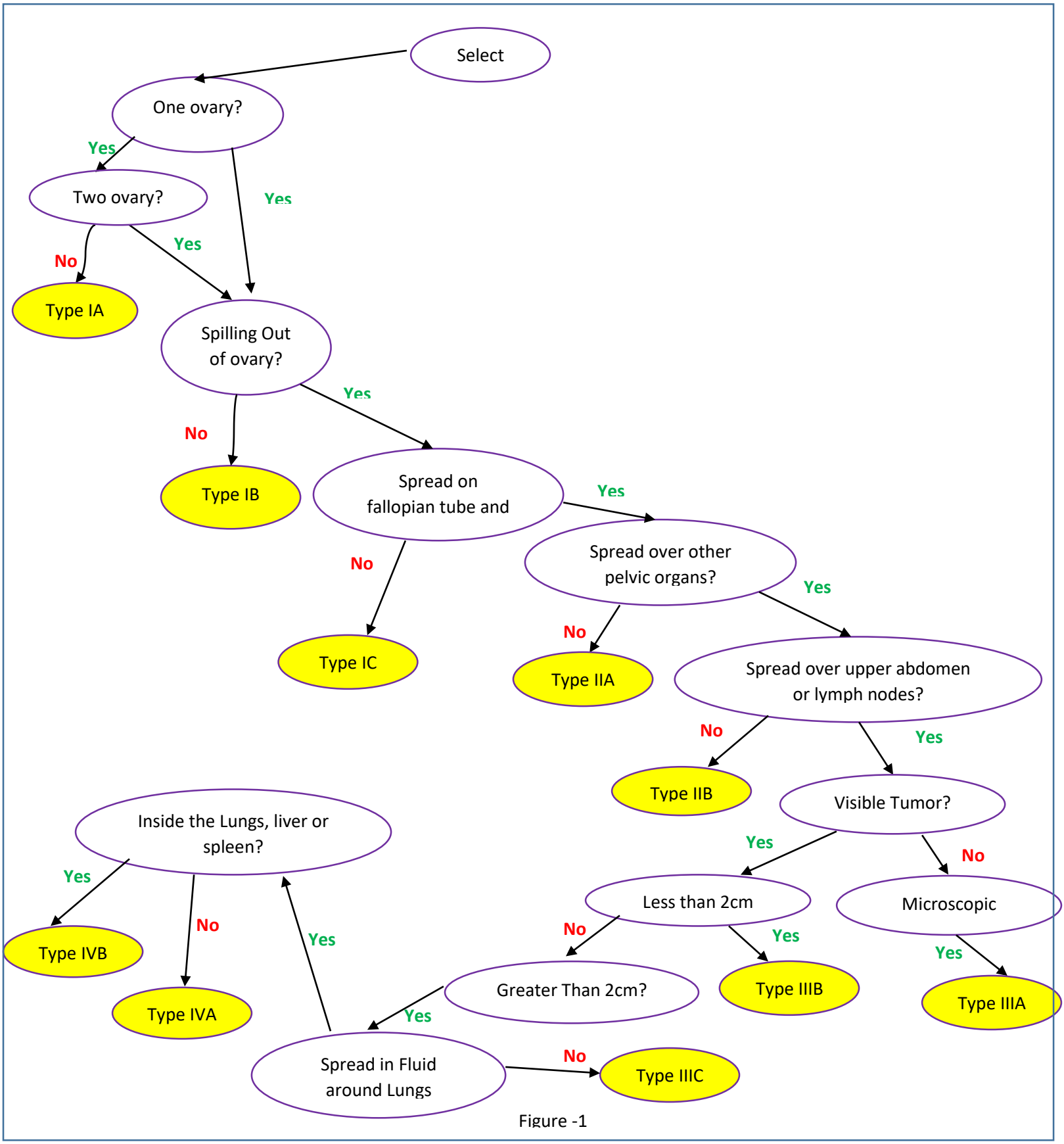

Select
One ovary?
Yes
Two ovary?
Yes
No
Type IA
Yes
Spilling Out of ovary?
No
Type IB
Yes
Spread on fallopian tube and
No
Type IC
Yes
Spread over other pelvic organs?
No
Type IIA
Yes
Spread over upper abdomen or lymph nodes?
No
Type IIB
Yes
Visible Tumor?
Yes
Less than 2cm
No
Greater Than 2cm?
Yes
Spread in Fluid around Lungs
No
Type IIIC
Yes
Type IIIB
No
Microscopic
Yes
Type IIIA
Inside the Lungs, liver or spleen?
Yes
Type IVB
No
Type IVA
Yes

Figure -1

Code:

Prolog code is give below for respective expert system. Code contains facts and rules to implement this expert system.

```
ready:-
   nl,nl,
   write("If you want to Know the stage of the ovarian cancer then-"),
   nl,
   write("Just answer the following question using yes/no"),
   nl,
   run.


run:-
   q12-> (q14->(showResult("Stage_IVB")
            );
          q13->
             (showResult("Stage_IVA")
                   );
           wrong()
              );



   q8->(q11->(showResult("Stage_IIIC")
          );
          q10->(showResult("Stage_IIIB")
              );
```

```
            q9->(showResult("Stage_IIIA")
                );
             wrong()
             );
q5-> (q7->( showResult("Stage_IIB")
        );
        q6->
          (
           showResult("Stage_IIA")
                );
         wrong()
    );


q1->(q4->( showResult("Stage_IC")
       );

       q3->(showResult("Stage_IB")
         );

        q2->(showResult("Stage_IA")
             );
        wrong()
 );

wrong().
```

q1:-

askQuestion("Is the cancer confined to the ovary or fallopian tube? ").

q2:-

askQuestion("Is the cancer confined to one ovary only?").

q3:-

askQuestion("Is the cancer found on both ovary?").

q4:-

askQuestion("Is One or both ovary are found with cancer cells spilling out from the ovaries? ").

q5:-

askQuestion("Does growth of the cancer involve one or both ovary and pelvic extension? ").

q6:-

askQuestion("Does the cancer extends to fallopian tube or uterus? ").

q7:-

askQuestion(" Does the cancer extend to other pelvic organs including fallopian tube and uterus? ").

q8:-

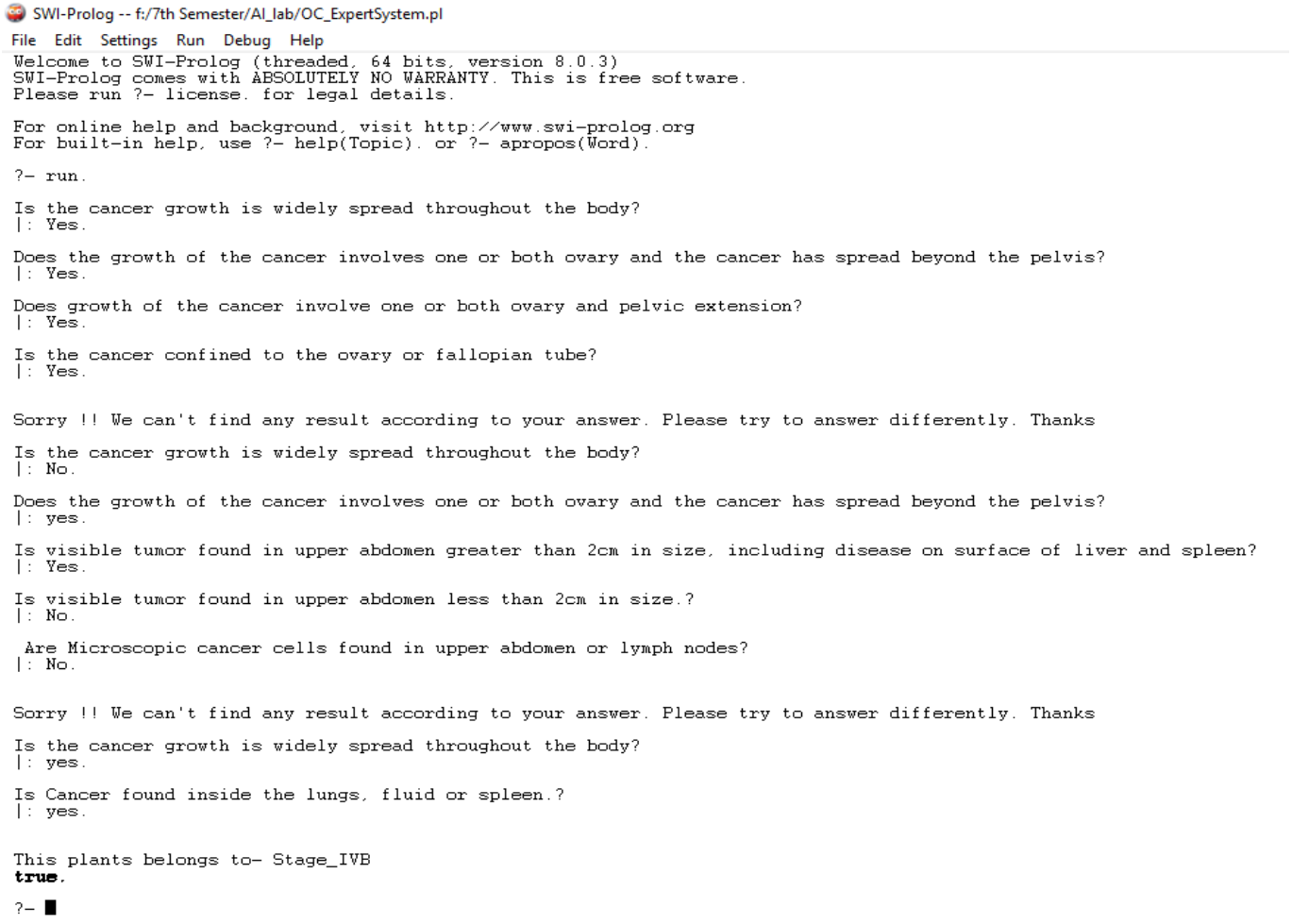
askQuestion("Does the growth of the cancer involves one or both ovary and the cancer has spread beyond the pelvis? ").

```
q9:-
   askQuestion(" Are Microscopic cancer cells found in upper abdomen or lymph nodes? ").

q10:-
   askQuestion("Is visible tumor found in upper abdomen less than 2cm in size.? ").

q11:-
   askQuestion("Is visible tumor found in upper abdomen greater than 2cm in size, including
disease on surface of liver and spleen? ").

q12:-
   askQuestion("Is the cancer growth is widely spread throughout the body? ").

q13:-
   askQuestion("Is Cancer found in the fluid around lungs ? ").

q14:-
   askQuestion("Is Cancer found inside the lungs, fluid or spleen.? ").

askQuestion(Q):-
   nl,
   write(Q), nl,
   read(Response),
   (Response == yes; Response == y)->true;false.
```

```
showResult(D):-
    nl, nl,
    write("This plants belongs to- "),
    write(D),
    nl.


wrong():-
    nl, nl,
    write("Sorry !! We can't find any result according to your answer. Please try to answer differently. Thanks "),
    nl,
    run.
```

Result:

The output of the expert system is shown below by taking screen shot from the prolog environment.



Conclusion:

Prolog is best suited for developing this kind of expert system. It can be able to detect the class of animals by using different facts and rules. It can be able to mimic the human thought. If doctors can identify the stage of cancer properly, the can start the proper treatment early and save a lot of women's life.