CS 514
Applied Artificial Intelligence
Project 1 – Boolean Logic
Codename - Purple

HEART DISEASE RISK PREDICTION SYSTEM

(Predicts risk for heart disease in the next 10 years based on user health data)

INDEX

Note: *Suitable links have been provided for additional information wherever necessary in RULES AND DESCRIPTION.*

ABSTRACT

Heart Disease Prediction System is a rule based amateur system built on JESS that is designed to take certain health related parameters from the user and infer certain vital parameters and makes recommendations to the user of the system. The system determines whether user is at risk for developing a heart disease in the next 10 years based on the person's age, gender, weight, family history, cholesterol, diabetes, physical inactivity, stress, blood pressure, smoking habits and unhealthy diet.

FEATURES

1. The system can classify the individual into different risk groups based on age and gender.
2. The system, after classifying individuals based on age and gender, further calculates the risk percentage of a heart disease based on their health factors after taking input from user.
3. After finding the risk percentage of the user, the system further sorts them into 3 groups:
    a. Low Risk
    b. Average Risk
    c. High Risk
4. The system recommends further action to be taken according to the risk level.
5. In case the system finds users with high risk, the system recommends the user to consult a physician immediately.

RULES AND DESCRIPTION

There are 5 templates described in the code

- ```
  (deftemplate patient
  (slot family_history (default 0))
  (slot age (default 0))
  (slot gender (default m))
  (slot smoking (default 0))
  (slot high_blood_pressure (default 0))
  (slot physical_inactivity (default 0))
  (slot diabetes (default 0))
  (slot cholestrol (default 0))
  (slot overweight (default 0))
  (slot stress (default 0))
  (slot unhealthy_diet (default 0)))
  ```

- `(deftemplate rating (slot score))`
- `(deftemplate recommendation (slot rating) (slot explanation))`
- `(deftemplate question (slot text) (slot type) (slot ident))`
- `(deftemplate answer (slot ident) (slot text))`

There are 25 rules in the program, which are further classified into 5 modules according to their function.

Rule Name	Module	Description
`defrule ask::ask-question-by-id`	`defmodule ask`	Rule to assert the answers given by the user to the question asked
`defrule welcome-user`	`defmodule application-startup`	Rule for the application that prints the Welcome message
1. `defrule request-family_history` 2. `defrule request-age` 3. `defrule request-gender` 4. `defrule request-smoking` 5. `defrule request-high_blood_pressure` 6. `defrule request-physical_inactivity` 7. `defrule request-diabetes`	`defmodule request-user-details`	Rules to request various user details
  ```

8. defrule request-cholestrol 9. defrule request-overweight 10. defrule request-stress 11. defrule request-unhealthy_diet		
(defrule assert-patient-fact	defmodule request-user-details	Rule to assert the answers based on the different questions
1. defrule risk-group1 2. defrule risk-group2 3. defrule risk-group3 4. defrule risk-group4 5. defrule risk-group5 6. defrule risk-group6 7. defrule risk-group7 8. defrule risk-group8 9. defrule risk-group9 10. defrule risk-group10	defmodule risk-recommendation	Rules that determine what is the risk for heart disease in the next 10 years depending on the values entered and the various combinations of these values in the answers. The risk groups are divided based on age and gender group combinations. The actual risk is further calculated based on the risk possessed by a healthy individual (source: a healthy person's risk of heart disease based on age and gender) and the increase in risk based on the values entered by the user.
defrule print-result	defmodule result	Rules to print out the result of the evaluation

USAGE MANUAL

JESS:

1. Copy the predict_heart_disease.clp file into the bin folder inside Jess directory.
2. Open JESS and execute the following command: (batch “predict_heart_disease.clp”).

ECLIPSE:

1. Create a new Java project in Eclipse.
2. Copy the file predict_heart_disease.clp to the *src* folder.
3. Run the file using the Eclipse *run* menu.

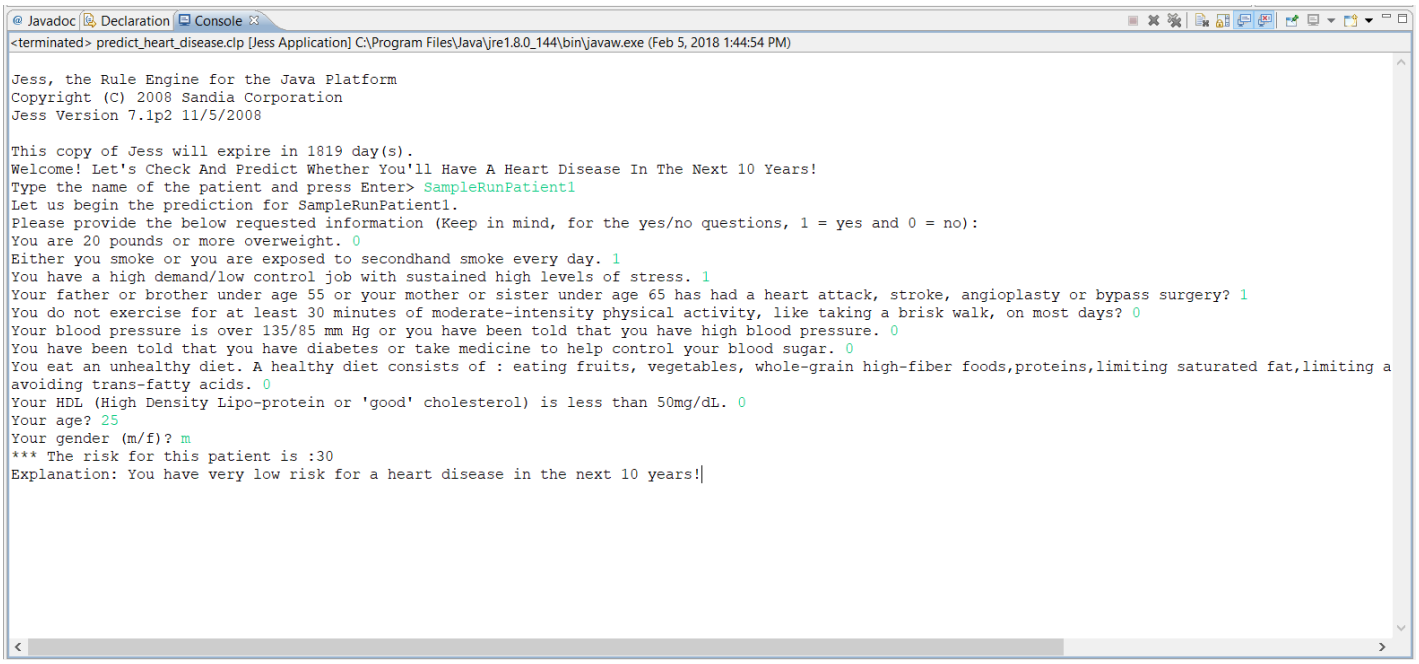
SAMPLE RUNS

RUN #1

According to below screenshot, the user gives the following input after the program runs:

```
Patient: SampleRunPatient1
(family_history 1)
(age 25)
(gender m)
(smoking 1)
(high_blood_pressure 0)
(physical_inactivity 0)
(diabetes 0)
(cholestrol 0)
(overweight 0)
(stress 1)
(unhealthy_diet 0)
```

Output for SampleRunPatient1:



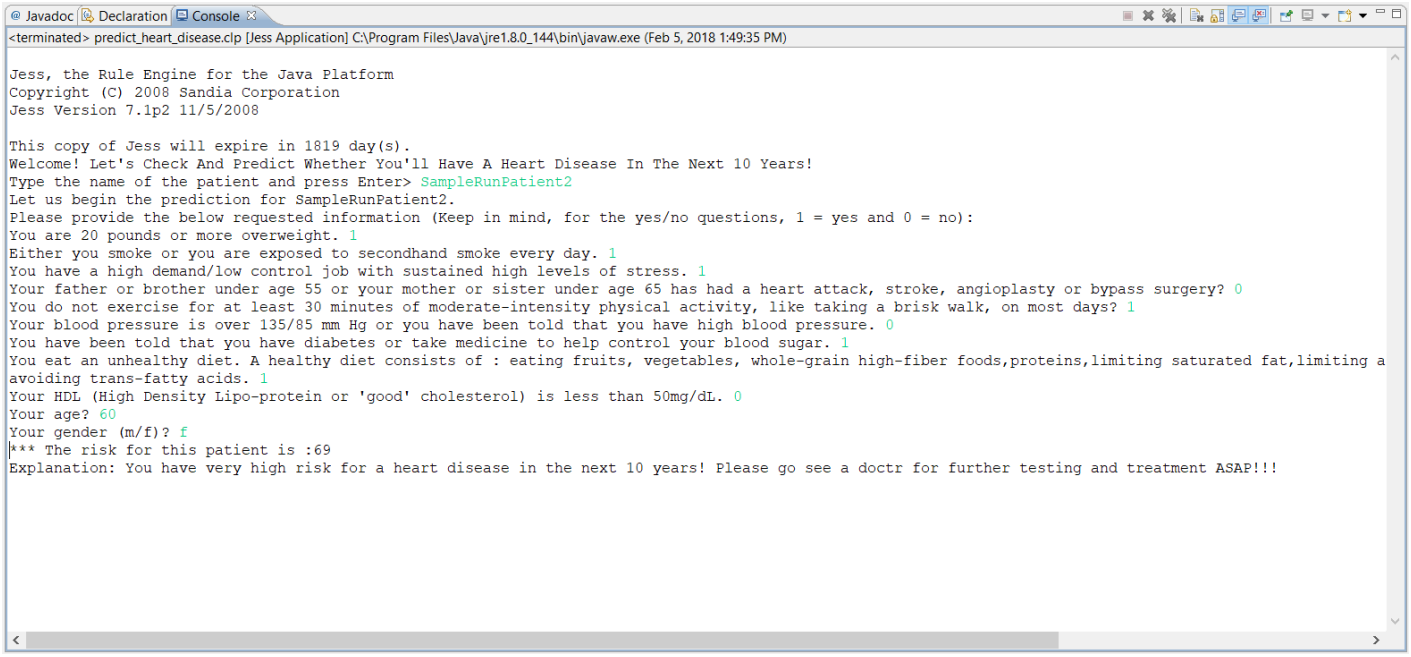
SampleRunPatient1.PNG

RUN #2

According to below screenshot, the user gives the following input after the program runs:

```
Patient: SampleRunPatient2
(family_history 0)
(age 60)
(gender f)
(smoking 1)
(high_blood_pressure 0)
(physical_inactivity 1)
(diabetes 1)
(cholestrol 0)
(overweight 1)
(stress 1)
(unhealthy_diet 1)
```

Output for SampleRunPatient1:



SampleRunPatient2.PNG