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Fuzzy Jess – Rule-based system

Domain: Course recommender systems
Jess version: 7.1
Java version: 1.8.0_201

Domain + use-case description:

- The course recommender systems is a specific subclass of recommender systems - course recommendations for various skill sets.
- This idea is inspired by the recommender systems available in MOOCs (Massive Open Online Courses) like Coursera.
- The project aims to analyze the user's age, experience in a particular domain and the duration of time the user can avail to identify possible courses to be recommended.
- This is achieved using rules defined in the system that map the feasibilities of courses that are finally listed to the user.

Steps to utilize the tool:

1. Extract the contents of the zip file. It contains both the source code (.java) and the compiled class file (.class).
2. Kindly copy the source code to your Eclipse IDE, set up with the Fuzzy Jess extension, and compile and execute the source code.
3. Alternately, please execute the .class file directly with the Fuzzy Jess JAR in the classpath.
4. The tool initially requests the end user to enter the following details.
    a. Name
    b. The user's age.
    c. The user's current domain. A user has to select one domain. The available domain options are Math, Data Science, and Computer Science.
    d. The user's experience (in years) in the selected domain.
    e. Duration (in months) the user wishes to commit.
5. On user input, the system shall list down the courses recommended based on the user's profile.
6. In case there are no recommendations, the system specifies that there are no recommendations for the user that could be generated based on the user's skills and preferences.

The recommendations suggested by the system are based on a set of rules that are explained in the 'Rules' section.

Knowledge base:

Domain	Course Name	Duration (in months)
Mathematics	Logic	2
	Statistics	6
Data Science	Data Analysis	4
	Machine Learning	6
	Probability and Statistics	3
Computer Science	Software Development	12
	Mobile Development	8
	Web Development	10
	Algorithms	4
	Design	6

Rules:

This project uses Fuzzy logic to define the rules. The different components of the user profile considered to be fuzzy are listed below.

1. Age - This component is processed as a fuzzy variable to classify the user into one of the four types: *young, thirties, forties and older*.
2. Experience - This component is considered in the form of a fuzzy variable to define a continuous range instead of a discrete value. The mapping function considers the experience to be *low, moderate or high*.
3. Commitment period - This component is mapped to one of the three ranges: *low, adequate, high.*

These fuzzy variables and their relationships are defined across a 0-10 scale, normalizing the user's actual inputs. A multitude of fuzzy shapes, Gaussian, Trapezoid, and SFuzzy, are utilized to define the fuzzy components.

The rules are defined to identify the domain to be recommended for the end user. This is also constructed as a fuzzy variable to identify if a change in the user's domain has one of the following effects on the user: *positive, neutral or negative.* Based on the conclusion, appropriate domains are chosen and the courses available in the domain are listed as recommendations.

Rules legend:
Final conclusion = *Positive* ⇒ Recommend change in domain
Final conclusion = *Neutral* ⇒ Recommend both new and old domain
Final conclusion = *Negative* ⇒ Recommend old domain only

Example rules:
Current domain = Math ∧ UserAge = *young* ∧ experience = *moderate* ∧ committment = *adequate* ⇒ Recommended domain = Data Science
Current domain = Computer Science ∧ UserAge = *thirties* ∧ experience = *low* ∧ committment = *adequate* ⇒ Recommended domain = Computer Science ∧ Data Science

Sample input/output:
Note: The highlighted (bold) text are user inputs.

Case 1:
Enter the user name:
Gandalf

Enter the user age:
25

The following domains are available currently.
1. Math
2. Data Science
3. Computer Science
Enter the number corresponding to your domain.
3

Enter the experience (in years) in the selected domain:
3

Enter the duration (in months) you are willing to commit for the courses:
12

Congratulations Gandalf! We recommend the following courses to be suitable for your career growth!

a. Domain: Data Science
1. Data Analysis
2. Machine Learning
3. Probability and Statistics

b. Domain: Computer Science
1. Software Development
2. Mobile Development
3. Web Development
4. Algorithms
5. Design

*Explanation:
The user's age is considered to be in the *twenties* (fuzzy variable 1).
The user's experience is considered to be *low* (fuzzy variable 2).
The commitment period is *adequate* (fuzzy variable 3).
Hence, the corresponding rule that is fired identifies that a change in the domain needs to have a *neutral* effect on the user's career. As part of this decision, the system recommends courses from the user's selected domain as well as a new domain in order to safeguard the user.

Case 2:
Enter the user name:
Gandalf

Enter the user age:
50

The following domains are available currently.
1. Math
2. Data Science
3. Computer Science
Enter the number corresponding to your domain.
2

Enter the experience (in years) in the selected domain:
30

Enter the duration (in months) you are willing to commit for the courses:
10

Congratulations Gandalf! We recommend the following courses to be suitable for your career growth!

a. Domain: Computer Science
1. Software Development
2. Mobile Development
3. Web Development
4. Algorithms
5. Design

*Explanation:

The user's age is considered to be in the *older* range (fuzzy variable 1).
The user's experience is considered to be *high* (fuzzy variable 2).
The commitment period is *adequate* (fuzzy variable 3).
The final conclusion identifies that a change in the domain would have a *positive* effect on the user (since the user's experience in the current domain is vast). Hence, courses from a new domain are listed down as recommendations.