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Jess - Rule-based system

Domain: Course recommender systems
Jess version: 7.1

Domain + use-case description:

- The course recommender systems are a specific subclass of recommender systems - course recommendations for various skillsets.
- This idea is inspired by the recommender systems available in MOOCs (Massive Open Online Courses) like Coursera.
- The project aims to understand the available skillset of the end user and suggest courses that suit the user's availability and career objectives.
- 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. Run the "course_recommender.clp" file using JESS.
2. The tool initially requests the end user to enter the following details.
    a. Name
    b. The user's current domain. A user has to select one domain. The available domain options are Math, Data Science, and Computer Science.
    c. An option to specify if the user is intending to change their domain.
    d. The user's current skills. The available skills are listed based on the domain selected earlier.
    e. Duration (in months) the user wishes to commit.
3. On user input, the system shall list down the courses recommended based on the user's skills, duration and the willingness to explore new domains.
4. 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.
5. There are two common use-cases when the system generally doesn't generate any recommendations.
    a. The user has mastered all the skills available in the current domain and is unwilling to explore other domains.
    b. The user's commitment duration is lesser than the time period required for the course identified by the system.
6. Hence, please try exploring new domains or provide longer commitment duration for the user in order to obtain different sets of recommendations.

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)	Dependency (prior knowledge required)	Optional cross-domain dependency
Mathematics	Logic	2	-	-
	Statistics	6	-	-
Data Science	Data Analysis	4	Probability and Statistics	Statistics
	Machine Learning	6	Data Analysis, Probability and Statistics	Logic, Statistics
	Probability and Statistics	3	-	Logic
Computer Science	Software Development	12	Algorithms	-
	Mobile Development	8	Software development / Web Development	-
	Web Development	10	Mobile Development (optional)	-
	Algorithms	4	-	Probability and Statistics
	Design	6	-	-

The course details, along with the domain details, are persisted as facts in the Knowledge Base while the dependencies are utilized in the rules.
A subset of facts from the Knowledge Base is listed below:
(course_details (CourseName Logic) (CourseDurationInMonths 2) (CourseDomain Math))
(course_details (CourseName Data_Analysis) (CourseDurationInMonths 4) (CourseDomain Data_Science))
(course_details (CourseName Software_development) (CourseDurationInMonths 12) (CourseDomain Computer_Science))
(domain_details (DomainName Math) (Courses Logic Statistics))
(courses (CourseList Math Data_Science Computer_Science))

Rules:

There are two categories of rules in the system.

1. User-driven - Initial course recommendation based on the user details.
2. System-driven - Further course recommendations based on the initial recommendation and available duration.

1. User-driven:

- Case 1: The user wishes to explore courses in the current domain - Recommend courses in the same domain sequentially (as listed in the Knowledge Base).
  Ex:
  ContinueInSameDomain ∧ Know-Logic ⇒ RecommendCourse-Statistics
- Case 2: The user wishes to explore a *new* domain
  - Step 1: Recommend a new domain based on user's current domain.
    Ex:
    ExploreNewDomain ∧ CurrentDomain-DataScience ⇒ RecommendDomain-ComputerScience
  - Step 2: Recommend a course in the new domain based on the user's skills in the current domain.
    Ex:
    RecommendDomain-DataScience ∧ Skills-Logic ∧ Skills-Statistics ⇒ RecommendCourse-MachineLearning

2. System-driven:

Based on the initial recommendation, further recommendations are added to the list of recommendations by the systems subject to the courses' durations.

Ex:

RecommendCourse-Algorithms ∧ RecommendCourse-SoftwareDevelopment ∧ UserDuration > 10 ⇒ RecommendCourse-WebDevelopment

Rules Legend:

Current Domain = Math ∧ Explore New Domain = False ⇒ New Domain = Math
Current Domain = Data Science ∧ Explore New Domain = False ⇒ New Domain = Data Science
Current Domain = Computer Science ∧ Explore New Domain = False ⇒ New Domain = Computer Science

Current Domain = Math ∧ Explore New Domain = True ⇒ New Domain = Data Science
Current Domain = Data Science ∧ Explore New Domain = True ⇒ New Domain = Computer Science
Current Domain = Computer Science ∧ Explore New Domain = True ⇒ New Domain = Data Science

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

Case 1:
Jess, the Rule Engine for the Java Platform
Copyright (C) 2008 Sandia Corporation
Jess Version 7.1p2 11/5/2008

This copy of Jess will expire in 23 day(s).
::
Welcome to the course recommender system!
::
Please fill the user profile section for the system to work on the recommendations.

Enter your name: **Gandalf**

The following domains are available currently.
1.Math
2.Data_Science
3.Computer_Science
Enter your domain: **3**

Are you looking for a change in domain (Y/N): **N**

The following skills are available currently in your selected domain.
1.Software_development
2.Mobile_development
3.Web_development
4.Algorithms
5.Design
Enter your skill: **4**
Do you wish to enter another skill (Y/N)? **Y**
Enter your skill: **5**
Do you wish to enter another skill (Y/N)? **N**

Enter the duration (in months) you are willing to commit for the courses: **12**
::
Congratulations Gandalf, we found the following courses in *Computer_Science* domain to be suitable for your career growth.
1. Mobile_development

*Explanation: Mobile Development is recommended initially since its duration is 8 months. No more recommendations are possible due to the remaining availability being 4 months.
Case 2:

Jess, the Rule Engine for the Java Platform

Jess Version 7.1p2 11/5/2008

This copy of Jess will expire in 23 day(s).
::
Welcome to the course recommender system!
::
Please fill the user profile section for the system to work on the recommendations.

Enter your name: **Gandalf**

The following domains are available currently.
1.Math
2.Data_Science
3.Computer_Science
Enter your domain: **1**

Are you looking for a change in domain (Y/N): **Y**

The following skills are available currently in your selected domain.
1.Logic
2.Statistics
Enter your skill: **1**
Do you wish to enter another skill (Y/N)? **N**

Enter the duration (in months) you are willing to commit for the courses: **20**

::
Congratulations Gandalf, we found the following courses in *Data_Science* domain to be suitable for your career growth.
1. Probability_And_Statistics
2. Data_Analysis
3. Machine_Learning

*Explanation: Thanks to ‘Logic’ being an available skill in the user’s profile, the “Probability and Statistics” course is recommended initially. The system adds “Data Analysis” and consequently “Machine Learning” to the recommendation list (in the order of dependency satisfaction) based on the users’ availability accommodating the courses.