University Application Assistant

TOOL FOR AUTOMATED APPLICATION VALIDATION USING FUZZY JESS

DEADLOCK

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ABSTRACT

The aim of the project is to provide a rule based assistant that can help serve as a consultant to analyze an applicant's profile. The motivation behind the project lies in the struggle an applicant faces while deciding if he should apply for a University's masters' program or not. The assistant is a rule based expert system that judges an applicant's application on several criteria and gives insight into how he or she would fare in the whole process.

FEATURES:

1. The system asks the applicant to input all the required details for the university application, like GPA, Work experience, Research papers published, GRE and TOEFL scores etc.
2. It first checks if the GPA is above the minimum requirement or not.
3. It then checks if the applicant's intended course of study is offered by the University or not.
4. Next it further analyzes the applicant's academic background by enquiring if he or she has any pending backlogs. Existence of backlogs is bad for the profile.
5. It analyzes if the applicant has any professional or research background.
6. An international student has a decreased chance of getting an admit as usually a domestic student gets preference in the whole process. That is analyzed here too.
7. At the end, the assistant validates the profile on the basis of the GRE and TOEFL scores along with the Letters of Recommendation and statement of Purpose.
8. It verifies all the details and informs the applicant if any facet of the application needs improvement and if everything is in order, it tells the applicant to move forward with the application.
9. NOTE: The assistant is just a boilerplate proof-of-concept and serves as a preliminary scan of the profile. It can help eradicate the cumbersome process of going through the FAQs and what-not while looking for information on the application, but cannot tell the psyche of the board behind their decisions.

RULES AND DESCRIPTION

There are 2 templates described in the code: One for the applicant and one for the University which are as follows:

1. **Applicant**

```
(deftemplate applicant
    (slot name)
    (slot age (type INTEGER))
    ; Applying for course (Right now limited to CS, ECE, Civil, Mech)
    (slot major)
    ; Intended term of application
```

```
    (slot term (allowed-values fall spring))
    ; GPA in Bachelors out of 4.0
    (slot gpa (type FLOAT))
    ; Any pending backlogs?
    (slot backlog (allowed-values Y N))
    ; Job experience if any in terms of assistantship, internships, volunteer
work etc.
    ; Input in the form of Number of years
    (slot workxp (type INTEGER))
    ; To determine if the applicant has research experience and publishings.
    (slot researchxp (type INTEGER))
    ; International or domestic applicant)
    (slot international (allowed-values Y N))
    ;Score in GRE
    (slot gre (type INTEGER))
    ; TOEFL score (enter 120 if domestic student)
    (slot toefl (type INTEGER))
    ; Letter of Recommendation
    (slot lor (type INTEGER))
    ; Statement of purpose
    (slot sop (allowed-values Y N))
)
```

2. **University**

```
(deftemplate university
    (slot name)
    ; Departments in School of Engineering
    (slot department (allowed-values CS ECE Civil Mech))
    ;Total annual fee for the program
    (slot totalfee (type INTEGER))
    ; Number of Recommendation letters required
    (slot reqlor (type INTEGER))
    ; Seat available for the applicant or not
    (slot seatavailable(allowed-values Y N))
    ; Available terms in the university
    (slot term (allowed-values fall spring))
    )
```

3. **Fuzzy templates**

```
(deftemplate gpa_data
    "Auto-generated"
    (declare (ordered TRUE)))

(deftemplate workxp_data
    "Auto-generated"
    (declare (ordered TRUE)))

(deftemplate researchxp_data
    "Auto-generated"
    (declare (ordered TRUE)))

(deftemplate gre_data
    "Auto-generated"
    (declare (ordered TRUE)))
```

```
(deftemplate toefl_data
    "Auto-generated"
  (declare (ordered TRUE)))
```

Now, in total there are 15 rules in the program:

Rule 0: Fuzzyfies all the required data according to the requirements.

1. **initial:** Prints all the information of the applicant.
2. **checkGPA:** Verifies if the GPA is above the threshold
3. **checkMajor:** Checks if the applicant's intended major is offered by the University.
4. **backlogCheck:** Verifies that the student has no active backlog in undergrad.
5. **workxpCheck:** If the applicant has no job experience then he is notified that getting in might be difficult but he can still apply.
6. **researchxpCheck:** If the applicant has no job experience then he is notified that getting in might be difficult but he can still apply.
7. **nationalityCheck:** To inform the applicant that if he or she is an international applicant getting in will be tough.
8. **greScoreCheck:** Checks if the student meets the University's minimum requirement.
9. **toeflScoreCheck:** Checks if the student meets the University's minimum toefl requirement.
10. **lorCheck:** The University requires that a student submits atleast 3 Letters of Recommendation.
11. **sopCheck:** To verify if a student has successfully submitted his statement of purpose.
12. **submitApp:** If everything is in order, portal advices the student to submit his/her application.
13. **printFacts:** To print all the facts.
14. **Init-** initializes the values for the applicant.

FUZZIFICATION OF THE DATA

The MAIN:: init-FuzzyVariables rule is used divides the gpa, work and research experience, gre and toefl scores into the desirable fuzzy categories with the following template-

```
(call ?*gpaVar* addTerm "low" (new ZFuzzySet 2.0 3.0))
(?*gpaVar* addTerm "medium" (new TrapezoidFuzzySet 2.7 3.0 3.2 3.4))
(?*gpaVar* addTerm "High" (new SFuzzySet 3.2 3.6))
```

Once the fuzzification is complete, the user defined values for the applicant template are passed into the rule so that they are categorized accordingly and used further ahead. This is done using-

```
(assert (gpa_data (new FuzzyValue ?*gpaVar* (new SingletonFuzzySet
?applicant.gpa))))
```

Finally, the rule that was defined for Boolean logic in project 1 can now be divided into all possible sub-categories that deal with all the fuzzy sets accordingly.

USAGE MANUAL

Create a new Java project in eclipse. Make sure you include the JAR file “fuzzyJ-2.0.jar” under New Project > Libraries.

Add deadlock.clp to the src folder of the project or create a new file and copy the contents of deadlock.clp into the blank file. Make sure you save the file with .clp extension.

In the run configurations of the file, change “jess.Main” to “nrc.fuzzy.jess.FuzzyMain”.

Run the project. In case you run into any errors, make sure that the run configs is pointed to the FuzzyMain as by default it is shifted back to jess.Main.

In case the grader wants to tweak the input, he has to make changes to the init rule at the end of the program. The assertion there looks like-

```
(assert (applicant (name "John Doe")
            (age 21)
            (major CS)
            (term fall)
            (gpa 3.8)
            (backlog N)
            (workxp 8)
            (researchxp 6)
            (international Y)
            (gre 321)
            (toefl 112)
            (lor 3)
            (sop Y)))
```

And the allowed input values can be referred from through the template.

SAMPLE OUTPUTS

1. **Sample 1**

```
(assert (applicant (name "John Doe")
            (age 21)
            (major CS)
            (term fall)
            (gpa 3.8)
            (backlog N)
            (workxp 8)
            (researchxp 6)
            (international Y)
            (gre 321)
            (toefl 112)
            (lor 3)(sop Y)))
```

Output

```
********************Welcome to University Application Consultancy
Services********************
Hey John Doe. Thank you for reaching out to us
Just to be sure, here is the information you provided to us
Age: 21
Intended major: CS
Intended term: fall
GPA in undergrad: 3.8
Backlogs in undergrad: N
Work Experience: 8 years
Research Experience: 6
International or Domestic Student?: Y
GRE Score: 321
TOEFL Score (To be filled as 120 if you are a domestic applicant): 112
Letter of Recommendation: 3
Statement of Purpose: Y
Your GPA exceeds the average requirement of the university. While this is not
the only criteria your profile is judged on, it is a strong steering factor.
We see that you have extensive job experience. This boosts your overall
profile and makes it stronger.
We see that you have moderate research experience. This strongly boosts your
profile and would outshine any other aspect of your profile.
The international intake at our university is really low and competition will
be really tough.
You exceed the university's criteria of minimum GRE score requirement.
You exceed the university's criteria of minimum TOEFL score requirement.
You are eligible to apply for the Masters program at our University
f-0    (MAIN::initial-fact)
f-1    (MAIN::applicant (name "John Doe") (age 21) (major CS) (term fall) (gpa
3.8) (backlog N) (workxp 8) (researchxp 6) (international Y) (gre 321) (toefl
112) (lor 3) (sop Y))
f-2    (MAIN::gpa_data <Java-Object:nrc.fuzzy.FuzzyValue>)
f-3    (MAIN::workxp_data <Java-Object:nrc.fuzzy.FuzzyValue>)
f-4    (MAIN::researchxp_data <Java-Object:nrc.fuzzy.FuzzyValue>)
f-5    (MAIN::gre_data <Java-Object:nrc.fuzzy.FuzzyValue>)
f-6    (MAIN::toefl_data <Java-Object:nrc.fuzzy.FuzzyValue>)
For a total of 7 facts in module MAIN.
```

2. **Sample 2**

```
(assert (applicant (name "John Doe")
            (age 24)
            (major CS)
            (term fall)
            (gpa 3.5)
            (backlog N)
            (workxp 2)
            (researchxp 5)
            (international Y)
            (gre 310)
            (toefl 100)
            (lor 3)
            (sop Y)))
```

Output

```
********************Welcome to University Application Consultancy
Services********************
Hey John Doe. Thank you for reaching out to us
Just to be sure, here is the information you provided to us
Age: 24
Intended major: CS
Intended term: fall
GPA in undergrad: 3.5
Backlogs in undergrad: N
Work Experience: 2 years
Research Experience: 5
International or Domestic Student?: Y
GRE Score: 310
TOEFL Score (To be filled as 120 if you are a domestic applicant): 100
Letter of Recommendation: 3
Statement of Purpose: Y
Your GPA exceeds the average requirement of the university. While this is not
the only criteria your profile is judged on, it is a strong steering factor.
We see that you have low job experience. While this may not necessarily be a
red flag on your profile and you can still apply, getting in may be difficult
since the application process is highly competitive.
We see that you have moderate research experience. This strongly boosts your
profile and would outshine any other aspect of your profile.
The international intake at our university is really low and competition will
be really tough.
While your GRE score meets the minimum criteria, generally the university
admits students with higher GRE score.
You met the criteria of minimum TOEFL requirement but giving it another shot
might be worth it.
You are eligible to apply for the Masters program at our University
f-0    (MAIN::initial-fact)
f-1    (MAIN::applicant (name "John Doe") (age 24) (major CS) (term fall) (gpa
3.5) (backlog N) (workxp 2) (researchxp 5) (international Y) (gre 310) (toefl
100) (lor 3) (sop Y))
f-2    (MAIN::gpa_data <Java-Object:nrc.fuzzy.FuzzyValue>)
f-3    (MAIN::workxp_data <Java-Object:nrc.fuzzy.FuzzyValue>)
f-4    (MAIN::researchxp_data <Java-Object:nrc.fuzzy.FuzzyValue>)
f-5    (MAIN::gre_data <Java-Object:nrc.fuzzy.FuzzyValue>)
f-6    (MAIN::toefl_data <Java-Object:nrc.fuzzy.FuzzyValue>)
For a total of 7 facts in module MAIN.
```

And similarly, the data can be modified to accommodate and run all possible rules. The program will easily and robustly handle all the cases without any hiccup.