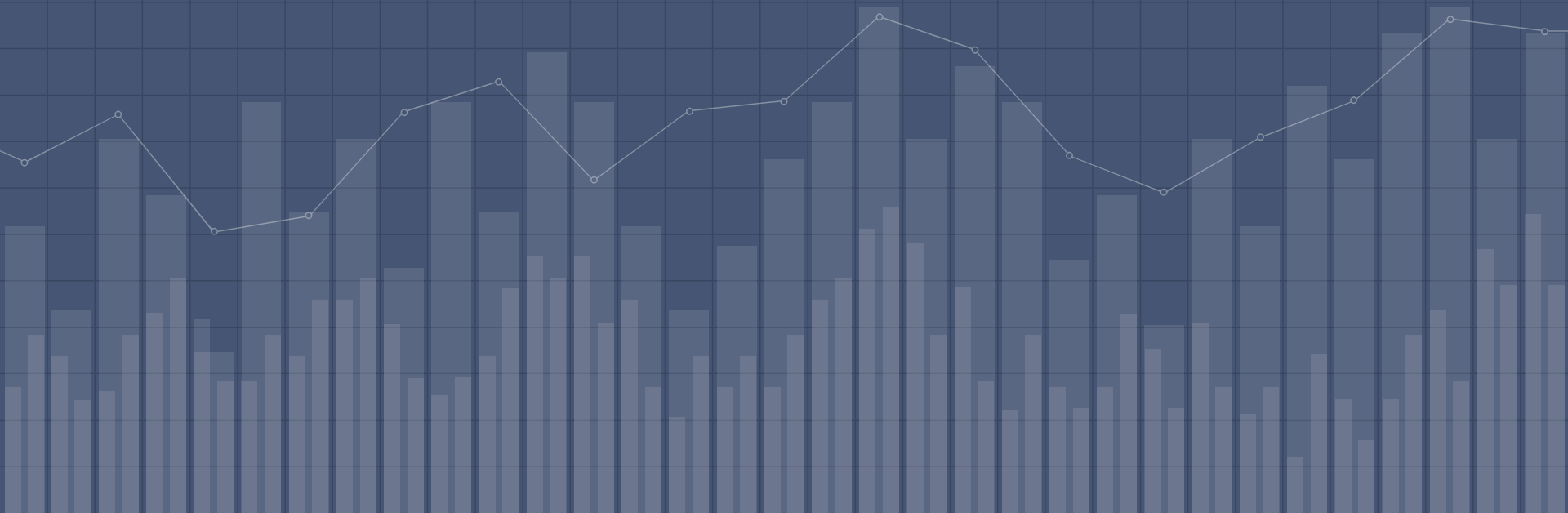
Course Advisory System



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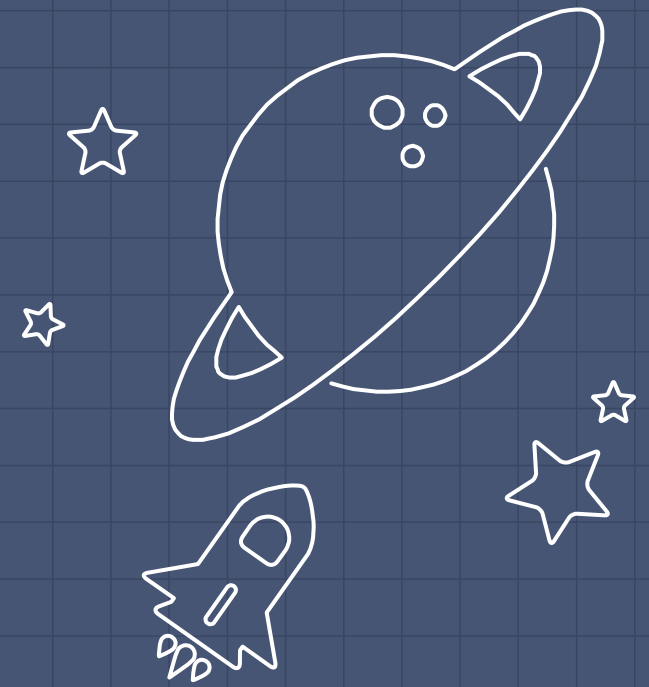
Problem Statement

- **Students over the years have always been confused on what course choices to make while selecting a career path.**
- **There has always been a question mark as to what the best option for them is depending on their grades and their interests in any particular sector.**
- **In order to streamline this decision making process, we are building an expert system which takes in the grade and the interest of the user as its parameters and suggests the most suitable course choice.**

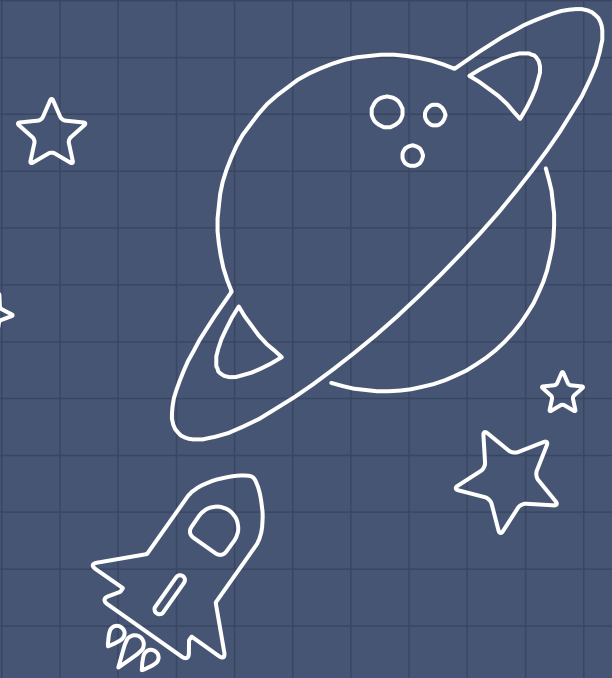
Method



Forward Chaining

- Forward chaining (or forward reasoning) is one of the two main methods of reasoning when using an inference engine and can be described logically as repeated application of modus ponens.
- Forward chaining is a popular implementation strategy for expert systems, business and production rule systems.
- Forward chaining starts with the available data and uses inference rules to extract more data (from an end user, for example) until a goal is reached.
- An inference engine using forward chaining searches the inference rules until it finds one where the antecedent (If clause) is known to be true.
- When such a rule is found, the engine can conclude, or infer, the consequent (Then clause), resulting in the addition of new information to its data.
- Inference engines will iterate through this process until a goal is reached.

Implementation

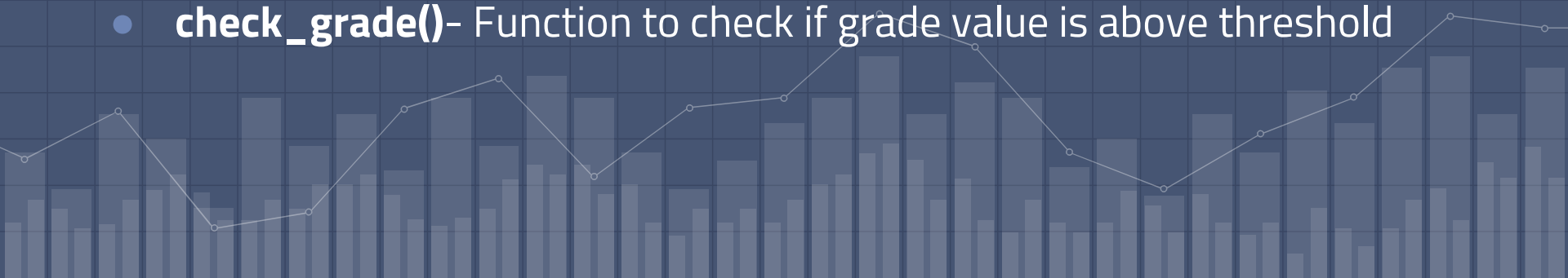


Java Expert System Shell(JESS)

- Jess is a rule engine for the Java platform that was developed as a superset of the CLIPS programming language which provides rule-based programming for the automation of an expert system, and is frequently termed as an expert system shell.
- In recent years, intelligent agent systems have also developed, which depend on a similar capability.
- Jess is a rule engine for the Java platform and in order to use it, the following procedure is followed:
  - The Jess rule language (prefered) or XML.
  - You also provide some of your own data for the rules to operate on.
  - When you run the rule engine, your rules are carried out.
  - Rules can create new data, or they can do anything that the Java programming language can do.

Coding Specifics

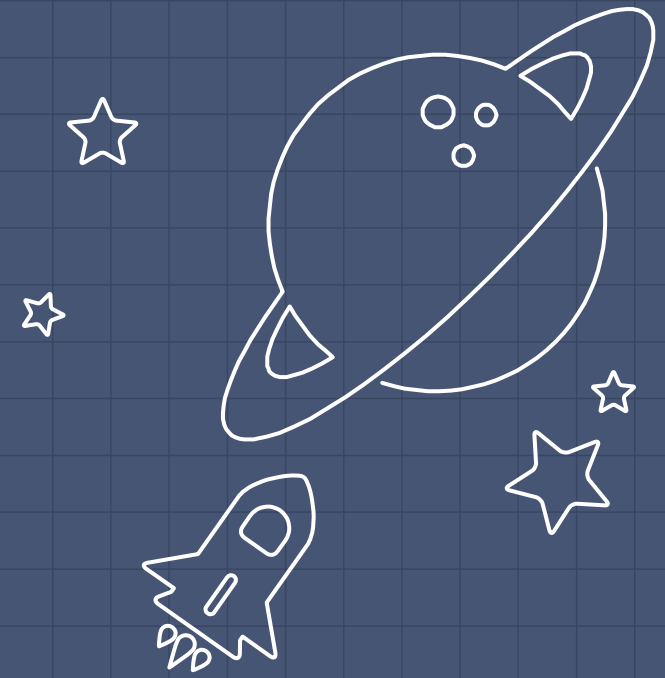
- **grades** - Store the grades of the user as hashmap data structure
- **interests** - Store the interests of the user as hashmap data structure
- **subject ()** - Template in order to store the facts of the expert system
- **prompt()**- Function to take user input for grades of different subjects
- **check_interest()**- Function to check if interest level is above threshold
- **check_grade()**- Function to check if grade value is above threshold



Course Selection Policy Instances

Subject	Grade	Interest	Interest Level	Suggestions
Maths, English, Hindi	>=4	Logic, Art, Politics	>=3	Law
Maths, English	>=2	Logic, Art	>=4	Management
Maths, English	>=1	Logic, Art	>=4	Business
Maths, English,	>=4	Management, Catering	>=5	Catering and Hotel Management
Home Science	>=5			

Code Snippets



Input for User Grades

```
(clear)

(deffunction prompt()
    ;Takes user input for grades in different subjects

    (printout t "Enter Grades on a scale of 1-10" crlf)
    (printout t "Mathematics grade: ")
    (bind ?answer (read))
    (call ?grades put "Mathematics" ?answer)

    (printout t "English grade: ")
    (bind ?answer (read))
    (call ?grades put "English" ?answer)

    (printout t "Physics grade: ")
    (bind ?answer (read))
    (call ?grades put "Physics" ?answer)

    (printout t "Chemistry grade: ")
    (bind ?answer (read))
    (call ?grades put "Chemistry" ?answer)

    (printout t "Geography grade: ")
    (bind ?answer (read))
    (call ?grades put "Geography" ?answer)

    (printout t "History grade: ")
    (bind ?answer (read))
    (call ?grades put "History" ?answer)

    (printout t "Biology grade: ")
    (bind ?answer (read))
    (call ?grades put "Biology" ?answer)
```

Input for User Interests

```
; Takes user input for interest levels in different fields
(printout t "Enter Interest Levels on a scale of 1-10" crlf)
(printout t "Interest in Logic: ")
(bind ?answer (read))
(call ?interests put "Logic" ?answer)

(printout t "Interest in Management: ")
(bind ?answer (read))
(call ?interests put "Management" ?answer)

(printout t "Interest in Medicine: ")
(bind ?answer (read))
(call ?interests put "Medicine" ?answer)

(printout t "Interest in Architecture: ")
(bind ?answer (read))
(call ?interests put "Architecture" ?answer)

(printout t "Interest in History: ")
(bind ?answer (read))
(call ?interests put "History" ?answer)

(printout t "Interest in Catering: ")
(bind ?answer (read))
(call ?interests put "Catering" ?answer)

(printout t "Interest in Inventions: ")
(bind ?answer (read))
(call ?interests put "Inventions" ?answer)

(printout t "Interest in Sports: ")
(bind ?answer (read))
(call ?interests put "Sports" ?answer)
```

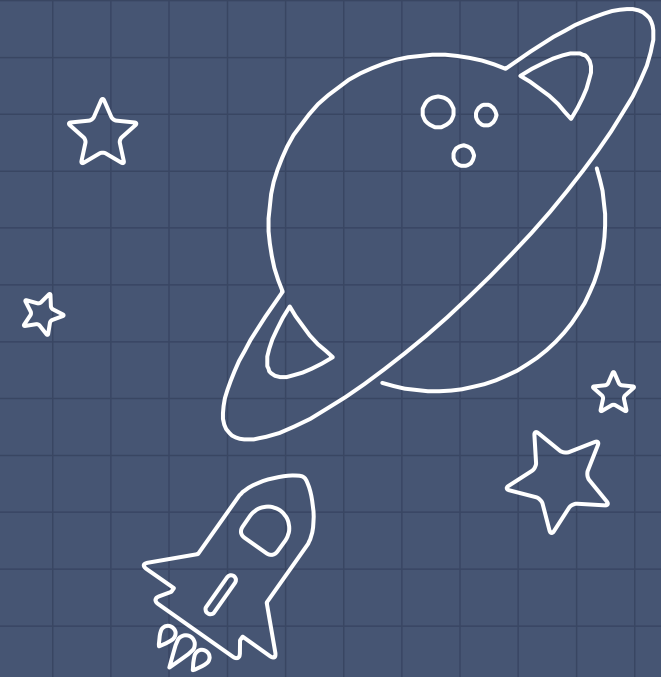
Checking for Threshold Grades and Interests

```
; defines how the system stores facts in runtime
(deftemplate subject (slot name) (slot description))

; function to check if interest level is above threshold
(deffunction check_interest(?interestList ?threshold)
    (bind ?flag 0)
    (foreach ?interest ?interestList
        (bind ?val (call ?interests get ?interest))
        (if (>= ?val ?threshold) then
            (bind ?flag 1)
        )
    )
    (if (= ?flag 1) then
        (return true)
    else
        (return false)
    )
)

; function to check if grade value is above threshold
(deffunction check_grade(?gradeList ?threshold)
    (bind ?flag 0)
    (foreach ?grade ?gradeList
        (bind ?val (call ?grades get ?grade))
        (if (>= ?val ?threshold) then
            (bind ?flag 1)
        )
    )
    (if (= ?flag 1) then
        (return true)
    else
        (return false)
    )
)
(reset)
```

Forward Chaining Mechanism

```
? creates two hash tables to store user input
(bind ?interests (new java.util.Hashtable))
(bind ?grades (new java.util.Hashtable))

? rules to check if any course is suitable considering the interest and grade level
(defrule can_take_law
    =>
    (if (= (check_interest (bind ?interestList (create$ "Logic" "Art" "Politics")) 4) true) then
        (if (= (check_grade (bind ?gradeList (create$ "Mathematics" "English" "Hindi")) 4) true) then
            (assert (subject (name "Law") (description "Deals with writing legal documents, offerring legal
            advice and representstion to
     people or companies")))
        )
    )
)
(defrule can_take_management
    =>
    (if (= (check_interest (bind ?interestList (create$ "Management")) 5) true) then
        (if (= (check_interest (bind ?interestwList (create$ "Logic" "Art")) 4) true) then
            (if (= (check_grade (bind ?gradeList (create$ "Mathematics" "English")) 2) true) then
                (assert (subject (name "Management") (description "Deals with Management")))
            )
        )
    )
)
(defrule can_take_business
    =>
    (if (= (check_interest (bind ?interestList (create$ "Logic" "Art")) 4) true) then
        (if (= (check_grade (bind ?gradeList (create$ "Mathematics" "English")) 1) true) then
            (assert (subject (name "Business") (description "Deals with Business")))
        )
    )
```

Sample Outputs



Sample Output #1

```
Interest in Inventions: 2
Interest in Sports: 3
Interest in Politics: 2
Interest in Art: 9
Interest in Science:
4
Interest in Farming: 4
Interest in Media: 3
f-0   (MAIN::initial-fact)
f-1   (MAIN::subject (name "Law") (description "Deals with writing legal documents, offerring legal advice and representstion to
     people or companies"))
f-2   (MAIN::subject (name "Physical Educaion and Sports") (description "Study of the science behind physical exercises."))
f-3   (MAIN::subject (name "Economics") (description "Study of the way in which money, industry, and trade are organized in a society."))
f-4   (MAIN::subject (name "Computer Science") (description "Study of computers, their design and their uses for various tasks,
       including design and development of computer hardware and software."))
f-5   (MAIN::subject (name "Architechture") (description "Deals with the art and practice of planning and designing buildings:"))
f-6   (MAIN::subject (name "Marine Engineering") (description "Study of marine life and science."))
f-7   (MAIN::subject (name "Mass Communication") (description "Deals with the study of communication"))
f-8   (MAIN::subject (name "Journalism") (description "Deals with the study of collecting news and writing about it for newspapers, magazines, television, or radio."))
f-9   (MAIN::subject (name "Commerce") (description "Deals with activities and procedures involved in buying and selling things."))
f-10   (MAIN::subject (name "Fashion Design") (description "Deals with clothings and fashion design"))
f-11   (MAIN::subject (name "Business") (description "Deals with Business"))
f-12   (MAIN::subject (name "Management") (description "Deals with Management"))
```

Sample Output #2

```
Homescience grade: 4
Interest in Logic: 5
Interest in Management: 2
Interest in Medicine: 1
Interest in Architecture: 1
Interest in History: 1
Interest in Catering: 1
Interest in Inventions: 1
Interest in Sports: 1
Interest in Politics: 1
Interest in Art: 1
Interest in Science: 1
Interest in Farming: 2
Interest in Media:
2
f-0   (MAIN::initial-fact)
f-1   (MAIN::subject (name "Law") (description "Deals with writing legal documents, offerring legal advice and representstion to
     people or companies"))
f-2   (MAIN::subject (name "Physical Educaion and Sports") (description "Study of the science behind physical exercises."))
f-3   (MAIN::subject (name "Computer Science") (description "Study of computers, their design and their uses for various tasks,
       including design and development of computer hardware and software."))
f-4   (MAIN::subject (name "Mass Communication") (description "Deals with the study of communication"))
f-5   (MAIN::subject (name "Commerce") (description "Deals with activities and procedures involved in buying and selling things."))
f-6   (MAIN::subject (name "Business") (description "Deals with Business"))
```

Thank You!