Artificial Intelligence

Assignment -1 Report

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Contents

Logic of the Program

Step1: We start the program using the start. query and then proceed for asking the specific branch of the candidate like CSE, ECE, CB.

Step2: The user has to enter as per his choice and then the user is asked to enter his career he wants to pursue. Depending on the branch we chosen the system provides three options ex: if user inputs cse as branch he can chose from scientist, machine learning engineer, software developer, test engineer.

Step3: The user has to enter the career he wants to pursue accordingly, Once the career is entered the system asks the user to enter his interest in the subdomain of the profession. ex: if user inputs scientist as his career he will be given three options for his interest. Ex: theory, systems, machine_learning.

Step4: The user will be asked to enter whether he has done any project during his MTech if no, user will be asked to do a BTP/MTP based on the profession he wants suppose career is scientist and proceed to step5.

Step5: At last, he will be asked to enter the courses he has taken from the list and will be suggested to take some more courses in order to pursue that career.

Step6.The user can then add new courses and give suggestions as per his will. User can also retract some courses.

Explanation of the code

The code is started with the start. rule which you can find in the code at the beginning it checks whether program(mtech) and new course is true or not .
program(mtech) is used to suggest new courses while all the new course is to ask the user whether he is interested to provide new courses to add in the database or not .

```
start :-
    program(mtech),
    newcourse(add),
    write('Would you like to continue yes/no'),nl,
    read(Bool),
    check(Bool).
```

Then the code for the facts is written where facts based on course prerequisites and career ,interest and branch is taken assumed. Below fact can be interpreted as “Prerequisities for biostatistics is biophysics given the user has taken cb and interested in biostatistics domain and aims to become a scientist.”

```
%Scientist biostatistics
prerequisites(biophysics,cb,scientist,biostatistics,biostatistics).
prerequisites(biophysics,cb,scientist,biostatistics,computer_aided_drug_design).
prerequisites(computational_neuroscience,cb,scientist,biostatistics,network_biology).
prerequisites(biophysics,cb,scientist,biostatistics,computational_neuroscience).
prerequisites(biostatistics,cb,scientist,biostatistics,computer_aided_drug_design).
prerequisites(biostatistics,cb,scientist,biostatistics,bioinformatics).
prerequisites(biostatistics,cb,scientist,biostatistics,mathematical_biology).
prerequisites(biostatistics,cb,scientist,biostatistics,probability_and_statistics).
```

Once the user starts he is then asked several question based on rules honour(branch selection) thereafter it directs to specialization based on branch as shown in the pic.

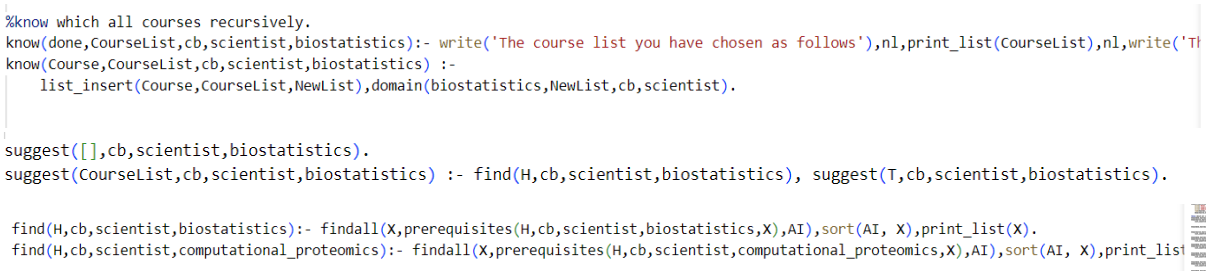
```
program(mtech) :-
    write('Enter the specialization you have chosen: CSE, CB, ECE '),
    read(Honours),
    honour(Honours).

honour(cse):-
    write('Enter the career you want to pursue out of the options'),nl,
    write('Scientist'),nl,
    write('Machine learning engineer'),nl,
    write('Software Engineer'),nl,
    write('Test Engineer'),nl,
    read(Career),
    specialization(cse,Career).

honour(ece):-
    write('Enter the career you want to pursue'),nl,
    write('Scientist'),nl,
    write('VLSI_engineer'),nl,
    read(Career),
    specialization(ece,Career).

honour(cb):-
    write('Enter the career you want to pursue'),nl,
    write('Scientist'),nl,
    read(Career),
    specialization(cb,Career).

specialization(cse, scientist) :-
    write('Enter the area of your interest from the option below'),nl,
    write('machine learning'),nl,
    write('systems'),nl,
    write('theory'),nl,
    read(Interest),
    interest(Interest, cse,scientist).
```

Specialization there captures the interest and interest rule is provoked based on whether he has done any research project or not , the courses are shown which the user has already done as shown below pic.

```
%interest
interest(biostatistics,cb,scientist) :-
    write('Have you ever worked on a research project yes/no'),
    read(Choice),
    verify(Choice,biostatistics,cb,scientist).
```

```
% domain of interest
domain(biostatistics,CourseList,cb,scientist) :-
    write('Enter the courses you have taken from the list, enter done to stop'),nl,
    write('biophysics'),nl,
    write('biostatistics'),nl,
    write('computational_neuroscience'),nl,
    write('linear_algebra'),nl,
    write('probability'),nl,
    read(Course),
    know(Course,CourseList,cb,scientist,biostatistics).
```

Lastly , we recursively suggest and find the appropriate fact and match the prerequisites completed to suggest the courses to take . Below pic shows the find , suggest and know function.



```
%know which all courses recursively.
know(done,CourseList,cb,scientist,biostatistics):- write('The course list you have chosen as follows'),nl,print_list(CourseList),nl,write('Th
know(Course,CourseList,cb,scientist,biostatistics) :-
    list_insert(Course,CourseList,NewList),domain(biostatistics,NewList,cb,scientist).


suggest([],cb,scientist,biostatistics).
suggest(CourseList,cb,scientist,biostatistics) :- find(H,cb,scientist,biostatistics), suggest(T,cb,scientist,biostatistics).

find(H,cb,scientist,biostatistics):- findall(X,prerequisites(H,cb,scientist,biostatistics,X),AI),sort(AI, X),print_list(X).
find(H,cb,scientist,computational_proteomics):- findall(X,prerequisites(H,cb,scientist,computational_proteomics,X),AI),sort(AI, X),print_list
```

The calls are reversed back to ask the user to enter whether he wants to update any course or not using go rule.

```
%add new course
newcourse(add) :-
        write('Enter any course you want to add or delete or press no'),nl,
        read(Value),
        go(Value).

go(no):-!.
go(add) :-
        write('Enter any new course you want to provide or want to remove some existing course'),
        read(NewCourse),
        write('Enter the specialization '),
        read(Specialization),
        write('Enter the Interest'),
        read(Interest),
        write('Enter the future Opportunities for this course'),
        read(Career),
        write('Enter the prerequisties for the course'),
        read(Pre),
        asserta(prerequisites(Pre,Specialization,Career,Interest,NewCourse)).
```

Prolog features used in the program

- Facts and Rules

```
prerequisites(digital_circuits,ece,vlsi_engineer,front_end,computer_architecture).
prerequisites(digital_circuits,ece,vlsi_engineer,front_end,integrated_electronics).
prerequisites(digital_circuits,ece,vlsi_engineer,front_end,signals_and_systems).
prerequisites(digital_circuits,ece,vlsi_engineer,front_end,natural_embedded_logic_design).
prerequisites(computer_architecture,ece,vlsi_engineer,front_end,integrate_electronics).
prerequisites(embedded_logic_design,ece,vlsi_engineer,front_end,vlsi_design_flow).

prerequisites(digital_circuits,ece,vlsi_engineer,back_end,radar_systems).
prerequisites(digital_circuits,ece,vlsi_engineer,back_end,integrated_electronics).
prerequisites(digital_circuits,ece,vlsi_engineer,back_end,signals_and_systems).
prerequisites(digital_circuits,ece,vlsi_engineer,back_end,natural_embedded_logic_design).
prerequisites(computer_architecture,ece,vlsi_engineer,back_end,integrate_electronics).
prerequisites(embedded_logic_design,ece,vlsi_engineer,back_end,digital_hardware_design).

%Scientist vlsi
prerequisites(digital_circuits,ece,scientist,vlsi,computer_architecture).
prerequisites(digital_circuits,ece,scientist,vlsi,integrated_electronics).
prerequisites(digital_circuits,ece,scientist,vlsi,signals_and_systems).
prerequisites(digital_circuits,ece,scientist,vlsi,natural_embedded_logic_design).
prerequisites(computer_architecture,ece,scientist,vlsi,integrate_electronics).
prerequisites(embedded_logic_design,ece,scientist,vlsi,vlsi_design_flow).

%scientist systems
prerequisites(operating_system,ece,scientist,systems,advanced_operating_system).
prerequisites(compilers,ece,scientist,systems,advanced_compiler).
prerequisites(parallel_runtime_modern_processors,ece,scientist,systems,GPU_computing).
prerequisites(operating_system,ece,scientist,systems,compiler).
prerequisites(compilers,ece,scientist,systems,operating_system).
prerequisites(operating_system,ece,scientist,systems,parallel_runtime_modern_processors).
suggest([],cse,scientist,systems).
suggest(CourseList,cse,scientist,systems) :- find(H,cse,scientist,systems), suggest(T,cse,scientist,systems).

suggest([],cse,scientist,theory).
suggest(CourseList,cse,scientist,theory) :- find(H,cse,scientist,theory), suggest(T,cse,scientist,theory).

find(H,cb,scientist,biostatistics):- findall(X,prerequisites(H,cb,scientist,biostatistics,X),AI),print_list(AI).
find(H,cb,scientist,computational_proteomics):- findall(X,prerequisites(H,cb,scientist,computational_proteomics,X),AI),print_list(AI).

find(H,ece,vlsi_engineer,front_end):- findall(X,prerequisites(H,ece,vlsi_engineer,front_end,X),AI),print_list(AI).
find(H,ece,vlsi_engineer,back_end):- findall(X,prerequisites(H,ece,vlsi_engineer,back_end,X),AI),print_list(AI).

find(H,ece,scientist,vlsi):- findall(X,prerequisites(H,ece,scientist,vlsi,X),AI),print_list(AI).
find(H,ece,scientist,systems):- findall(X,prerequisites(H,ece,scientist,systems,X),AI),print_list(AI).
```

- Recursion

```
know(done,CourseList,cb,scientist,computational_proteomics):- write('The course list you have chosen as follows'),
                                                              nl,print_list(CourseList),nl,write('The suggestion of courses for you to take is'),nl,
                                                              suggest(CourseList,cb,scientist,computational_proteomics),!.
know(Course,CourseList,cb,scientist,computational_proteomics) :-
    list_insert(Course,CourseList,NewList),domain(computational_proteomics,NewList,cb,scientist).
```

- Cut

```
verify(yes,vlsi,ece,scientist):-
    CourseList=[],
    domain(vlsi,CourseList,ece,scientist),!.

verify(yes,systems,ece,scientist):-
    CourseList=[],
    domain(systems,CourseList,ece,scientist),!.

verify(yes,front_end,cse,software_engineer):-
    CourseList=[],
    domain(front_end,CourseList,cse,software_engineer),!.

verify(yes,back_end,cse,software_engineer):-
    CourseList=[],
    domain(front_end,CourseList,cse,software_engineer),!.
```

- Input/Output

```
honour(cse):-
    write('Enter the career you want to pursue out of the options'),nl,
    write('Scientist'),nl,
    write('Machine learning engineer'),nl,
    write('Software Engineer'),nl,
    write('Test Engineer'),nl,
    read(Career),
    specialization(cse,Career).

honour(ece):-
    write('Enter the career you want to pursue'),nl,
    write('Scientist'),nl,
    write('VLSI_engineer'),nl,
    read(Career),
    specialization(ece,Career).

honour(ch):-
```

- List

```
suggest([],cse,scientist,machine_learning).
suggest(CourseList,cse,scientist,machine_learning) :- find(H,cse,scientist,machine_learning), suggest(T,cse,scientist,machine_learning).
```

- Assert

```
go(add) :-
        write('Enter any new course you want to provide or want to remove some existing course'),
        read(NewCourse),
        write('Enter the specialization '),
        read(Specialization),
        write('Enter the Interest'),
        read(Interest),
        write('Enter the future Opportunities for this course'),
        read(Career),
        write('Enter the prerequisties for the course'),
        read(Pre),
        assert(prerequisites(Pre,Specialization,Career,Interest,NewCourse)).
```

- Retract

```
go(delete):-
        write('Enter any new course you want to remove some existing course'),
        read(NewCourse),
        write('Enter the specialization '),
        read(Specialization),
        write('Enter the Interest'),
        read(Interest),
        write('Enter the future Opportunities for this course'),
        read(Career),
        write('Enter the prerequisties for the course'),
        read(Pre),
        retract(prerequisites(Pre,Specialization,Career,Interest,NewCourse)).
```

- discontiguous (to keep facts and rules apart)

```
:-discontiguous(prerequisites/5).
:-dynamic(prerequisites/5).
```

- predefined functions used (findall , sort)

```
ind(H,cse,scientist,machine_learning):-findall(X,prerequisites(H,cse,scientist,machine_learning,X),AI),sort(AI, X),print_list(X).
ind(H,cse,scientist,systems):- findall(X,prerequisites(H,cse,scientist,systems,X),AI),sort(AI, X),print_list(X).
ind(H,cse,scientist,theory):- findall(X,prerequisites(H,cse,scientist,theory,X),AI),sort(AI, X),print_list(X).
```

Output of the program.

```
(110 ms) no
| ?- start.
Enter the specialization you have chosen: CSE, CB, ECE cb.
Enter the career you want to pursue
Scientist
scientist.
Enter the area of your interest from the options
Biostatistics
computational_proteomics
biostatistics.
Have you ever worked on a research project yes/noyes.
Enter the courses you have taken from the list, enter done to stop
biophysics
biostatistics
computational_neuroscience
linear_algebra
probability
biophysics.
Enter the courses you have taken from the list, enter done to stop
biophysics
biostatistics
computational_neuroscience
linear_algebra
probability
done.
The course list you have chosen as follows
biophysics


The suggestion of courses for you to take is
bioinformatics
biostatistics
computational_neuroscience
computer_aided_drug_design
mathematical_biology
network_biology
probability_and_statistics

Enter any course you want to add or delete or press no
no.
Would you like to continue yes/no
no.

(62 ms) yes
| ?- |
```

```
(140 ms) yes
| ?- start.
Enter the specialization you have chosen: CSE, CB, ECE cb.
Enter the career you want to pursue
Scientist
scientist.
Enter the area of your interest from the options
Biostatistics
computational_proteomics
biostatistics.
Have you ever worked on a research project yes/nono.
Please do an MTech Thesis project in biostatistics or biophysics
Enter the courses you have taken from the list, enter done to stop
biophysics
biostatistics
computational_neuroscience
biostatistics.
Enter the courses you have taken from the list, enter done to stop
biophysics
biostatistics
computational_neuroscience
done.
The course list you have chosen as follows
biostatistics


The suggestion of courses for you to take is
biostatistics
computer_aided_drug_design
network_biology
computational_neuroscience
computer_aided_drug_design
bioinformatics

Enter any course you want to add or delete
```

```
(359 ms) yes
| ?- start.
Enter the specialization you have chosen: CSE, CB, ECE cb.
Enter the career you want to pursue
Scientist
scientist.
Enter the area of your interest from the options
Biostatistics
computational_proteomics
biostatistics.
Have you ever worked on a research project yes/noyes.
Enter the courses you have taken from the list, enter done to stop
biophysics
biostatistics
computational_neuroscience
biophysics.
Enter the courses you have taken from the list, enter done to stop
biophysics
biostatistics
computational_neuroscience
biostatistics.
Enter the courses you have taken from the list, enter done to stop
biophysics
biostatistics
computational_neuroscience
done.
The course list you have chosen as follows
biostatistics
biophysics


The suggestion of courses for you to take is
bioinformatics
biostatisticscomputational_neuroscience
computer_aided_drug_design
mathematical_biology
network_biology
probability_and_statistics

Enter any course you want to add or delete or press no
no.
Would you like to continue yes/no
no.

(141 ms) yes
| ?-
```

```
Machine learning engineer
Software Engineer
Test Engineer
machine_learning_engineer.
Enter the area of your interest
computer vision
natural language processing
computer_vision.
Have you ever worked on a project yes/nono.
Please do an MTech Thesis project in Machine Learning or deep learning in computer vision
Enter the courses you have taken, enter done to stop
linear algebra
computer vision
machine learning
linear_algebra.
Enter the courses you have taken, enter done to stop
linear algebra
computer vision
machine learning
done.
The course list you have chosen as follows
linear_algebra


The suggestion of courses for you to take is
machine_learning
computer_vision
advanced_machine_learning
deep_learning
statistical_machine_learning
bayesian_machine_learning
data_mining
data_processing

Enter any course you want to add or delete or press no
add.
Enter any new course you want to provide or want to remove some existing courseprobabilistic_graphical_models.
Enter the specialization cse.
Enter the Interestmachine_learning.
Enter the future Opportunities for this coursescientist.
Enter the prerequisties for the courseprobability.
Would you like to continue yes/no
no.

true ?

(265 ms) yes
```

```
| ?- start.
Enter the specialization you have chosen: CSE, CB, ECE ece.
Enter the career you want to pursue
Scientist
VLSI_engineer
scientist.
Enter the area of your interest from the options below
vlsi
systems
vlsi.
Have you ever worked on a research project yes/nono.
Please do an MTech Thesis project in VLSI Design or embedded system
Enter the courses you have taken, enter done to stop
digital circuits
computer architecture
embedded logic design
digital_circuits.
Enter the courses you have taken, enter done to stop
digital circuits
computer architecture
embedded logic design
embedded_logic_design.
Enter the courses you have taken, enter done to stop
digital circuits
computer architecture
embedded logic design
done.
The course list you have chosen as follows
embedded_logic_design
digital_circuits


The suggestion of courses for you to take is
computer_architecture
integrated_electronics
signals_and_systems
natural_embedded_logic_design
integrate_electronics
vlsi_design_flow

Enter any course you want to add or delete or press no
no.
Would you like to continue yes/no
no.

true ?
```

```
(32 ms) yes
| ?- start.
Enter the specialization you have chosen: CSE, CB, ECE cse.
Enter the career you want to pursue out of the options
Scientist
Machine learning engineer
Software Engineer
Test Engineer
scientist.
Enter the area of your interest from the option below
machine learning
systems
theory
machine_learning.
Have you ever worked on a research project yes/noyes.
Enter the courses you have taken, enter done to stop
linear algebra
machine Learning
deep Learning
convex optimization
linear_algebra.
Enter the courses you have taken, enter done to stop
linear algebra
machine Learning
deep Learning
convex optimization
done.
The course list you have chosen as follows
linear_algebra


The suggestion of courses for you to take is
advanced_computer_vision
advanced_machine_learning
bayesian_machine_learning
computer_vision
convex_optimization
deep_learning
linear_optimization
machine_learning
natural_language_processing
statistical_machine_learning
theories_of_deep_learning

Enter any course you want to add or delete or press no
no.
Would you like to continue yes/no
```