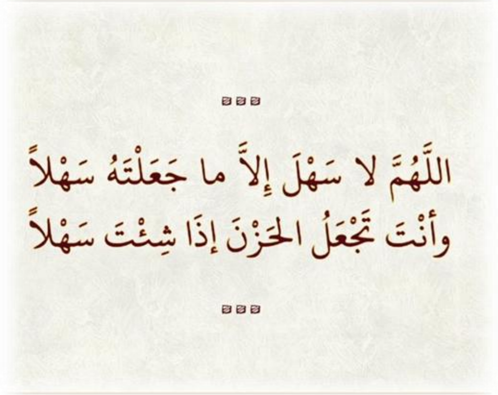

اللَّهُمَّ لا سَهْلَ إلاَّ ما جَعَلْتَهُ سَهْلاً
وأنْتَ تَجْعَلُ الحَزْنَ إذا شِئْتَ سَهْلاً

IDSS

PART (3)

ProLog

Programing Logic [Section]

بسم الله الرحمن الرحيم

4th year - mis track

course package

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3 SUBJECTS :

IIS

E-COMMERCE

DSS

الأسعار :

٣ مواد	١٠٦٠ ج
مادتين	٨١٠ ج
مـــادة	٤٦٠ ج

CONTACT US

0127 187 3664

شبابنا الحلو .. ربنا معاكوا في اخر ترم وفي مشروع التخرج.

حنكون معاكوا ان شاء الله في ٣ مواد ... متشغلوش بالكوا بيهم و ركزوا في مشروعكوا

صلي علي سيدنا محمد

Agents

1. Reflex Agent

Use a mapping **from states** to **actions**. [If-then]

Considers how the world *is*:

- Choose action based on **current percept.**
- **Do not consider the future** consequences of actions.
- **Example**: A thermostat that turns on the heater when the temperature drops below a certain threshold is a reflex agent.

2. Planning (Goal-based) agent

problem solving agents or **planning agents.**

- Considers how the world *WOULD BE*:

- Decisions based on (hypothesized) **consequences of actions.**
- Must have a model of how the world evolves in response to actions.
- Must formulate a goal.

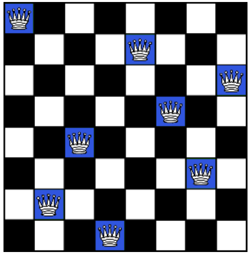
- Agents that **work towards a goal**.

- Agents consider **the impact of actions on future states**.

- Agent’s job is to identify **the action or series of actions that lead to the goal**.

- Agents that **work towards a goal**.

The 8-queen problem: on a chess board, place 8 queens so that no queen is attacking any other horizontally, vertically or diagonally.



Number of possible sequences to investigate:

$64 * 63 * 62 * ... * 57 = 1.8 \times 10^{14}$

- Agents consider the impact of actions on future states.
- Agent’s job is to identify the action or series of actions that lead to the goal.
- Formalized as a search through possible solutions.

صلي علي سيدنا محمد

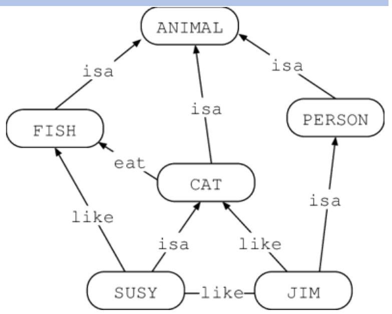
Logic Programming and Prolog

1. Overview of Logic Programming Concepts

- **Declarative Programming Paradigm**:
  - Logic programming takes a different approach from functional and imperative programming.
  - Programs are expressed in terms of symbolic logic and logical inferences.
    - Built over **first-order predicate calculus**.
- **Declarative Semantics**:
  - Logic programs describe what should be accomplished, not how to achieve it.
    - Relevant information and inference methods drive computation.

2. What is Prolog?

- Prolog stands for Programming Logic.
- It focuses on describing facts and relationships about problems rather than creating a series of steps to solve those problems.
- Emphasis is on what rather than how.



3. Basic Elements of Prolog

A program consists of **clauses**.

Facts: Statements about what is true about a problem.

Facts are used to work out how to accomplish solutions by searching through the space of possible solutions.

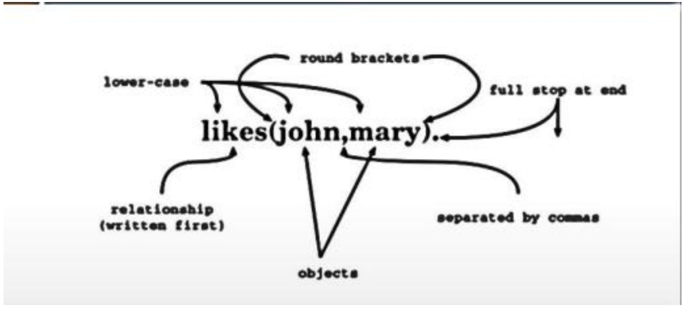
Rules: Express dependencies among facts.

Rules consist of a **head** and a **body** connected by the symbol (:-) (IF).

4. Syntax for Fact Declaration

Names of relationships and objects must begin with a lowercase letter.

Relationship (typically the predicate of the sentence) is written first. Objects are separated by commas and enclosed in round brackets. End each fact with a full stop (.).



صلي علي سيدنا محمد

5. Examples of Facts

valuable(gold).	: Gold is valuable.
owns(john, gold) .	: John owns gold.
father(john, mary).	: John is the father of Mary.
gives(john, book, mary).	: John gives the book to Mary.

Facts:

- likes(joe, fish).
- likes(joe, mary).
- likes(mary, book).
- likes(albert, book).

Questions:	Answer:	
?- likes(joe, mary).	yes	
?- likes(mary, joe).	no	
?- likes(mary, mary).	no	
?- likes(joe, fish).	yes	
?- likes(joe, X).	X= fish	X= mary
?- likes(Who, fish).	??	

Note : likes(joe, mary). not equals to likes(mary, joe).

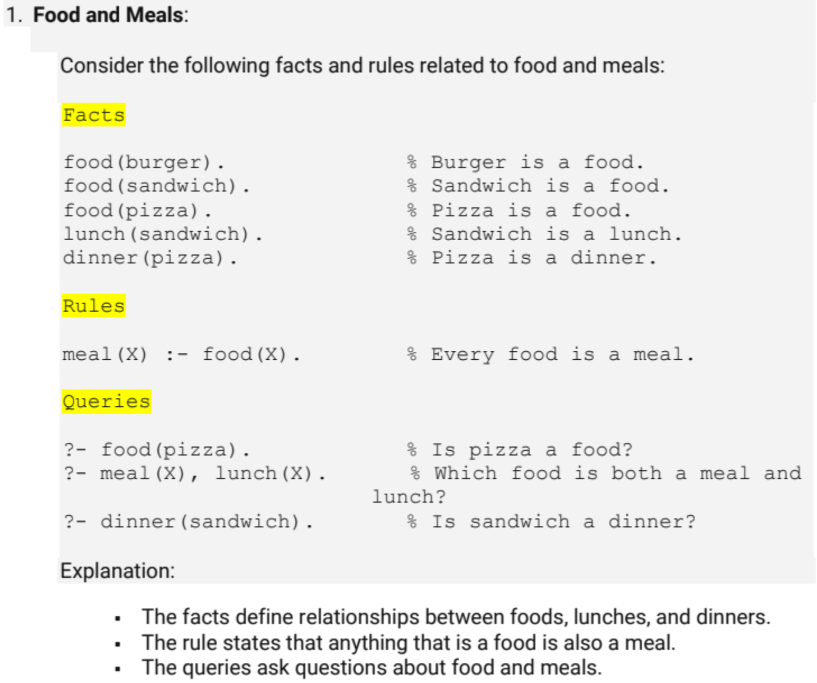
6. Use of Prolog in AI Applications

a. **Natural language interfaces**

b. **Automated reasoning systems**

c. **Expert systems**: Consist of a database of facts and rules, with Prolog's inference engine providing services.

7. Examples of Facts



1. **Food and Meals**:

Consider the following facts and rules related to food and meals:

Facts

```
food(burger).               % Burger is a food.
food(sandwich).             % Sandwich is a food.
food(pizza).                % Pizza is a food.
lunch(sandwich).            % Sandwich is a lunch.
dinner(pizza).              % Pizza is a dinner.
```

Rules

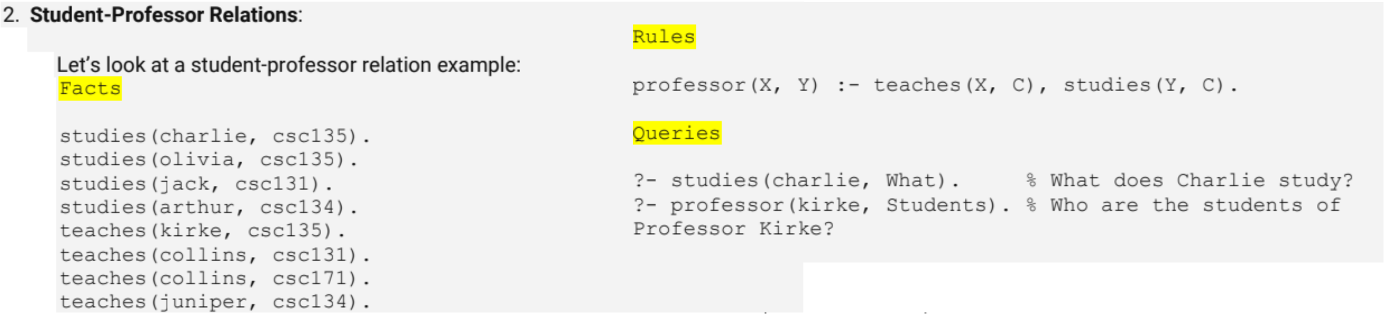
```
meal(X) :- food(X).         % Every food is a meal.
```

Queries

```
?- food(pizza).             % Is pizza a food?
?- meal(X), lunch(X).        % Which food is both a meal and
                         lunch?
?- dinner(sandwich).         % Is sandwich a dinner?
```

Explanation:

- The facts define relationships between foods, lunches, and dinners.
- The rule states that anything that is a food is also a meal.
- The queries ask questions about food and meals.



2. **Student-Professor Relations**:

Let's look at a student-professor relation example:

Facts

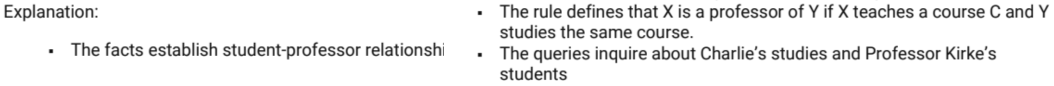
```
studies(charlie, csc135).
studies(olivia, csc135).
studies(jack, csc131).
studies(arthur, csc134).
teaches(kirke, csc135).
teaches(collins, csc131).
teaches(collins, csc171).
teaches(juniper, csc134).
```

Rules

```
professor(X, Y) :- teaches(X, C), studies(Y, C).
```

Queries

```
?- studies(charlie, What).     % What does Charlie study?
?- professor(kirke, Students). % Who are the students of
Professor Kirke?
```



Explanation:

- The facts establish student-professor relationshi
- The rule defines that X is a professor of Y if X teaches a course C and Y studies the same course.
- The queries inquire about Charlie's studies and Professor Kirke's students

8. High Example

Anonymous Variable

```
o  Male(john).
o  Male(alex).
o  Female(mary).


o  ?- male(X).          X= john    X= alex
o  ?- male(fady).       False
o  ?- male(_).          True
```

- **Conjunction**

```
o  likes(mary, john).
o  likes(mary, Book).
o  likes(john, france).
o  likes(john, book).
o  likes(john, mary).


o  ?- likes(mary, john), likes(john, mary).
o  ?- likes(mary, X), likes(john, X).
o  ?- likes(mary, france); likes(john, france).
```

- **Rules**

```
o  friend(jin, james).
o  friend(jin,john).
o  likes(john, jin).
o  likes(james, john).


o  happy(X) :- friend(X,Y),likes(Y,X).

o  ?- happy(X).
```

9. Questions

(1) If sky is blue, everyone likes it. - Write this statement as a prolog clause.

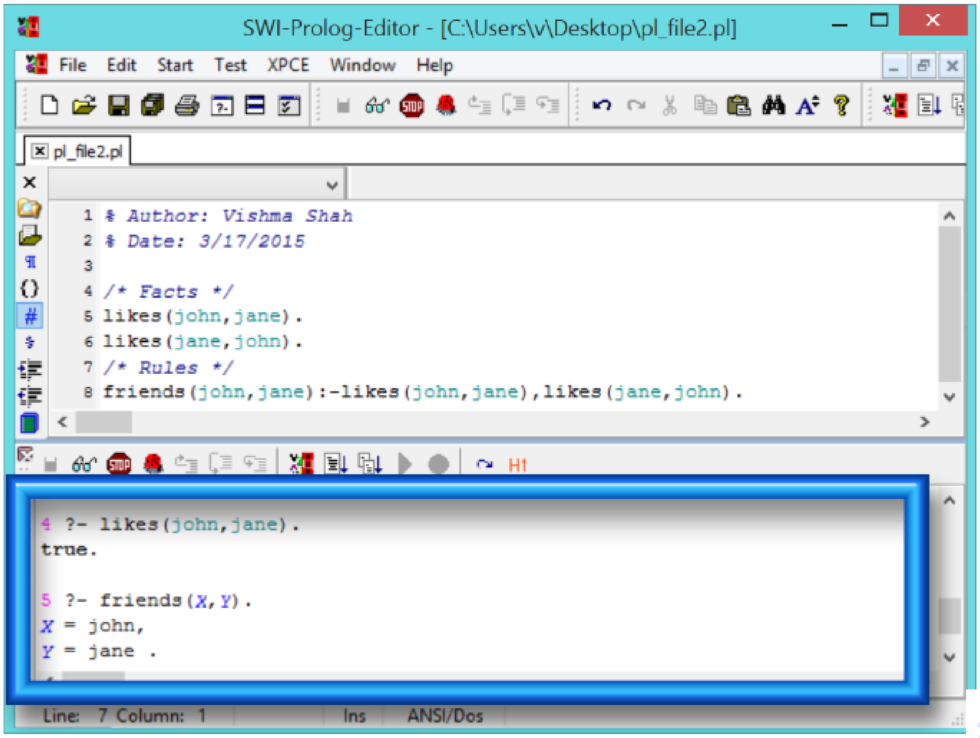
A) sky(blue) :- everyone(likes).
B) blue(sky), likes(X).
C) likes(X, sky) :- blue(sky).
D) likes(sky, everyone) :- blue(sky).

(2) ?- owner(jack, cat(X)) :- fur(X),spots(X). - What would be the English meaning for this prolog clause.

A) jack is a owner of cat and fur and spots.
B) jack is the owner of X or jack is the owner of fur and spots .
C) jack is the owner of some cat if that cat has fur and spots.
D) B & C both.

(1)C   (2)C

10. SWI PROLOG EDITOR



```
% Author: Vishma Shah
% Date: 3/17/2015

/* Facts */
likes(john,jane).
likes(jane,john).
/* Rules */
friends(john,jane):-likes(john,jane),likes(jane,john).
```

```
4 ?- likes(john,jane).
true.

5 ?- friends(X,Y).
X = john,
Y = jane .
```

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