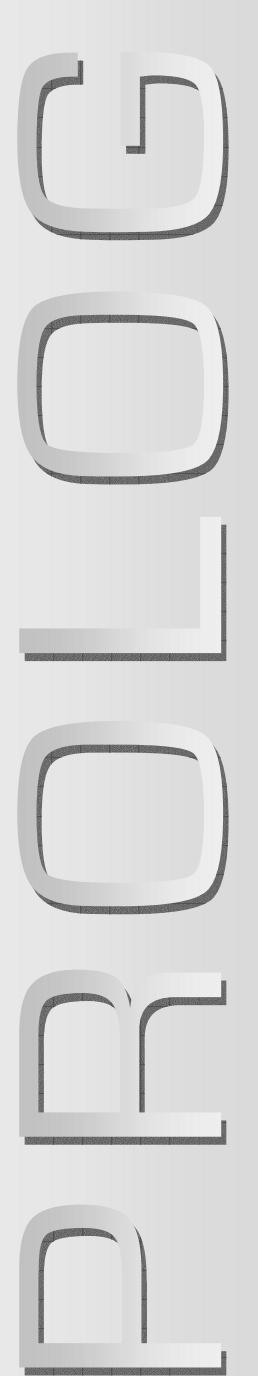


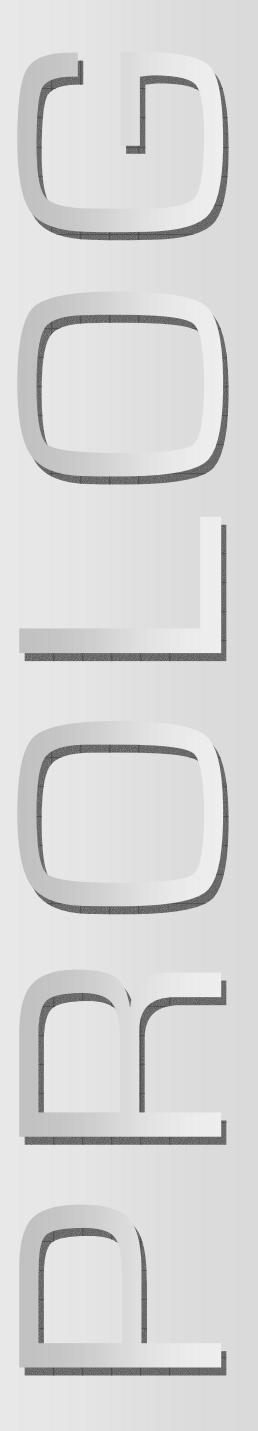
Artificial Intelligence Programming in Prolog

Lecture 1:
An Introduction
23/09/04



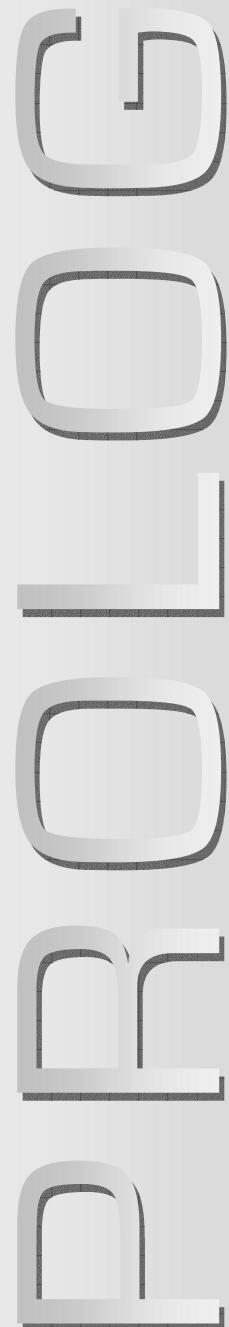
Contents

- Course Details
- References
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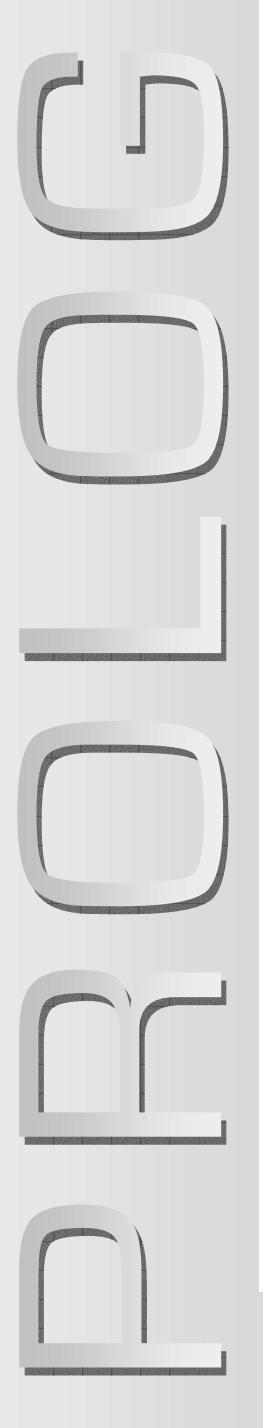
Introductions

- I am Tim Smith
 - tim.smith@ed.ac.uk
 - Office 9, 2nd floor/left, 2 Buccleuch Place.
 - Office Hours 9am-12pm every Tuesday.
- You are....
 - Masters students
 - Informatics, AI, CogSci, SLP



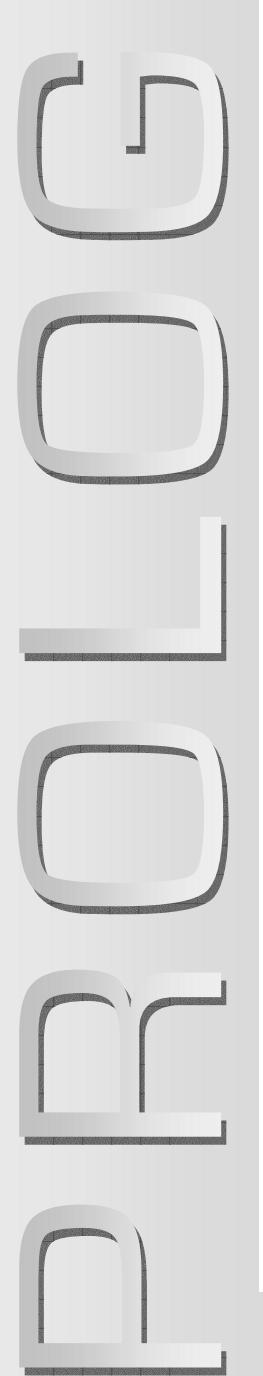
Course Details

- 19 lectures
- Mondays and Thursdays 16:10-17:00
 - A9/11, Ground Floor, Forrest Hill
- 2hr weekly lab tutorials
 - Computer Lab West, level 5, Appleton Tower
 - Wednesday 4-6pm or
 - Friday 3-5pm
 - Please record preference on sheet.



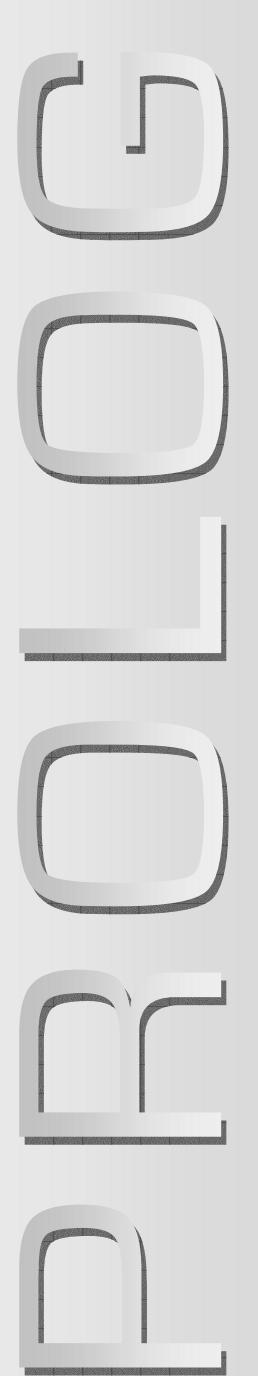
Assessment

- Summer Examination 70%
- 2 Assignments
 - Assignment 1 = 10%
 - Available week 2. Due week 6
 - Assignment 2 = 20%
 - Available week 6. Due week 11.
- Weekly Practical exercises
 - Not assessed, but
 - Completion is compulsory.



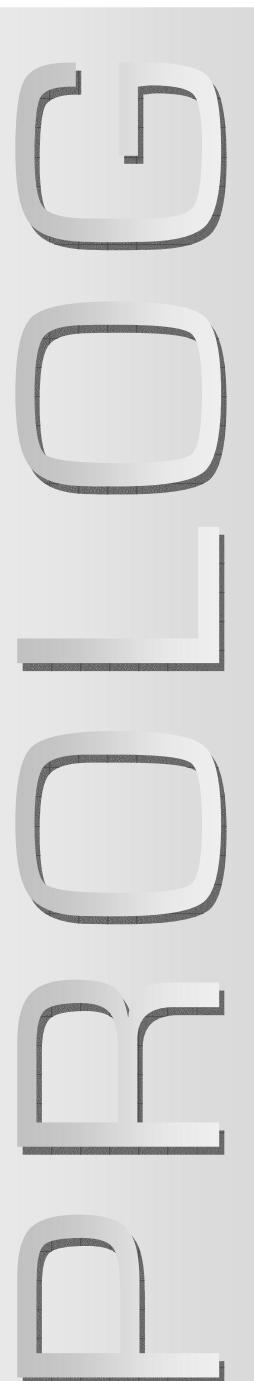
Course Materials

- Course Notes (primary reference)
 - Handed out in Monday's lecture
 - Contains:
 - Course details
 - Introduction to Prolog
 - Revision exercises
 - Weekly Practical exercises
 - Must bring to practical sessions
- On-line Lecture slides
 - <http://www.inf.ed.ac.uk/teaching/courses/aipp>



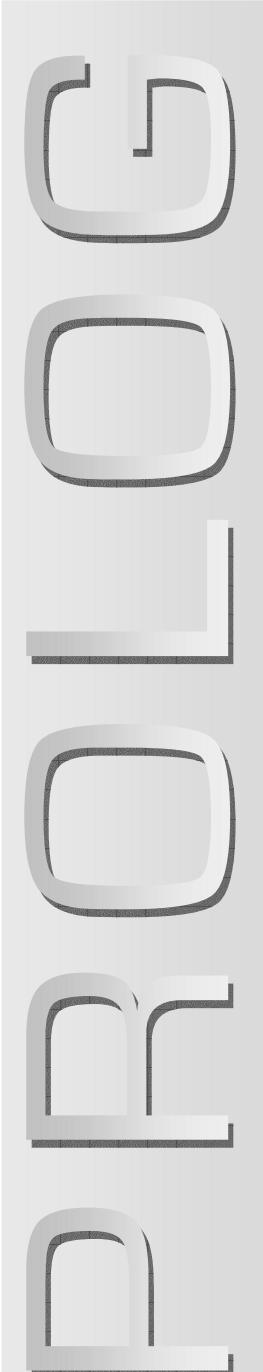
References

- No course text book
- Useful references:
 - Clocksin, W.F. and Mellish, C.S., Programming in Prolog: Using the ISO Standard (5th edition), 2003.
 - Bratko, I., Prolog Programming for Artificial Intelligence (3rd edition), 2001.
 - Sterling, L. and Shapiro, E., The Art of Prolog (Second edition), 1994.



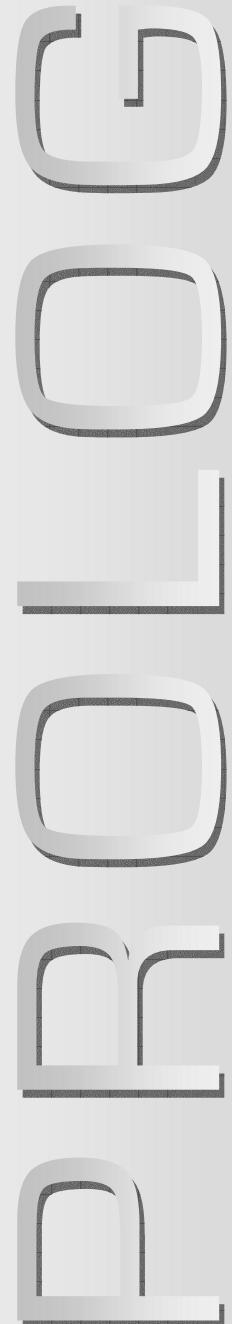
Requirements & Exemptions

- AIPP is aimed at students with previous programming experience.
- If you have no, or little experience please take Introduction to Java Programming.
- If you are required to take AIPP and believe you may struggle with the programming speak to me.
- You may be exempt from AIPP if:
 - You have previously taken a Uni course in Prolog
 - You have used Prolog competently in industry.
- Speak to Specialism supervisor for exemption.



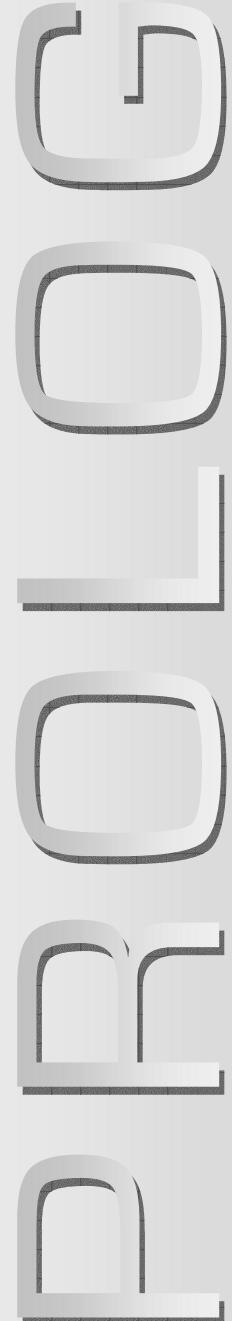
Software

- Sicstus Prolog
- Installed on the Informatics DICE network
 - Type `sicstus` in a terminal window.
- Computer labs: 5th floor, Appleton Tower
- Free Windows version of sicstus available
 - Request a copy using the Informatics support form: <http://www.inf.ed.ac.uk/cgi-bin/support.cgi>
 - All prolog code must be tested on DICE version of sicstus before submission.



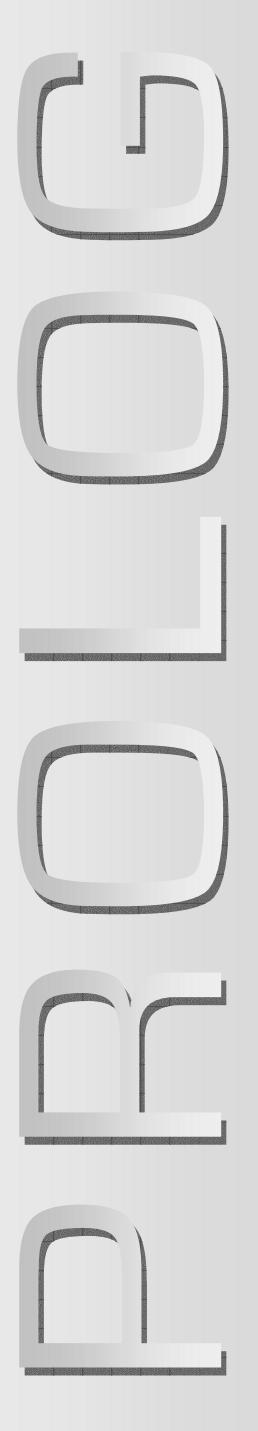
What is AIPP?

- A comprehensive introduction to Prolog.
- Specific focus on Artificial Intelligence programming techniques:
 - Knowledge representation and manipulation,
 - Database construction and management,
 - State-space Search,
 - Planning,
 - Meta-programming,
 - Text parsing and Definite Clause Grammars.



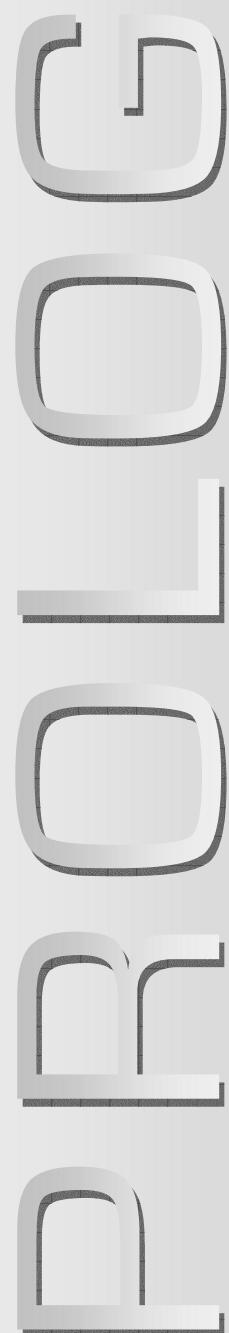
What is Prolog?

- PROgrammation et Logique.
- Edinburgh syntax is the basis of ISO standard.
- High-level interactive language.
- Logic programming language.
 - Based on Horn Clauses
 - $(\text{parent}(X,Z) \wedge \text{ancestor}(Z,Y)) \supset \text{ancestor}(X,Y)$



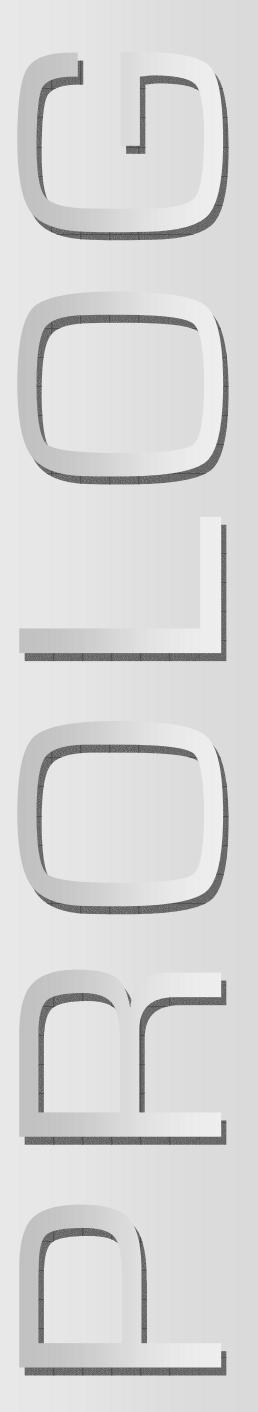
What is Prolog? (2)

- Programming languages are of two kinds:
 - **Procedural** (BASIC, ForTran, C++, Pascal, Java);
 - **Declarative** (LISP, Prolog, ML).
- In procedural programming, we tell the computer **how** to solve a problem.
- In declarative programming, we tell the computer **what** problem we want solved.
- (However, in Prolog, we are often forced to give clues as to the solution method).



What is Prolog used for?

- Good at
 - Grammars and Language processing,
 - Knowledge representation and reasoning,
 - Unification,
 - Pattern matching,
 - Planning and Search.
 - i.e. Prolog is good at Symbolic AI.
- Poor at:
 - Repetitive number crunching,
 - Representing complex data structures,
 - Input/Output (interfaces).



Basic Elements of Prolog

- Our program is a database of **facts** and **rules**.
- Some are always true (facts):
`father(john, jim).`
- Some are dependent on others being true (rules):
`parent(Person1, Person2) :-
 father(Person1, Person2).`
- To run a program, we ask questions about the database.

Prolog in English

Example Database:

John is the father of Jim.
Jane is the mother of Jim.
Jack is the father of John.

Person 1 is a parent of Person 2 **if**
 Person 1 is the father of Person 2 **or**
 Person 1 is the mother of Person 2.

Person 1 is a grandparent of Person 2 **if**
 some Person 3 is a parent of Person 2 **and**
 Person 1 is a parent of Person 3.

Example questions:

Who is Jim's father?
Is Jane the mother of Fred?
Is Jane the mother of Jim?
Does Jack have a grandchild?

Facts
Rules

Prolog in Prolog

Example Database:

John is the father of Jim.
Jane is the mother of Jim.
Jack is the father of John.

Person 1 is a parent of Person 2 **if**
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Example questions:

Who is Jim's father?
Is Jane the mother of Fred?
Is Jane the mother of Jim?
Does Jack have a grandchild?

Example Database:

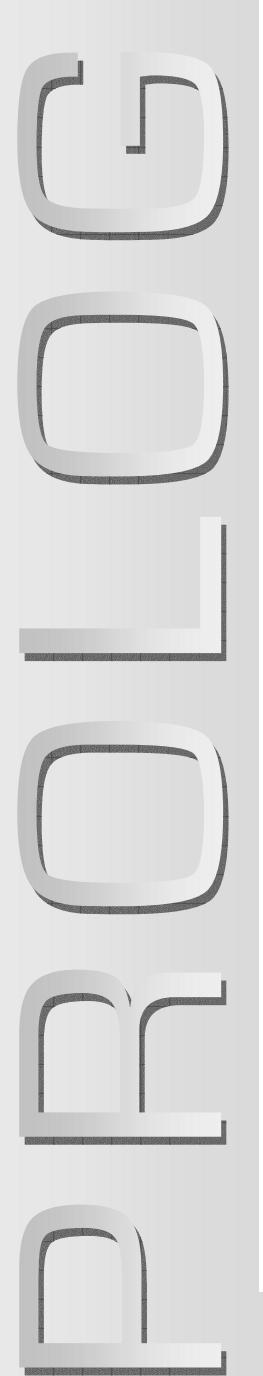
father(john, jim).
mother(jane, jim).
father(jack, john).

parent(Person1, Person2) :-
 father(Person1, Person2).
parent(Person1, Person2) :-
 mother(Person1, Person2).

grandparent(Person1, Person2) :-
 parent(Person3, Person2),
 parent(Person1, Person3).

Example questions:

?- father(Who, jim).
?- mother(jane, fred).
?- mother(jane, jim).
?- grandparent(jack, _).

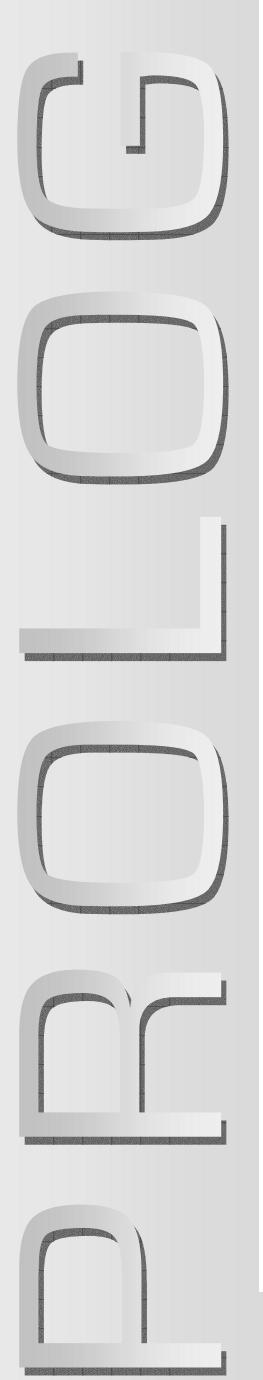


Using Prolog

1. First, write your program (away from computer!).
2. Then, type it into a file, with a **.pl** extension.
 - Any text editor will do, but **Emacs** is recommended.
3. Then, type:

sicstus

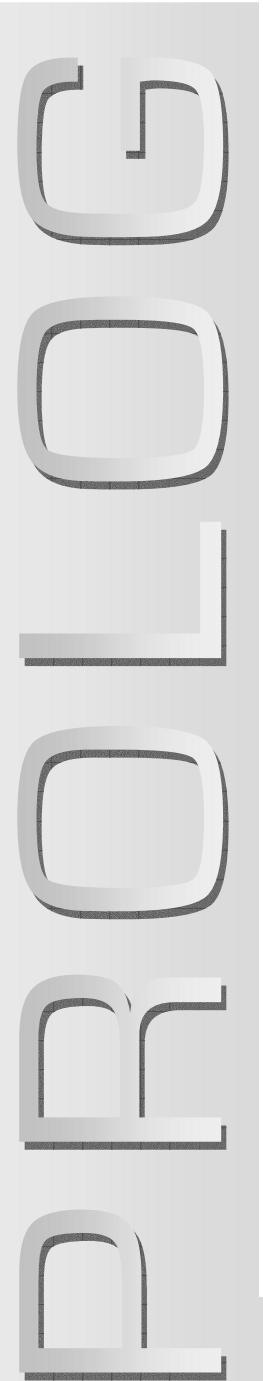
4. You will be presented with the Prolog prompt
|?-
5. Then, `consult' your file (omitting the **.pl**):
|?- consult[yourfilename]. or
|?- [yourfilename]. or **['folder/filename'].**
6. The entire content of your file is then stored in the memory of the Prolog interpreter.
 - You can see what is consulted by typing **| ?- listing.**
7. Then you can ask questions of your database.



Using Prolog (2)

- If you edit your program file (e.g. to correct something), be sure to consult it again afterwards!
- To exit from Prolog, type
 - |?- halt.
or press
Control/D
- The Prolog comment characters:
 - Single line comments: %
% This is a comment
This not a comment, but an error
 - Multiple line comments: /*
/* This is a multi-line comment
which must be closed with a */

Prolog Demo



```
SICStus 3.10.1 (x86-win32-nt-4): Fri Apr 11 23:08:29 WEDT 2003
File Edit Flags Settings Help
SICStus 3.10.1 (x86-win32-nt-4): Fri Apr 11 23:08:29 WEDT 2003
Licensed to dai.ed.ac.uk
| ?- ['imdb/actors_popular1'].
% consulting c:/program files/sicstus prolog 3.10.1/bin/imdb/actors_popular1.pl...
%
% consulted c:/program files/sicstus prolog 3.10.1/bin/imdb/actors_popular1.pl in
% module user, 24408 msec 33949296 bytes
yes
| ?- actor('Kevin Bacon',Film,Date),
Date = 1994,
Film = 'Air Up There, The' ? ;
Date = 1978,
Film = 'Animal House' ? ;
Date = 1995,
Film = 'Apollo 13' ?
yes
| ?- actor('Kevin Bacon',Film,Date),actor('Dustin Hoffman',Film,Date)
Date = 1996,
Film = 'Sleepers' ? ;
no
| ?- ■
```