University of BRISTOL

Artificial Intelligence: SWI Prolog Hints & tips

Oliver Ray

SWI Toolchain Notes

- Developed by J. Wielemaker at Uni of Amsterdam's Human-Computer Studies group - previously called Social Science Informatics Sociaal-Wetenschappelijke Informatica, **SWI**
- Popular, free, open-source, cross-platform, well-documented toolchain with excellent libraries and community support under continuous development from 1987-2022
- Terminal-based program (**SWIPL**) a highly integrated graphical editor/debugger/profiler (**PceEmacs**) and an extensive hyperlinked, searchable online reference manual (**PlDoc**)
- Can also be used with a browser-based GUI (**SWISH**) that facilitates basic user interaction, Jupiter-style **notebooks** and which is also hosted as a free (sand-boxed) **web-service**
- In practice, Prolog programs are typically edited using generic file editors (e.g. **Atom)** with Prolog-specific syntax bindings and run using SWIPL command-line tools

SWI Local Installation Tips

The latest SWI **setup instructions** and **binary installers** (and **source codes)** are available from https://www.swi-prolog.org/download/stable. Either follow the instructions to download, make and configure the source files or try one of the following platforms shortcuts:

- On **Linux** try running **sudo apt-add-repository ppa:swi-prolog/stable**.
- On **Mac** try running **brew install swi-prolog**. Alternatively download and run the **.dmg** file, drag swipl into the applications folder, add it to the path with something like **export PATH=$PATH:/Applications/SWI-Prolog.app/Contents/MacOS** (and, as the publisher is "unknown", to run it for the very the first time you'll need to open the applications folder in finder, right click on swipl, and select open)
- On **Windows** download/run the **.exe** file (64 or 32 bit) making sure to tick the checkbox saying "**add swipl to the system path for …**" (or you'll need to do this later by adding something like "**C:\Program Files\swipl\bin**" to the system path using something like **System-> About-> Advanced System Settings->Environmental Variables->Path->Add**)

You may (optionally) obtain **SWISH** from GitHub or Docker to simulate the online GUI

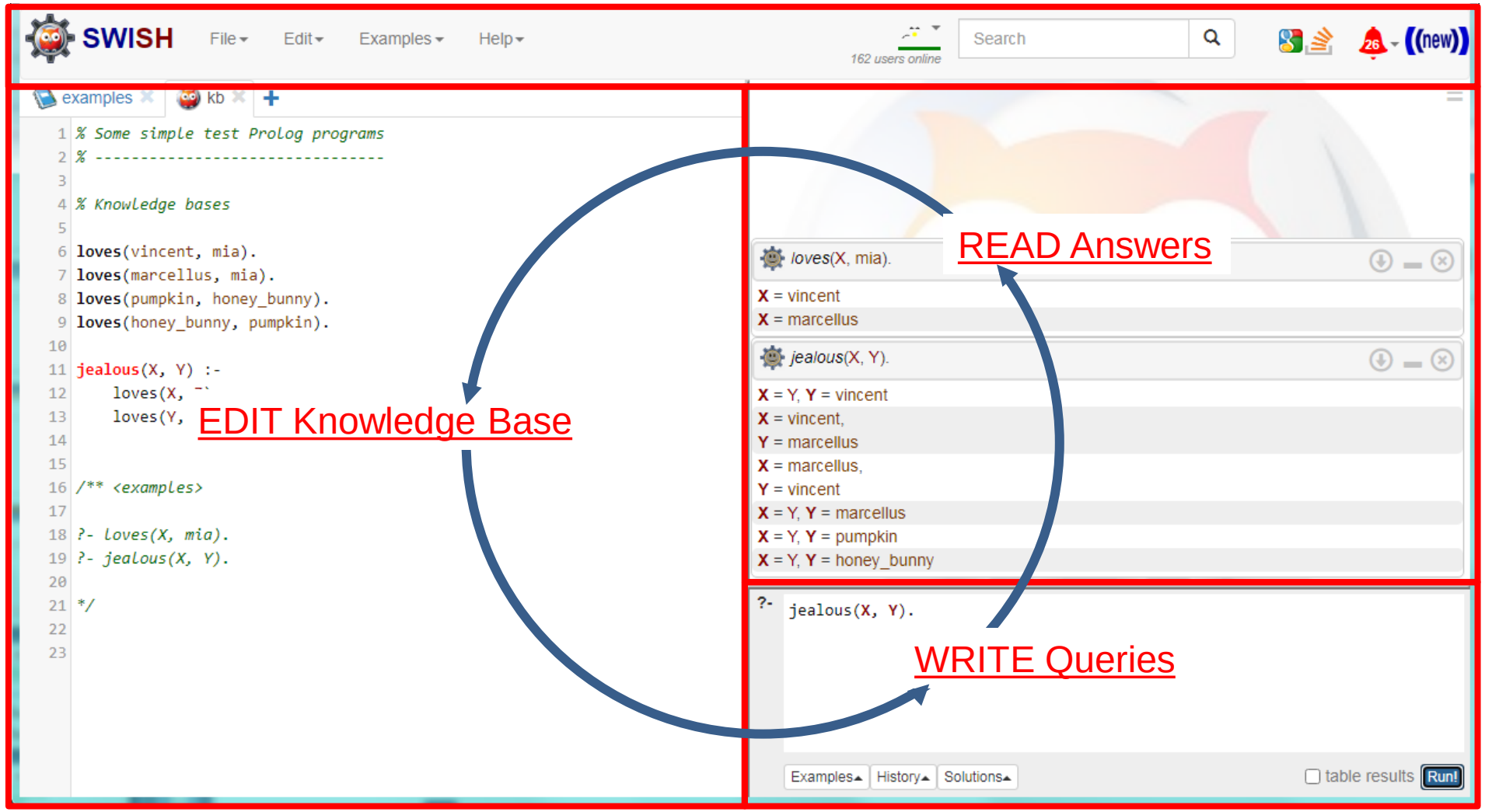
SWI Running Tips

- On **Linux** or **Mac** type swipl in a terminal; or double click the swipl app
- On **Windows** type swipl (command-line app) or swipl-win (window-based app) in a terminal (cmd or powershell); or double click the swipl app ; or double click a **.pl** file in an Explorer window (if necessary, after associating swipl or swipl-win with the .pl extension – not PERL!)
- On **Lab Machines** SWIPL and SWISH should both be pre-installed.
  - To run SWIPL
    - simply type swipl in a BASH terminal;
  - To run SWISH:
    - First copy it (one time only) to your home dir: cp -r /opt/swish ~/
    - Then go to your brand new swish copy: cd ~/swish
    - And start a SWISH server by typing : swipl run.pl
    - Now open any web browser and go to url: http://localhost:3050/
  - You can remotely access lab machines with this Remote Desktop Guidance
- Alternatively, you can use the **SWISH server** at https://swish.swi-prolog.org/

Useful SWI Queries

- `?- current_directory(D,D).`
- `?- [file].`
- `?- ['file.ext'].`
- `?- [file1, file2].`
- `?- edit.`
- `?- make.`
- `?- halt.`
- `?- listing.`
- `?- listing(predicate/arity)`
- `;`
- `<ctrl>-c`
- `<ctrl>-d`

Workflow with SWISH



Workflow with PceEmacs/swipl-win

kb.pl

File Edit Browse Compile Prolog Pce Help

kb.pl

```
% Some simple test Prolog programs
% --------------------------------

% Knowledge bases

loves(vincent, mia).
loves(marcellus, mia).
loves(pumpkin, honey_bunny).
loves(honey_bunny, pumpkin).

jealous(X, Y) :-
    loves(X, Z),
    loves(Y, Z).

/** <examples>

?- loves(X, mia).
?- jealous(X, Y).

*/
```

comment(line) Line: 1

SWI-Prolog (AMD64, Multi-threaded, version 8.2.4)

File Edit Settings Run Debug Help

```
Welcome to SWI-Prolog (threaded, 64 bits, version 8.2.4)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free s
oftware.
Please run ?- license. for legal details.

For online help and background, visit https://www.swi-prolog
.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?- working_directory(_, 'C:\\Users\\csxor\\OneDrive - Univers
ity of Bristol/Documents/Prolog').
true.

?- [kb].true.

?- jealous(X,Y).
X = Y, Y = vincent ;
X = vincent,
Y = marcellus ;
X = marcellus,
Y = vincent ;
X = Y, Y = marcellus ;
X = Y, Y = pumpkin ;
X = Y, Y = honey_bunny.

?- halt.
```

Workflow with text-editor/swipl

kb.pl - WordPad

```
% Some simple test Prolog programs
% --------------------------------

% Knowledge bases

loves(vincent, mia).
loves(marcellus, mia).
loves(pumpkin, honey_bunny).
loves(honey_bunny, pumpkin).

jealous(X, Y) :-
    loves(X, Z),
    loves(Y, Z).


/** <examples>

?- loves(X, mia).
?- jealous(X, Y).

*/
```

SWI-Prolog (console)

```
Welcome to SWI-Prolog (threaded, 64 bits, version 8.2.4)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

For online help and background, visit https://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

1 ?- working_directory(_,'C:\\Users\\csxor\\OneDrive - University of Bris
tol/Documents/Prolog').
true.

2 ?- [kb].
true.

3 ?- jealous(X,Y).
X = Y, Y = vincent ;
X = vincent,
Y = marcellus ;
X = marcellus,
Y = vincent ;
X = Y, Y = marcellus ;
X = Y, Y = pumpkin ;
X = Y, Y = honey_bunny.

4 ?- halt.
```

Miscellaneous Usage Notes

- There may be cosmetic differences between the output of the different SWI apps or when running those apps on different operating systems
  - e.g. one student noticed erroneous characters occasionally appear in the knowledge base if using the SWISH web service from a lab machine
  - e.g. last year some students noticed that some problems were caused the default web browser not being correctly on lab machines
- Students are advised to spend a bit of time initially finding an installation setup that works for them on their own machine
- When using a 3rd party editor to modify Prolog programs, you should use the command **?- make.** to reload any updated files into SWIPL
- Exit Prolog using the command **?- halt.**
- Remember to press semicolon **;** to obtain more answers to a query!

Useful Prolog Operators

- Logical operators:

  :- (if) , (and) ; (or) \+ (not)

- Comparison operators for (ground) numbers:

  < , > , =< , >= , == , \==

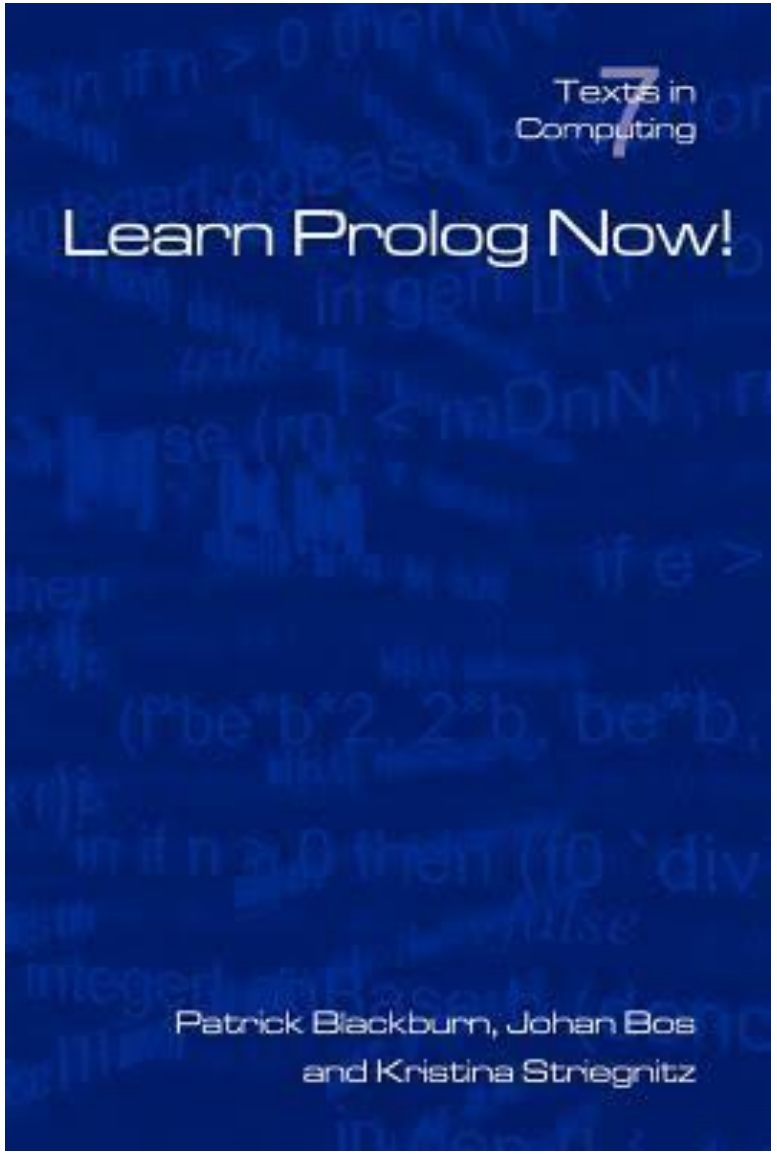
- comparison operators for (arbitrary) terms:

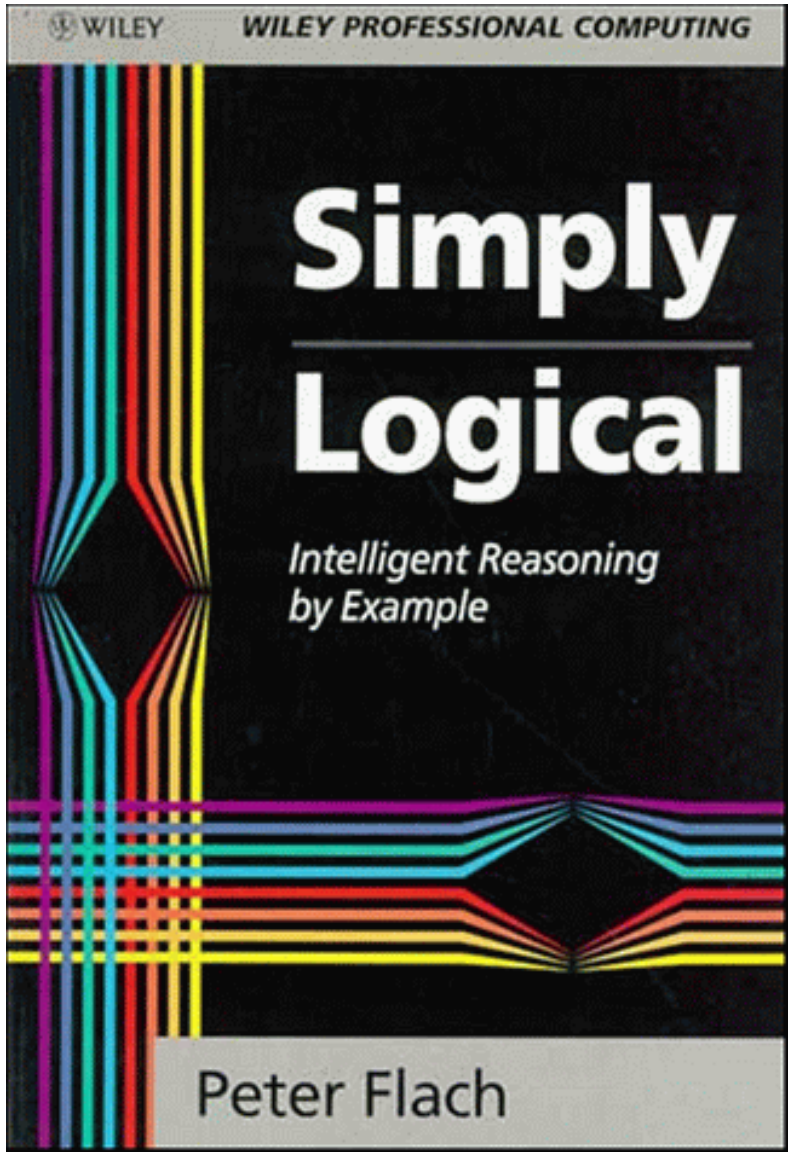
  @< , @> , @=< , @>= , == , \==

- Examples:

```
teenager(X) :- (male(X) ; female(X)) , age(X,Y), Y>12, Y<20.
brother(X,Y) :- male(X), parent(X,Z), parent(Y,Z), X\==Y.
only_child(X) :-  \+ (parent(X,Z), parent(Y,Z), X\=Y).
```

Free Online Prolog Resources





Thank you