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Artificial Intelligence: SWI Prolog Hints & tips

Oliver Ray

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SWI Toolchain Notes

- Developed by J. Wielemaker at Uni of Amsterdam's Human-Computer Studies group (previously called Social Science Informatics Sociaal-Wetenschappelijke Informatica)
- Popular, free, open-source, cross-platform, well-documented toolchain with excellent libraries and community support under continuous development from 1987-2022
- Includes terminal-based program (**SWIPL**) a 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. **Notepad++**, **Atom**, **VS-Code**, etc.) with Prolog syntax bindings and run via SWIPL command-line tools (using the SWI **make** command to detect and reload any modified predicate definitions)

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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

see SWISH installation notes: swish (swi-prolog.org)

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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/

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Useful SWI Commands

```
> swipl                          % run SWI command interface
?- current_directory(D,D).       % show source directory (and keep it the same)
?- [file].                       % load source code from file.pl
?- ['file.ext'].                 % load source code from file.ext
?- [file1, file2].               % load source code from file1.pl and file2.pl
?- listing.                      % show current predicatate definitions
?- listing(predicate/arity)      % show definitions for a specified predicate
?- make.                         % detect and reload any modified definitions
;                                % show more answers!
?- halt.                         % exit from Prolog
<ctrl>-d                         % abort / end of file
<ctrl>-c                         % abort
> swipl file.ext                 % run SWI command interface and load file
? associated_file(F).            % show the name of the loaded file
?- edit.                         % open editor on the associated_file
```

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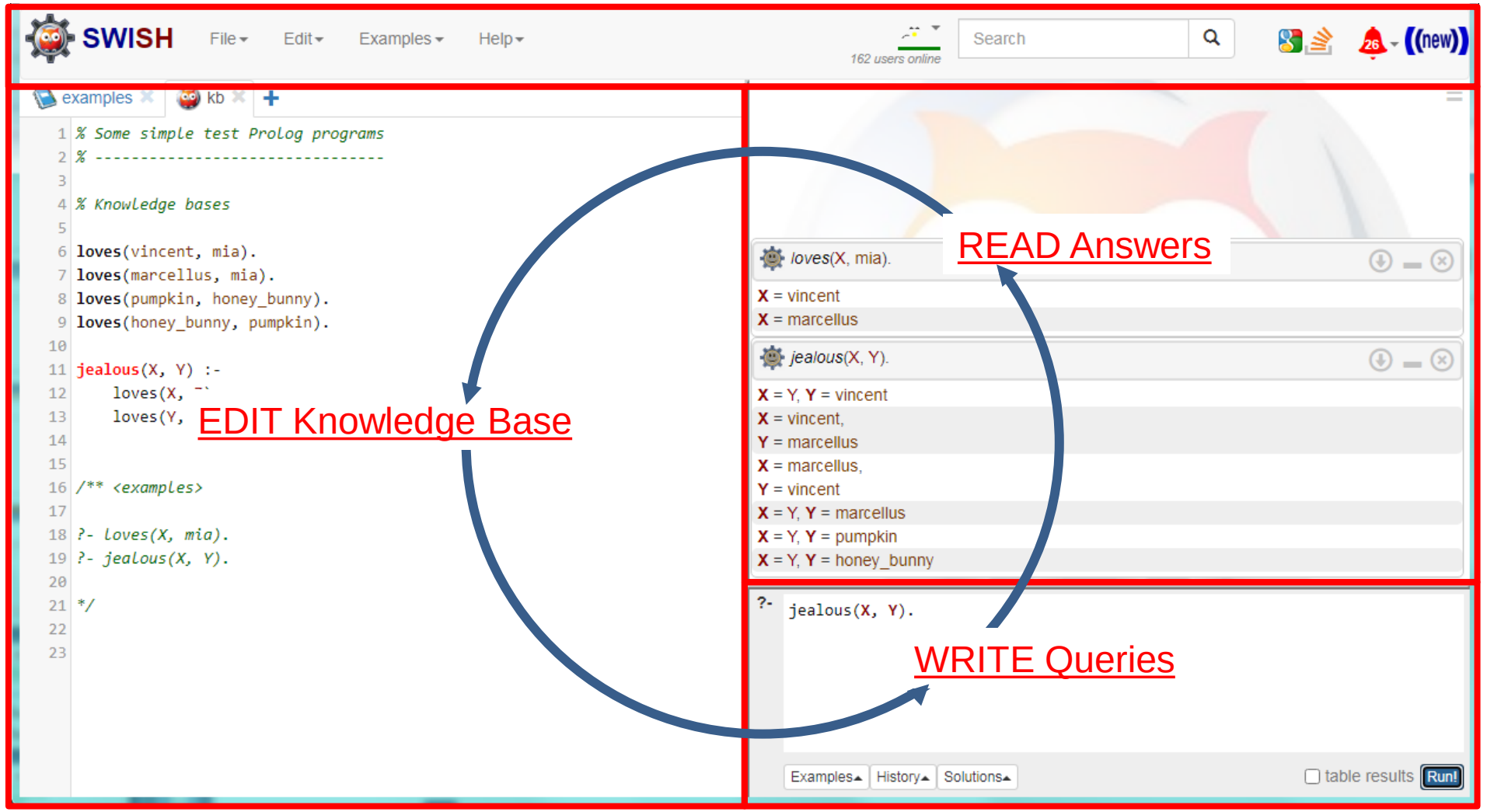
Workflow with SWISH



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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.
```

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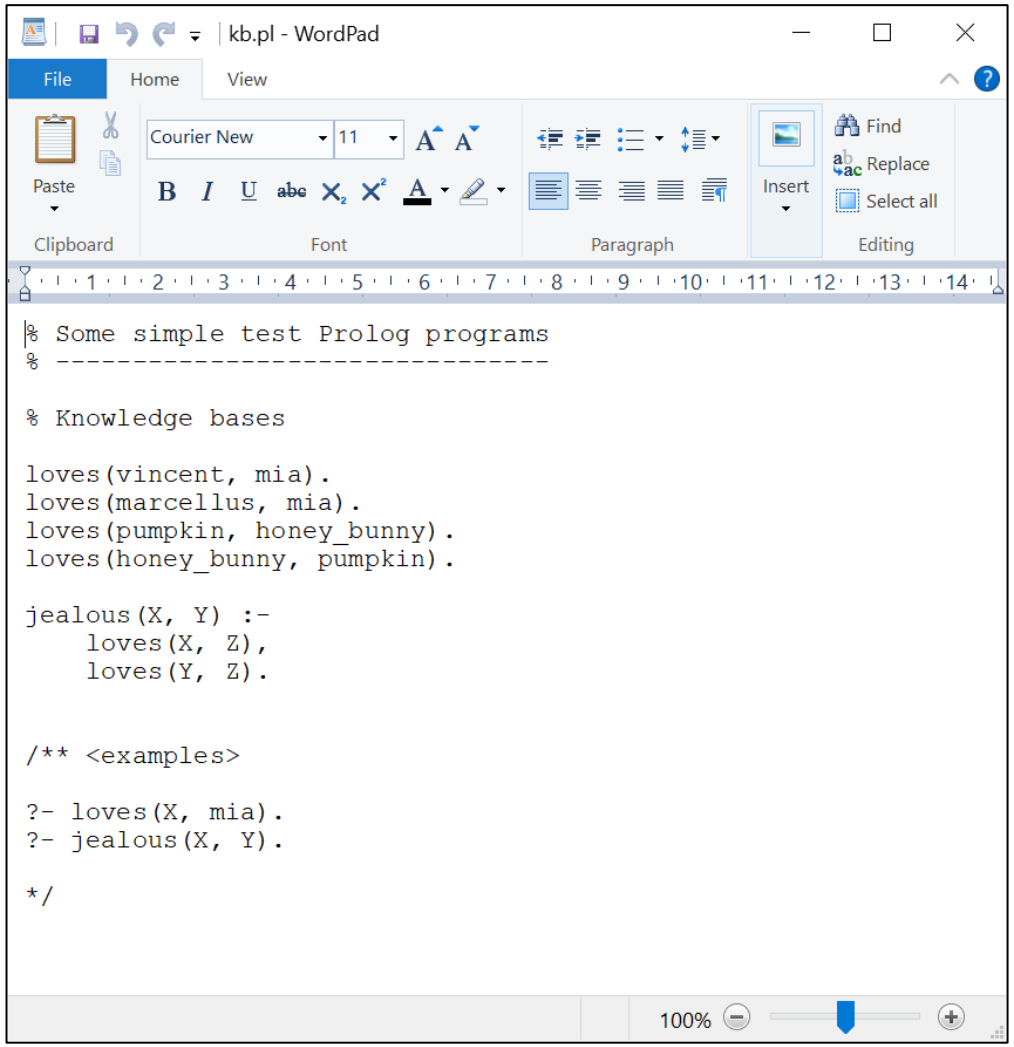
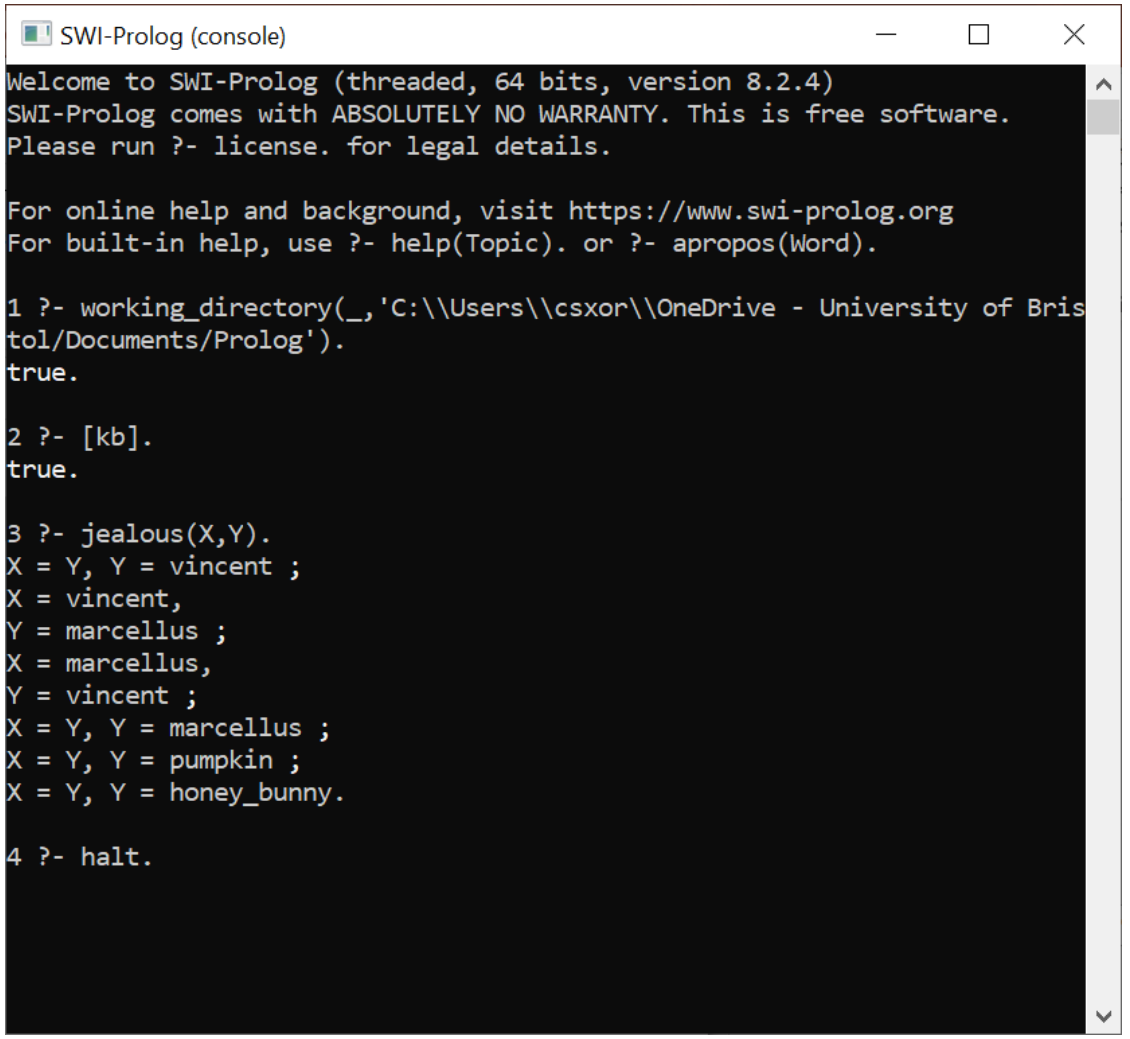
Workflow with text-editor/swipl





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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 configured on some 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
- Remember to press semicolon **;** to obtain more answers to a query!
- You can exit from Prolog using the command **?- halt.**

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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).
```

this space is important!

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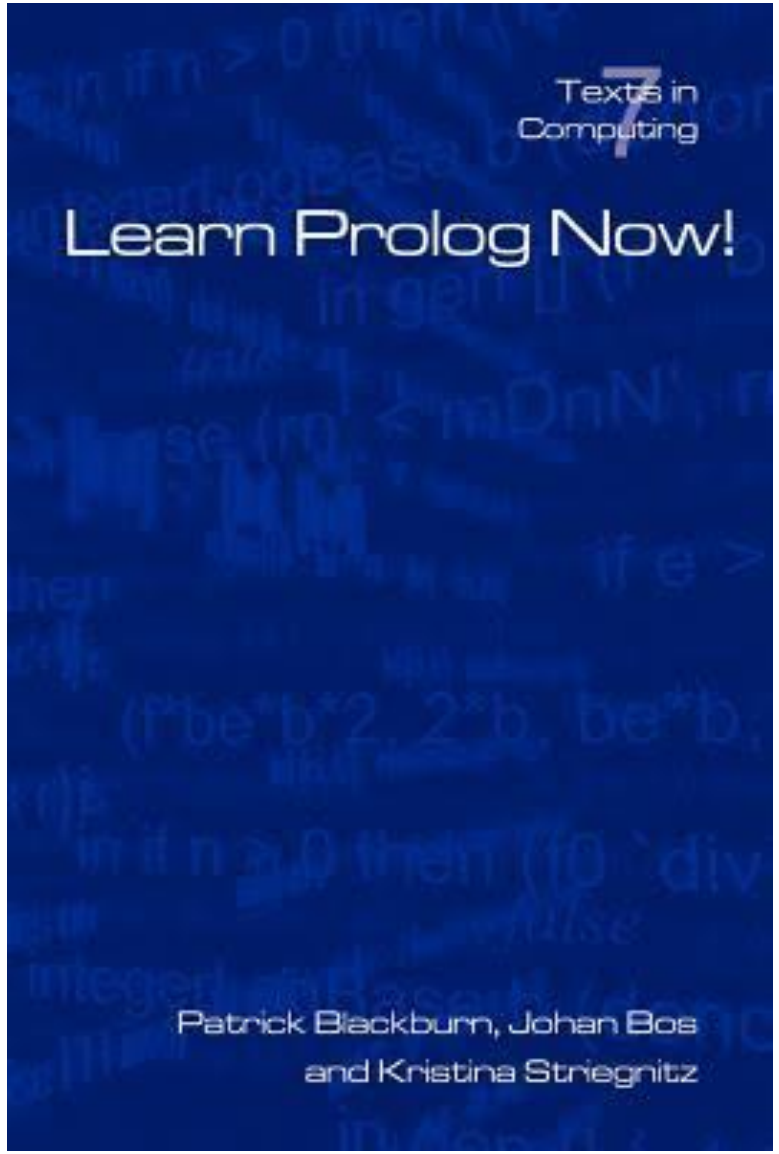
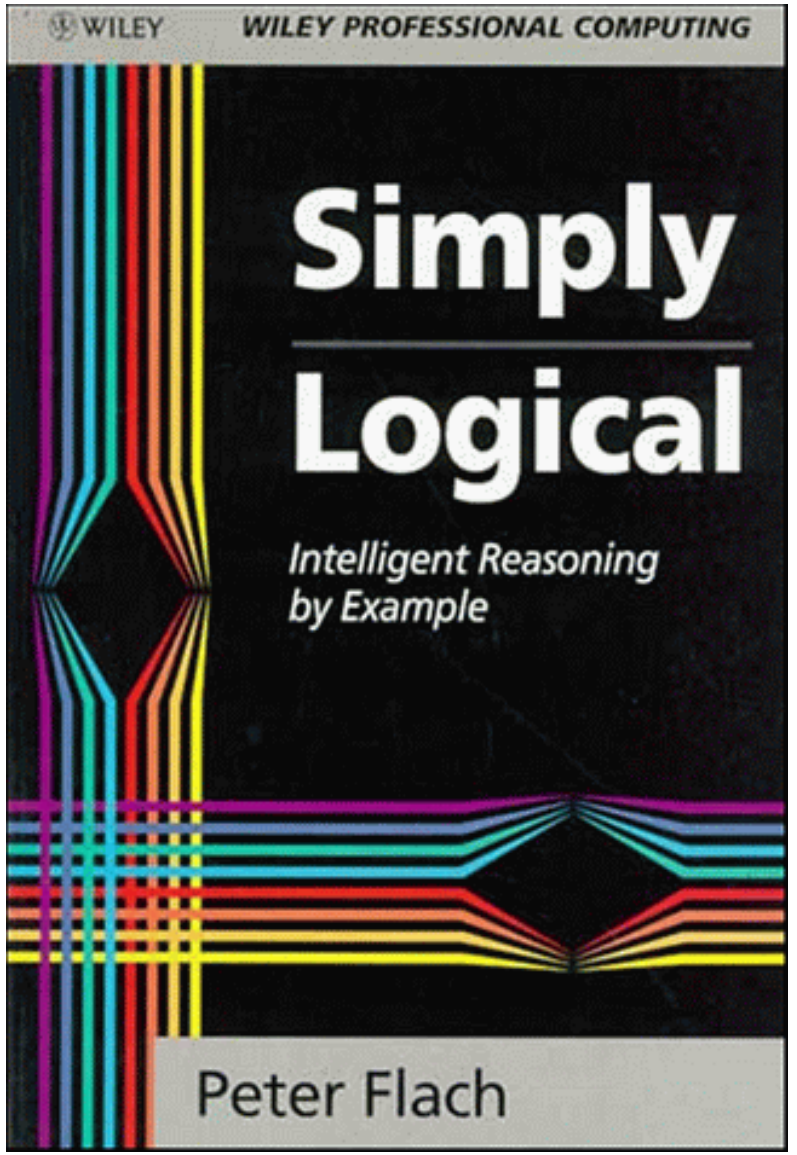
Free Online Prolog Resources





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Thank you