CSB 310: Artificial Intelligence

Lab1: Introduction to Prolog

Submitted By:

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Semester: **5th Sem**

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Department of Computer Science and Engineering

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Q1: What is Prolog and how it is connected to Artificial Intelligence?

Ans: Prolog is a logic programming language. It has important role in artificial intelligence. Unlike many other programming languages, Prolog is intended primarily as a declarative programming language. In prolog, logic is expressed as relations (called as Facts and Rules). Core heart of prolog lies at the logic being applied. Formulation or Computation is carried out by running a query over these relations.

Q2: Download the SWI-Prolog from following link as per your operating system?

Code:

```
[sh-3.2$ brew install swi-prolog
Running `brew update --preinstall`...
==> Downloading https://ghcr.io/v2/homebrew/portable-ruby/portable-ruby/blobs/sh
a256:1f50bf80583bd436c9542d4fa5ad47df0ef0f0bea22ae710c4f04c42d7560bca
######################################################################## 100.0%
==> Pouring portable-ruby-2.6.8_1.el_capitan.bottle.tar.gz
==> Auto-updated Homebrew!
Updated 6 taps (heroku/brew, microsoft/mssql-release, homebrew/core, homebrew/ca
sk, homebrew/services and mongodb/brew).
==> New Formulae
adamstark-audiofile
astro
aws-nuke
aws2-wrap
aztfy
berkeley-db@5
bfgminer
burst
c2rust
cargo-bundle
cargo-crev
cargo-depgraph
cargo-nextest
cargo-udeps
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```
==> Downloading from https://pkg-containers.githubusercontent.com/ghcr1/blobs/sh
######################################################################## 100.0%
==> Downloading https://ghcr.io/v2/homebrew/core/openssl/1.1/manifests/1.1.1q
######################################################################## 100.0%
==> Downloading https://ghcr.io/v2/homebrew/core/openssl/1.1/blobs/sha256:b4dabe
==> Downloading from https://pkg-containers.githubusercontent.com/ghcr1/blobs/sh
######################################################################## 100.0%
==> Downloading https://ghcr.io/v2/homebrew/core/swi-prolog/manifests/8.4.3_1
######################################################################## 100.0%
==> Downloading https://ghcr.io/v2/homebrew/core/swi-prolog/blobs/sha256:f020fd1
==> Downloading from https://pkg-containers.githubusercontent.com/ghcr1/blobs/sh
######################################################################## 100.0%
==> Installing dependencies for swi-prolog: berkeley-db@4, lz4, xz, ca-certifica
tes and openssl@1.1
==> Installing swi-prolog dependency: berkeley-db@4
==> Pouring berkeley-db@4--4.8.30.monterey.bottle.2.tar.gz
🍺  /usr/local/Cellar/berkeley-db@4/4.8.30: 4,596 files, 77.9MB
==> Installing swi-prolog dependency: lz4
==> Pouring lz4--1.9.4.monterey.bottle.tar.gz
🍺  /usr/local/Cellar/lz4/1.9.4: 22 files, 685.2KB
==> Installing swi-prolog dependency: xz
==> Pouring xz--5.2.6.monterey.bottle.tar.gz
🍺  /usr/local/Cellar/xz/5.2.6: 95 files, 1.4MB
==> Installing swi-prolog dependency: ca-certificates
==> Pouring ca-certificates--2022-07-19_1.all.bottle.tar.gz
==> Regenerating CA certificate bundle from keychain, this may take a while...
🍺  /usr/local/Cellar/ca-certificates/2022-07-19_1: 3 files, 222.7KB
==> Installing swi-prolog dependency: openssl@1.1
==> Pouring openssl@1.1--1.1.1q.monterey.bottle.tar.gz
🍺  /usr/local/Cellar/openssl@1.1/1.1.1q: 8,097 files, 18.5MB
==> Installing swi-prolog
==> Pouring swi-prolog--8.4.3_1.monterey.bottle.tar.gz
🍺  /usr/local/Cellar/swi-prolog/8.4.3_1: 999 files, 21.4MB
==> Running `brew cleanup swi-prolog`...
Disable this behaviour by setting HOMEBREW_NO_INSTALL_CLEANUP.
Hide these hints with HOMEBREW_NO_ENV_HINTS (see `man brew`).
Removing: /Users/umangkumar/Library/Caches/Homebrew/swi-prolog--8.4.2... (5.3MB)
Warning: The following dependents of upgraded formulae are outdated but will not
```

Q3: Convert following statements [facts/rules/queries] into PROLOG.

Examples (Facts):

"A dog is a mammal"

"A sparrow is a bird"

Examples (Rules):

"Something is an animal, if it is a mammal or a bird"

Examples (Queries):

"is a sparrow an animal?"

"is a table an animal?"

"what is a dog?"

Code:

```
/* Facts */

/* Dog is mammal */
isa(dog, mammal).

/* Sparrow is a bird */
isa(sparrow, bird).


/* Rule: Something is an animal, if it is a mammal or a bird */
animal(X) :- isa(X, mammal); isa(X, bird).
```

Output:

```
sh-3.2$ swipl
Welcome to SWI-Prolog (threaded, 64 bits, version 8.4.3)
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).

?- consult("3.pl").
true.

?- animal(sparrow).
true.

?- animal(table).
false.

?- isa(dog, X).
X = mammal.

?- _
```

Observation:

Facts and rules need to be described inside the program while the queries are need to run on the console. The rules and facts should be described using rational keywords.

Dogs are mammal and sparrow is a bird are facts while the animal statement is a rule.

The attribute's first character should not be capital. Variable should be capital and constant must be lowercase.

Q4. **Find the answer of the query based on the following statement / knowledge base.**

It is hot today
If it is hot, it will rain.
It was hot yesterday
Query : Will it rain today ?

Code:

```
/* Facts */

/* It is hot today */
hot(today).

/* It was hot yesterday */
hot(yesterday).

/* Rule */

/* If it is hot, it will rain */
rainy(X) :- hot(X).

```

Output:

```
umangkumar@Umangs-MacBook-Air Lab1 % swipl
Welcome to SWI-Prolog (threaded, 64 bits, version 8.4.3)
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).

?- consult("4.pl").
true.

?- rainy(today).
true.

?-
```

Explanation:

Consult operation compile and loads prolog program file on the console. We can access the console using the swipl command. According to the defined rule we can check whether it will rain on any day. It will rain on a day if that day is hot.