ParaGnosis

ParaGnosis is a C++ weighted model counting toolset for linux. Its implementation is based on [1,2,3,4]. We have also added a significant number of Bayesian networks to play with (under *./data/net*)

The toolset consists of the following command-line tools:

- `bn-to-cnf` : a c++ tool to create Conjunctive Normal Form (CNF) encodings from a Bayesian network.
- `bnc` : a c/c++ **B**ayesian **N**etwork **C**ompiler for multiple target representations.
- `bnmc` : a c++ **B**ayesian **N**etwork **M**odel **C**ounter.
- `pg` : a **P**ara**G**nosis user friendly interface to the tools above, written in Python.

The currently supported target languages are:

- Weighted Positive Binary Decision Diagrams (WPBDD)
- Weighted Positive Multi-Valued Decision Diagrams (WPMDD)
- Tree-driven Weighted Positive Multi-valued Decision Diagrams (TD-WPMDD)

Installation (Ubuntu 18.04+)

Install requirements with `apt` :

```
> sudo apt-get install -y libboost-all-dev python3 \
    python-setuptools make cmake gcc g++ libgmp-dev \
    libgsl-dev libreadline-dev make cmake evince
```

Install latest pip (the python package installer):

```
> sudo python3 -m pip install --upgrade pip
```

Install 'sympy' with pip

```
> sudo pip3 install sympy
```

To build all tools in the toolset, type:

```
> make
```

Binaries will be installed in the `<path/to/source>/bin` directory, and the `pg` script will be available system wide.

(Re-)configure `pg`

The `make` process automatically configures `pg` , so this step is optional or if the configuration has failed. In order to let the `pg` script know where the toolset is located, we can run `pg` commands with `pg --source-dir=<path/to/source> ...` , or adjust the following in `pg` 's configuration file `~/.pgrc` :

```
location = <path/to/source>
```

To test if the installation is successful, we can give the following a try. Open a terminal at any location and type:

```
> pg encode asia
or:
> pg --source-dir=<path/to/source> encode asia
```

This should produce encoding statistics for the *asia* network.

Usage

All available commands can be found through `pg --help`, `pg compile --help`, `pg encode --help` and `pg inference --help`. For comprehensive examples, please see the demo.

References

[1] G.H. Dal, A.W. Laarman, A. Hommerso and P.J.F. Lucas, "*A Compositional Approach to Probabilistic Knowledge Compilation*", in International Journal of Approximate Reasoning, vol 138:38-66, 2021.

[2] G.H. Dal, A.W. Laarman and P.J.F. Lucas, "*Parallel Probabilistic Inference by Weighted Model Counting*", in Proceeding of the International Conference on Probabilistic Graphical Models, PMLR, vol 72:97-108, 2018.

[3] G.H. Dal, S. Michels and P.J.F. Lucas, "*Reducing the Cost of Probabilistic Knowledge Compilation*", in Proceedings of Machine Learning Research, volume 73, pages 41-152, 2017.

[4] G.H. Dal and P.J.F. Lucas, "*Weighted Positive Binary Decision Diagrams for Exact Probabilistic Inference*", in Journal of Approximate Reasoning, volume 90, pages 411-432, 2017.