User Manual: Reasoning about the Cascading Failure of Financial Network Using Prolog

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1 Introduction

We construct a Prolog script that models the financial network which has the capability to simulate the spread of financial loss due to bankruptcy. Our focus is in the construction of Prolog script that simulates the cascading failure for a previously constructed model pertaining to Sariwangi AEA and Indorub bankruptcy case. The script is capable of finding *bankrupt nodes*, the amount of financial loss the entire model suffers, and nodes that are vulnerable to bankruptcy. A simulation is run multiple times under different financial failure threshold. From the simulation results, we obtain seven classifications regarding bankrupt nodes associated to a particular failure threshold.

2 Requirements

2.1 Software Requirement

The simulation require SWI-Prolog version 7.6.4 or higher.

3   How To Use

Here we show you the steps to use the program:

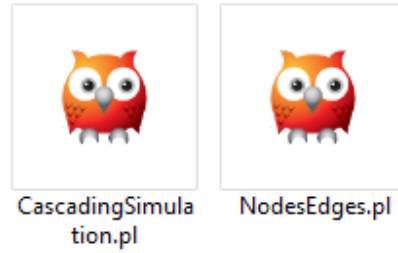1. To start get 'NodesEdges.pl' and 'CascadingSimulation.pl' in one directory. Get both files from: `https://github.com/Georgbart/SariwangiProlog`.

Figure 1: Both files in the same directory

2. Open or run 'CascadingSimulation.pl', it will show the following window.

Figure 2: Start window of CascadingSimulation.pl

3. Type '**start(*Threshold*).**' to start the simulation from default nodes (Sariwangi AEA and Indorub) with threshold of $0 \leq$ **Threshold** < 1. Alternatively you can type '**start(*NodeNames, Threshold*).**' to start the simulation from **NodeNames** (A set of node names).

```
Welcome to SWI-Prolog (threaded, 64 bits, version 7.6.4)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

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

?- start(0.9).
true .
```

Figure 3: Result of **start(0.9)**

4. Type 'collapsed(*Out*).' or 'listCollapsed(*Out*).' to show all nodes that collapsed due to cascading failure. Type 'totalLoss(*Out*).' to show the financial loss of the network (in billions of IDR).

```
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For built-in help, use ?- help(Topic). or ?- apropos(Word).

?- start(0.9).
true .

?- collapsed(Out).
Out = sariwangiaea ;
Out = rabobank ;
Out = aditirtas ;
Out = antariksabuana ;
Out = antarindoo ;
Out = mitrauks ;
Out = craroma ;
Out = indorub.

?- listCollapsed(Out).
Out = [sariwangiaea, rabobank, aditirtas, antariksabuana, antarindoo, mitrauks, craroma
, indorub].

?- totalLoss(Out).
Out = -2891.8380000001257.

?- 
```

Figure 4: Result of simulation

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