KU LEUVEN

DEPARTMENT OF COMPUTER SCIENCE

From Probabilistic NetKAT to ProbLog: New Algorithms for Inference and Learning in Probabilistic Networks

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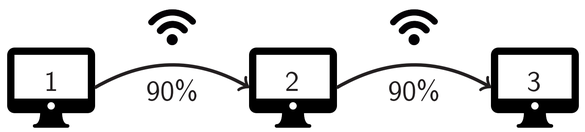
Idea

Transform a Domain-Specific Language into a General-Purpose Language to provide fast prototyping for solving new tasks. We provide a formal translation from **Probabilistic NetKAT to ProbLog**.

Probabilistic NetKAT & ProbLog

ProbNetKAT is a Domain-Specific Language (DSL) to model packets traveling through an unreliable network.
ProbLog is a general purpose probabilistic logic programming language.

Example Network with three nodes and connections with 10% packet loss.



ProbNetKAT

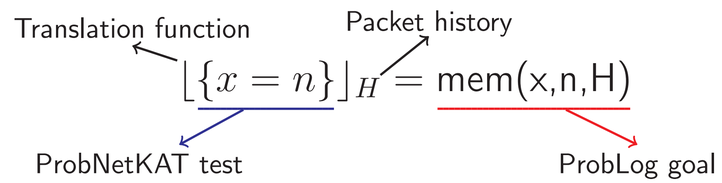
```
((sw = 1 ; sw <- 2 ⊕0.9 drop) & (sw = 2 ; sw <- 3 ⊕0.9 drop))*
                                ; sw = 3
```

ProbLog

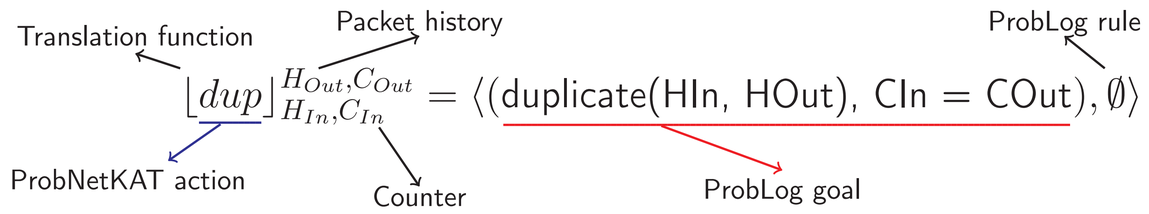
```
0.9 :: connection1.          arrive :- connection1, connection2.
0.9 :: connection2.
```

Translation

Test example

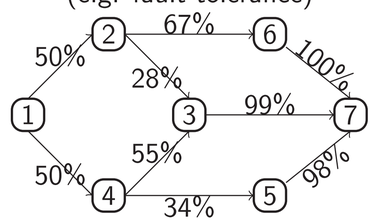


Action example



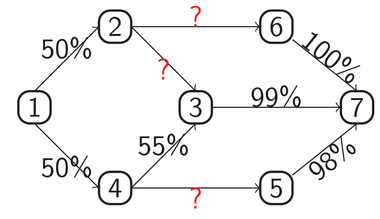
Task Examples

Probabilistic inference
(e.g. fault tolerance)



stochastic policy routing in unreliable network

Parameter learning



unknown parameters in unreliable network

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