Using Probabilistic Logic Programming to Find Patterns

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ProbLog Semantics

MetaProbLog
- Full Negation
- Flexible(intensional) Probabilistic Facts
- Annotated Disjunctions
- Meta calls (High order calls)
- Efficient Inference
- Exact (Marginals and Conditional)
- Program Sampling (Marginals and Conditional)
- Most Probable Explanation (MPE)

ProbLog Models
- Graphical Models
- Bayesian Networks
- Hidden Markov Models
- Probabilistic Graphs
- Any Logic Program (Relational Databases)

ProbLog Applications
- Link Discovery in Biomine Alzheimer database.
- WebKB: discovering the relation among two webpages.
- Probabilistic Dictionary: discover the probability that two words are synonyms.
- Model Mobile Ad hoc Networks and analyses of Fadip.
- Robotic affordance model learning.

Classification of phonocardiogram (PCG) signals
Model PCG signals as HMMs
Use Gaussian distributions for signal features to probabilities
Use counting for calculating the HMM parameters
Future work: learn the HMM parameters

% Query 1: Probability of a state
?- problog_exact(signal(s1,5),P).
P = [0.4]

% Query 2: Conditional probability of a state with prior knowledge
?- problog_exact(signal(s1,5)/start(s1,0),P).
P = [0.23616]

% Query 3: Most probable explanation of a query
?- problog_mpe(signal(s1,5),Res).
Res = [0.131072/start(s2,0)→true,
trans(s2,s1,0,1)→true,
trans(s1,s2,1,2)→true,
trans(s2,s1,2,3)→true,
trans(s2,s1,4,5)→true,
trans(s1,s2,3,4)→true]

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