

Paper Review – Markov Logic Networks

Akhil Sai Chintala (934409906)

- **What is the problem discussed in the paper?**

The problem discussed in the paper is that combining probability and first order logic in a single representation has been a goal in AI for a very long time. To solve this problem, the authors have introduced Markov Logic Networks (MLNs) which is known as a representation that is quite simple combinations of first order logic and probability with no restrictions other than the finiteness of the domain. They have developed efficient algorithms for inference and learning in MLNs and evaluate them in the real world.

MLN is a first-order knowledge base with a weight attached to each formula and can be viewed as a template for constructing Markov networks.

- **Why is it important?**

From the paper, I feel it is important because many real-world problems are unable to be solved or explained by using only probabilistic theory or by only first-order logic. The combination of both can solve many complex problems which resulted in Markov Logic Networks. It uses lifted inference algorithms, which were operated at the first order impact level and uses propositions if necessary. This can be more scalable and can be performed on much larger networks.

- **What are the main ideas of the proposed solution for the problem?**

The main ideas of the proposed solution are,

- a) The main question the author aimed to answer was whether adding probability to a logical knowledge base improves its ability to model the domain or not.
For testing this they have observed the results of answering queries using only logical inference which is very complicated.
- b) The other question was whether the existing probabilistic models are powerful enough to be used in relational domains without the need of MLNs.
- c) The authors have also tried out Inductive Logic Programming to test whether it can be developed automatically or not.

Based on all the problems the final solution was to invent Markov Logic Network.

- **What are the shortcomings of the proposed solution?**

- a) The paper mentioned that the MLN needs to be more efficient to study the use of belief propagation to identify and exploit special cases.
- b) To develop the algorithms for learning and revising the structure of MLNs by directly optimizing likelihood and to study alternative approaches.