Beyond Maximum Likelihood boosting Chow-liu

Head1

Head2

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Paper 1

Problem statement

The Chow-Liu algorithm is designed for learning tree graphical models. From a closer inspection, the Chow-Liu algorithm performs optimally when the number of sample grows towards infinity. However, this is not the case with datasets that lack obsevations relative to the alphest sisze. The Chow-Liu algorithm is highly sub optimal in these high dimension distributions, in the regime where the alphabet size of each node is comparable to the number of observations.

Improving the chow-liu algorithm

The original implementation of the Chow-Liu algoritm attems to solve the Maximum Likelihood Estimator using a tree. Specifically, a Maximum Weight Spanning Tree (MWST) is formed using the mutual information between the nodes of a graph \*\*\*\*AS DEPICTED IN EXPOSEE\*\*\*

However, as referenced in \*\*\*\*HAVE CITATION FOR PEOPLE\*\*\*\*, in high dimensional regimes, finding the mutual information can be sub-optimal

Theorem 1[\*\*\*have citation\*\*\*]. Suupose we have two random variables The minimax sample complexity in estimating the mutual information under mean squsred error is , while the sample complexity required by the empirical mutual information to be consistant is

Interpresting this theorem means that it is sufficient to take fewer samples, if using a minimax rate-optimal estimator to compute the mutual information. At the same time however, there exists distributions hwere in order to bound the error.

This indicates a possible improvement for the traditional Chow-Liu algoritm. Specificcally, finding a more computationally efficient mutal information estimator could reduce the sample size complexity from to .

\*\*\*\*\*INSERT SECTION ABOUT POINTS FROM OTHER LITERATURE IF NEEEDED, (but do later so can focus on important stuff)\*\*\*