UNIVERSITY of GUELPH

COLLEGE of ENGINEERING AND PHYSICAL SCIENCES

SCHOOL OF COMPUTER SCIENCE

MSc Defense

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(If you are interested in viewing the defense please contact Xiaodong at xlin08@uoguelph.ca)

Mixing ICI and CSI Models for More Efficient Probabilistic Inference

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ABSTRACT:

Bayesian Networks (BNs) concisely represent probabilistic knowledge of uncertain environments by exploiting conditional independencies between variables. BNs model variable dependencies with a directed acyclic graph structure and quantify the strength of the dependencies with a conditional probability table (CPT) for each variable. However, a CPT is still exponential on the number of parents that a variable has in the graph.

To address the exponential growth, various local models have been introduced for representational savings and further inference efficiency. Some exploit context-specific independence (CSI), which concisely encode duplicated probabilities. Others exploit independence of causal influence (ICI), which encode causal relationships between variables. Existing techniques apply only ICI or only CSI in a BN. Hence, methods exploiting one model sacrifice savings yielded by the other.

We develop an exact inference framework for BNs modelled with both: We apply non-impeding noisy-AND trees for ICI, and CPT-trees for CSI. The experimental evaluation demonstrates a significant inference efficiency gain beyond what is attainable by exploiting only one type of model.