6. Supplementary Materials for "Parallel Bayesian Network Structure Learning"

We have tested our algorithm on 2 more datasets, CHILD3 (CH) and HAILFINDER (HA). For synchronous cases, BDeu scores fluctuate within -0.2 to $+0.2\%$ and -0.1% to $+2\%$ for CH and HA respectively. Efficiency-wise, we observe that using the proposed inference rules reduces total function calls from 3722 (CH) and 3158 (HA) for GGSL to 1039 and 948 with the inference rules, which is about a $3\sim4$X improvement. When the number of learning agents $K > 1$, we observe similar trends of mean function call reduction as in ALARM. We observe similar results in asynchronous cases as well.

Table 3. BDeu Scores and Numbers of Queries for Different Parallel Algorithms on CHILD10 dataset.

k AGENT	SYNCHRONOUS BDEU CHANGE	MEANFC	TOTALFC
GGSL	+0.0	3722	3722
1	+0.0	1039	1039
2	-1039.1	600.5	1201
3	-234.3	350.7	1052
4	+480.0	263	1052
5	+962.9	230	1150
k AGENT	ASYNCHRONOUS BDEU CHANGE	MEANFC	TOTALFC
2	-60.0	514.0	1028
3	-239.8	373.3	1120
4	-28.0	245.3	969
5	+741.5	206.8	1034

Table 4. BDeu Scores and Numbers of Queries for Different Parallel Algorithms on HAILFINDER dataset.

k AGENT	SYNCHRONOUS BDEU CHANGE	MEANFC	TOTALFC
GGSL	+0.0	3158	3158
1	+0.0	948	948
2	+314.5	443.5	887
3	+767.3	345.7	1037
4	+209.1	273.3	1093
5	+432.8	235.2	1176
k AGENT	ASYNCHRONOUS BDEU CHANGE	MEANFC	TOTALFC
2	-60.0	482.0	964
3	+767.6	332.3	997
4	+856.5	277.0	1108
5	+593.4	199.8	999