Table 1S. Results of validatory experiments with learning from synthetic data

(a) $k = 30$ :											
.01				.05				.10			
$\underline{\alpha = .875}$	$\underline{\alpha = .90}$	$\underline{\alpha = .95}$	$\underline{\alpha} = .975$	$\underline{\alpha = .875}$	$\underline{\alpha = .90}$	$\underline{\alpha = .95}$	$\underline{\alpha = .975}$	$\underline{\alpha = .875}$	$\underline{\alpha = .90}$	$\underline{\alpha = .95}$	$\underline{\alpha = .975}$
.292	.344	.439	.467	.242	.278	.402	.420	.215	.266	.334	.373
13.60	14.80	17.35	18.60	11.60	13.45	16.55	17.90	11.01	12.70	15.60	17.25
.360	.390	.427	.432	.278	.339	.384	.384	.268	.308	.372	.378
.435	.436	.410	.383	.407	.421	.399	.369	.398	.411	.404	.373
$\underline{\alpha = .875}$	$\underline{\alpha = .90}$	$\underline{\alpha = .95}$	$\underline{\alpha = .975}$	$\underline{\alpha = .875}$	$\underline{\alpha = .90}$	$\underline{\alpha = .95}$	$\underline{\alpha = .975}$	$\underline{\alpha = .875}$	$\underline{\alpha = .90}$	$\underline{\alpha = .95}$	$\underline{\alpha = .975}$
.708	.765	.891	.919	.651	.707	.869	.880	.722	.778	.916	.941
22.45	23.70	27.00	28.05	21.85	23.15	26.50	27.20	23.10	24.60	27.75	28.45
.622	.655	.718	.716	.612	.649	.707	.684	.652	.691	.741	.713
.431	.403	.304	.261	.424	.403	.312	.284	.408	.372	.280	.256
$\underline{\alpha = .875}$	$\underline{\alpha = .90}$	$\underline{\alpha = .95}$	$\underline{\alpha = .975}$	$\underline{\alpha = .875}$	$\underline{\alpha = .90}$	$\underline{\alpha = .95}$	$\underline{\alpha = .975}$	$\underline{\alpha = .875}$	$\underline{\alpha = .90}$	$\underline{\alpha = .95}$	$\underline{\alpha = .975}$
.946	.963	.992	.993	.936	.978	.989	.994	.971	.980	.989	.995
28.45	28.80	29.70	29.70	28.15	29.35	29.70	29.90	28.95	29.30	29.70	29.85
.878	.878	.879	.829	.862	.900	.873	.837	.896	.900	.876	.832
.210	.200	.158	.176	.226	.159	.151	.158	.199	.179	.170	.176
(b) $k = 50$ :											
(b) $k = 50$ : .01				.05				.10			
(b) $k = 50$ : .01 $\alpha = .875$	$\underline{\alpha = .90}$	$\underline{\alpha = .95}$	$\underline{\alpha = .975}$	$\underline{\alpha = .875}$	$\underline{\alpha = .90}$	$\underline{\alpha} = .95$	$\underline{\alpha = .975}$	$\underline{\alpha = .875}$	$\underline{\alpha} = .90$	$\underline{\alpha = .95}$	$\underline{\alpha} = .975$
(b) $k = 50$ : .01 $\alpha = .875$ .988	.989	.992	$\frac{\alpha = .975}{.993}$	$\frac{\alpha = .875}{.973}$	.956	.973	.981	$\frac{\alpha = .875}{.924}$	.940	.967	.970
(b) $k = 50$ : .01 $\alpha = .875$ .988 48.05	.989 48.25	.992 48.65	$\underline{\alpha = .975}_{.993}$ 48.80	$\frac{\alpha = .875}{.973}$ 45.60	$.956 \\ 46.20$	$.973 \\ 47.25$	.981 48.10	$\frac{\alpha = .875}{.924}$ 45.50	$.940 \\ 46.15$	$.967 \\ 47.55$	.970 48.25
(b) $k = 50$ : .01 $\alpha = .875$ .988 48.05 .901	.989 48.25 .903	.992 48.65 .894	$\underline{\alpha = .975}$ .993 48.80 .875	$\frac{\alpha = .875}{.973}$ 45.60 .841	.956 46.20 .846	.973 47.25 .841	.981 48.10 .827	$     \underline{\alpha = .875}     .924     45.50     .835 $	$.940 \\ 46.15 \\ .843$	.967 47.55 .836	.970 48.25 .814
(b) $k = 50$ : .01 $\alpha = .875$ .988 48.05	.989 48.25 .903 .222	.992 48.65	$\underline{\alpha = .975}_{.993}$ 48.80	$\frac{\alpha = .875}{.973}$ 45.60	$.956 \\ 46.20$	$.973 \\ 47.25$	.981 48.10 .827 .244	$\frac{\alpha = .875}{.924}$ 45.50	$.940 \\ 46.15$	.967 47.55 .836 .248	.970 48.25
(b) $k = 50$ : .01 $\alpha = .875$ .988 48.05 .901 .234 $\alpha = .875$	$     \begin{array}{r}         .989 \\         48.25 \\         .903 \\         .222 \\         \underline{\alpha = .90}     \end{array} $	.992 48.65 .894	$     \frac{\alpha = .975}{.993}      48.80  .875  .205      \alpha = .975 $		$.95646.20.846.285\alpha = .90$	.973 47.25 .841 .261 $\alpha = .95$	$.981 \\ 48.10 \\ .827 \\ .244 \\ \alpha = .975$	$\frac{\alpha = .875}{.924} \\ 45.50 \\ .835 \\ .294 \\ \alpha = .875$	$.940 \\ 46.15 \\ .843$	$.967 \\ 47.55 \\ .836 \\ .248 \\ \underline{\alpha = .95}$	$ \begin{array}{r} .970 \\ 48.25 \\ .814 \\ .236 \\ \underline{\alpha} = .975 \end{array} $
(b) $k = 50$ : .01 $\alpha = .875$ .988 48.05 .901 .234 $\alpha = .875$ .999	$ \begin{array}{r} .989\\ 48.25\\ .903\\ .222\\ \underline{\alpha = .90}\\ .999 \end{array} $	.992 48.65 .894 .205	$     \frac{\alpha = .975}{.993}      48.80  .875  .205      \alpha = .975  .998 $	$\begin{array}{l} \underline{\alpha = .875} \\ .973 \\ 45.60 \\ .841 \\ .296 \\ \underline{\alpha = .875} \\ .999 \end{array}$	$.956 46.20 .846 .285 \alpha = .90.999$	.973 47.25 .841 .261 $\alpha = .95$ .999	$.981 48.10 .827 .244 \alpha = .975.999$	$     \underline{\alpha} = .875   $ .924     45.50     .835     .294	.940 46.15 .843 .275	.967 47.55 .836 .248	$ \begin{array}{r} .970 \\ 48.25 \\ .814 \\ .236 \\ \underline{\alpha = .975} \\ .999 \end{array} $
(b) $k = 50$ : .01 $\alpha = .875$ .988 48.05 .901 .234 $\alpha = .875$ .999 50.00	$ \begin{array}{r} .989\\ 48.25\\ .903\\ .222\\ \underline{\alpha = .90}\\ .999\\ 50.00\\ \end{array} $	$ \begin{array}{r} .992 \\ 48.65 \\ .894 \\ .205 \\ \underline{\alpha = .95} \\ .999 \\ 50.10 \end{array} $	$ \frac{\alpha = .975}{.993} \\ 48.80 \\ .875 \\ .205 \\ \alpha = .975 \\ .998 \\ 50.15 $	$\begin{array}{l} \underline{\alpha = .875} \\ .973 \\ 45.60 \\ .841 \\ .296 \\ \underline{\alpha = .875} \\ .999 \\ 50.00 \end{array}$	$.956 46.20 .846 .285 \alpha = .90.99950.00$	.973 47.25 .841 .261 $\alpha = .95$ .999 50.00	$.981 48.10 .827 .244 \alpha = .975.99950.10$	$\frac{\alpha = .875}{.924} \\ 45.50 \\ .835 \\ .294 \\ \alpha = .875 \\ .999 \\ 50.00$	$.940 46.15 .843 .275 \alpha = .90.99950.00$	$.96747.55.836.248\alpha = .95.99950.00$	$ \begin{array}{r} .970 \\ 48.25 \\ .814 \\ .236 \\ \underline{\alpha = .975} \\ .999 \\ 50.00 \\ \end{array} $
(b) $k = 50$ : .01 $\alpha = .875$ .988 48.05 .901 .234 $\alpha = .875$ .999 50.00 .978	$ \begin{array}{r}     .989 \\     48.25 \\     .903 \\     .222 \\     \underline{\alpha = .90} \\     .999 \\     50.00 \\     .976 \\ \end{array} $	$ \begin{array}{r} .992 \\ 48.65 \\ .894 \\ .205 \\ \underline{\alpha = .95} \\ .999 \\ 50.10 \\ .956 \end{array} $	$ \frac{\alpha = .975}{.993} \\ 48.80 \\ .875 \\ .205 \\ \frac{\alpha = .975}{.998} \\ 50.15 \\ .936 $	$\begin{array}{l} \underline{\alpha = .875} \\ .973 \\ 45.60 \\ .841 \\ .296 \\ \underline{\alpha = .875} \\ .999 \\ 50.00 \\ .988 \end{array}$	$\begin{array}{c} .956 \\ 46.20 \\ .846 \\ .285 \\ \underline{\alpha = .90} \\ .999 \\ 50.00 \\ .984 \end{array}$	.973 47.25 .841 .261 $\underline{\alpha = .95}$ .999 50.00 .966	$ \begin{array}{r} .981\\ 48.10\\ .827\\ .244\\ \underline{\alpha = .975}\\ .999\\ 50.10\\ .950\\ \end{array} $	$\frac{\alpha = .875}{.924} \\ 45.50 \\ .835 \\ .294 \\ \alpha = .875 \\ .999 \\ 50.00 \\ .989$	$.94046.15.843.275\underline{\alpha = .90}.99950.00.986$	$\begin{array}{c} .967 \\ 47.55 \\ .836 \\ .248 \\ \underline{\alpha = .95} \\ .999 \\ 50.00 \\ .974 \end{array}$	
(b) $k = 50$ : .01 $\alpha = .875$ .988 48.05 .901 .234 $\alpha = .875$ .999 50.00 .978 .058		$\begin{array}{c} .992\\ 48.65\\ .894\\ .205\\ \underline{\alpha=.95}\\ .999\\ 50.10\\ .956\\ .084 \end{array}$	$\frac{\alpha = .975}{.993}$ $\frac{48.80}{.875}$ $\frac{.205}{.205}$ $\frac{\alpha = .975}{.998}$ $\frac{50.15}{.936}$ $.101$	$\begin{array}{l} \underline{\alpha = .875} \\ .973 \\ 45.60 \\ .841 \\ .296 \\ \underline{\alpha = .875} \\ .999 \\ 50.00 \\ .988 \\ .041 \end{array}$	$.956 46.20 .846 .285 \alpha = .90.99950.00$	.973 47.25 .841 .261 $\alpha = .95$ .999 50.00 .966 .077	$ \begin{array}{r} .981 \\ 48.10 \\ .827 \\ .244 \\ \underline{\alpha = .975} \\ .999 \\ 50.10 \\ .950 \\ .091 \\ \end{array} $	$\begin{array}{l} \underline{\alpha = .875} \\ .924 \\ 45.50 \\ .835 \\ .294 \\ \underline{\alpha = .875} \\ .999 \\ 50.00 \\ .989 \\ .036 \end{array}$	$\begin{array}{c} .940 \\ 46.15 \\ .843 \\ .275 \\ \underline{\alpha = .90} \\ .999 \\ 50.00 \\ .986 \\ .042 \end{array}$	$\begin{array}{c} .967\\ 47.55\\ .836\\ .248\\ \underline{\alpha=.95}\\ .999\\ 50.00\\ .974\\ .064 \end{array}$	$ \begin{array}{r} .970 \\ 48.25 \\ .814 \\ .236 \\ \underline{\alpha = .975} \\ .999 \\ 50.00 \\ \end{array} $
(b) $k = 50$ : .01 $\alpha = .875$ .988 48.05 .901 .234 $\alpha = .875$ .999 50.00 .978 .058 $\alpha = .875$	$\begin{array}{c} .989\\ 48.25\\ .903\\ .222\\ \underline{\alpha=.90}\\ .999\\ 50.00\\ .976\\ .059\\ \underline{\alpha=.90} \end{array}$	$\begin{array}{c} .992 \\ 48.65 \\ .894 \\ .205 \\ \underline{\alpha = .95} \\ .999 \\ 50.10 \\ .956 \\ .084 \\ \underline{\alpha = .95} \end{array}$	$\frac{\alpha = .975}{.993}$ 48.80 .875 .205 $\frac{\alpha = .975}{.998}$ 50.15 .936 .101 $\alpha = .975$	$\begin{array}{l} \underline{\alpha = .875} \\ .973 \\ 45.60 \\ .841 \\ .296 \\ \underline{\alpha = .875} \\ .999 \\ 50.00 \\ .988 \\ .041 \\ \underline{\alpha = .875} \end{array}$	$\begin{array}{c} .956\\ 46.20\\ .846\\ .285\\ \underline{\alpha=.90}\\ .999\\ 50.00\\ .984\\ .050\\ \underline{\alpha=.90} \end{array}$	$\begin{array}{l} .973\\ 47.25\\ .841\\ .261\\ \underline{\alpha=.95}\\ .999\\ 50.00\\ .966\\ .077\\ \underline{\alpha=.95} \end{array}$	$\begin{array}{c} .981\\ 48.10\\ .827\\ .244\\ \underline{\alpha=.975}\\ .999\\ 50.10\\ .950\\ .091\\ \underline{\alpha=.975}\\ \end{array}$	$\begin{array}{l} \underline{\alpha = .875} \\ .924 \\ 45.50 \\ .835 \\ .294 \\ \underline{\alpha = .875} \\ .999 \\ 50.00 \\ .989 \\ .036 \\ \underline{\alpha = .875} \end{array}$	$\begin{array}{c} .940 \\ 46.15 \\ .843 \\ .275 \\ \underline{\alpha = .90} \\ .999 \\ 50.00 \\ .986 \\ .042 \\ \underline{\alpha = .90} \end{array}$	$\begin{array}{l} .967\\ 47.55\\ .836\\ .248\\ \underline{\alpha=.95}\\ .999\\ 50.00\\ .974\\ .064\\ \underline{\alpha=.95} \end{array}$	$\begin{array}{c} .970\\ 48.25\\ .814\\ .236\\ \underline{\alpha=.975}\\ .999\\ 50.00\\ .959\\ .081\\ \underline{\alpha=.975}\\ \end{array}$
(b) $k = 50$ : .01 $\alpha = .875$ .988 48.05 .901 .234 $\alpha = .875$ .999 50.00 .978 .058 $\alpha = .875$ 1.000		$\begin{array}{c} .992\\ 48.65\\ .894\\ .205\\ \underline{\alpha=.95}\\ .999\\ 50.10\\ .956\\ .084\\ \underline{\alpha=.95}\\ 1.000\\ \end{array}$	$\begin{array}{l} \underline{\alpha = .975} \\ .993 \\ 48.80 \\ .875 \\ .205 \\ \underline{\alpha = .975} \\ .998 \\ 50.15 \\ .936 \\ .101 \\ \underline{\alpha = .975} \\ 1.000 \end{array}$	$\begin{array}{l} \underline{\alpha = .875} \\ .973 \\ 45.60 \\ .841 \\ .296 \\ \underline{\alpha = .875} \\ .999 \\ 50.00 \\ .988 \\ .041 \\ \underline{\alpha = .875} \\ .999 \end{array}$	$\begin{array}{c} .956 \\ 46.20 \\ .846 \\ .285 \\ \underline{\alpha = .90} \\ .999 \\ 50.00 \\ .984 \\ .050 \\ \underline{\alpha = .90} \\ 1.000 \end{array}$	$\begin{array}{c} .973 \\ 47.25 \\ .841 \\ .261 \\ \underline{\alpha = .95} \\ .999 \\ 50.00 \\ .966 \\ .077 \\ \underline{\alpha = .95} \\ 1.000 \end{array}$	$\begin{array}{c} .981\\ 48.10\\ .827\\ .244\\ \underline{\alpha=.975}\\ .999\\ 50.10\\ .950\\ .091\\ \underline{\alpha=.975}\\ .999\end{array}$	$\begin{array}{l} \underline{\alpha = .875} \\ .924 \\ 45.50 \\ .835 \\ .294 \\ \underline{\alpha = .875} \\ .999 \\ 50.00 \\ .989 \\ .036 \\ \underline{\alpha = .875} \\ .999 \end{array}$	$\begin{array}{c} .940\\ 46.15\\ .843\\ .275\\ \underline{\alpha=.90}\\ .999\\ 50.00\\ .986\\ .042\\ \underline{\alpha=.90}\\ .999\end{array}$	$\begin{array}{c} .967\\ 47.55\\ .836\\ .248\\ \underline{\alpha=.95}\\ .999\\ 50.00\\ .974\\ .064\\ \underline{\alpha=.95}\\ .999\end{array}$	$\begin{array}{c} .970 \\ 48.25 \\ .814 \\ .236 \\ \underline{\alpha} = .975 \\ .999 \\ 50.00 \\ .959 \\ .081 \\ \underline{\alpha} = .975 \\ .999 \end{array}$
(b) $k = 50$ : .01 $\alpha = .875$ .988 48.05 .901 .234 $\alpha = .875$ .999 50.00 .978 .058 $\alpha = .875$ 1.000 50.00	.989 $48.25$ .903         .222 $\alpha = .90$ .999 $50.00$ .976         .059 $\alpha = .90$ $1.000$ $50.00$	$\begin{array}{c} .992\\ 48.65\\ .894\\ .205\\ \underline{\alpha=.95}\\ .999\\ 50.10\\ .956\\ .084\\ \underline{\alpha=.95}\\ 1.000\\ 50.00\\ \end{array}$	$\begin{array}{l} \underline{\alpha = .975} \\ .993 \\ 48.80 \\ .875 \\ .205 \\ \underline{\alpha = .975} \\ .998 \\ 50.15 \\ .936 \\ .101 \\ \underline{\alpha = .975} \\ 1.000 \\ 50.00 \end{array}$	$\begin{array}{l} \underline{\alpha = .875} \\ .973 \\ 45.60 \\ .841 \\ .296 \\ \underline{\alpha = .875} \\ .999 \\ 50.00 \\ .988 \\ .041 \\ \underline{\alpha = .875} \\ .999 \\ 50.00 \end{array}$	$\begin{array}{c} .956 \\ 46.20 \\ .846 \\ .285 \\ \underline{\alpha = .90} \\ .999 \\ 50.00 \\ .984 \\ .050 \\ \underline{\alpha = .90} \\ 1.000 \\ 50.00 \end{array}$	$\begin{array}{c} .973 \\ 47.25 \\ .841 \\ .261 \\ \underline{\alpha = .95} \\ .999 \\ 50.00 \\ .966 \\ .077 \\ \underline{\alpha = .95} \\ 1.000 \\ 50.00 \end{array}$	$\begin{array}{c} .981\\ 48.10\\ .827\\ .244\\ \underline{\alpha=.975}\\ .999\\ 50.10\\ .950\\ .091\\ \underline{\alpha=.975}\\ .999\\ 50.00\\ \end{array}$	$\begin{array}{l} \underline{\alpha = .875} \\ .924 \\ 45.50 \\ .835 \\ .294 \\ \underline{\alpha = .875} \\ .999 \\ 50.00 \\ .989 \\ .036 \\ \underline{\alpha = .875} \\ .999 \\ 50.00 \end{array}$	$\begin{array}{c} .940\\ 46.15\\ .843\\ .275\\ \underline{\alpha=.90}\\ .999\\ 50.00\\ .986\\ .042\\ \underline{\alpha=.90}\\ .999\\ 50.00\\ \end{array}$	$\begin{array}{c} .967\\ 47.55\\ .836\\ .248\\ \underline{\alpha=.95}\\ .999\\ 50.00\\ .974\\ .064\\ \underline{\alpha=.95}\\ .999\\ 50.00\\ \end{array}$	.970 $48.25$ .814         .236 $\alpha = .975$ .999 $50.00$ .959         .081 $\alpha = .975$ .999 $50.15$
(b) $k = 50$ : .01 $\alpha = .875$ .988 48.05 .901 .234 $\alpha = .875$ .999 50.00 .978 .058 $\alpha = .875$ 1.000		$\begin{array}{c} .992\\ 48.65\\ .894\\ .205\\ \underline{\alpha=.95}\\ .999\\ 50.10\\ .956\\ .084\\ \underline{\alpha=.95}\\ 1.000\\ \end{array}$	$\begin{array}{l} \underline{\alpha = .975} \\ .993 \\ 48.80 \\ .875 \\ .205 \\ \underline{\alpha = .975} \\ .998 \\ 50.15 \\ .936 \\ .101 \\ \underline{\alpha = .975} \\ 1.000 \end{array}$	$\begin{array}{l} \underline{\alpha = .875} \\ .973 \\ 45.60 \\ .841 \\ .296 \\ \underline{\alpha = .875} \\ .999 \\ 50.00 \\ .988 \\ .041 \\ \underline{\alpha = .875} \\ .999 \end{array}$	$\begin{array}{c} .956 \\ 46.20 \\ .846 \\ .285 \\ \underline{\alpha = .90} \\ .999 \\ 50.00 \\ .984 \\ .050 \\ \underline{\alpha = .90} \\ 1.000 \end{array}$	$\begin{array}{c} .973 \\ 47.25 \\ .841 \\ .261 \\ \underline{\alpha = .95} \\ .999 \\ 50.00 \\ .966 \\ .077 \\ \underline{\alpha = .95} \\ 1.000 \end{array}$	$\begin{array}{c} .981\\ 48.10\\ .827\\ .244\\ \underline{\alpha=.975}\\ .999\\ 50.10\\ .950\\ .091\\ \underline{\alpha=.975}\\ .999\end{array}$	$\begin{array}{l} \underline{\alpha = .875} \\ .924 \\ 45.50 \\ .835 \\ .294 \\ \underline{\alpha = .875} \\ .999 \\ 50.00 \\ .989 \\ .036 \\ \underline{\alpha = .875} \\ .999 \end{array}$	$\begin{array}{c} .940\\ 46.15\\ .843\\ .275\\ \underline{\alpha=.90}\\ .999\\ 50.00\\ .986\\ .042\\ \underline{\alpha=.90}\\ .999\end{array}$	$\begin{array}{c} .967\\ 47.55\\ .836\\ .248\\ \underline{\alpha=.95}\\ .999\\ 50.00\\ .974\\ .064\\ \underline{\alpha=.95}\\ .999\end{array}$	$\begin{array}{c} .970 \\ 48.25 \\ .814 \\ .236 \\ \underline{\alpha} = .975 \\ .999 \\ 50.00 \\ .959 \\ .081 \\ \underline{\alpha} = .975 \\ .999 \end{array}$

The values .01, .05, .1 refer to the defined levels of noise in the generating model. The three rows of each table panel (a,b) correspond to the generating distributions of the cluster sizes: Uniform (5,20), Uniform (10,25), Uniform (15,30), in the given order (top-down). Each column of

four values under a specific value of  $\alpha$  reports means over 20 simulated data sets generated using the same design (k, distribution of the number of clusters, noise level) and analyzed using the proposed method. The four reported values are (top-down): adjusted Rand Index, number of clusters in the optimal partition, mean percentage (over clusters) of the group-specific amplifications correctly discovered by the optimal model structure, std.dev. of the percentage (over clusters) of the group-specific amplifications correctly discovered by the optimal model structure.