Problem 10: Lifted Inference

Given:

A probabilistic program directly implementing the generative model:

$$\text{cause} \sim \text{Bernoulli}(0.01);$$
$$\texttt{for all } i \texttt{ in } \{1, \ldots, n\}$$
$$\text{effect}_i \sim \text{Bernoulli}(0.6), \texttt{ if } \text{cause},$$
$$\text{Bernoulli}(0.05), \texttt{ if not } \text{cause}$$

Find:

Query: The exact value of $P(\text{cause} \mid \#\{i: \text{effect}_i\} = k)$. Here, $\#set$ returns the cardinality of the set.

Metric:

Time required to answer the query for values:

$n \in \{10,20,40,80,160,320,640,1280,2560,5120\}$

$k \in \{1,2,4,8,16,32,64\}$ and $k < n$

Instead of a performance profile for each of these values, please submit a single CSV file named "problem-10-metrics.csv" with three columns: n, k, and running time (in milliseconds with decimal fraction) of your solution.

Note that ideal running time should scale as $O\big(log(n + k)\big)$

Submission:

The metric value should be computed for each elapsed time step (by calling the provided code or by implementing yourself). The metric value should be reported for several elapsed time steps. The number of elapsed time steps should be sufficient to establish an "informative profile".

For further details regarding submission of the metric and your code, please refer to the main CP4 problem description document, e.g. PPAML-Challenge-Problem-4.pdf.

Sample output for this problem has been provided in the "sampleoutput" folder:

`problem-10-metrics.csv`