CONJECTURE:

Any arbitrary network solution can be approximated by a matroidal solution (i.e., with integer-valued entropies) over a possibly larger alphabet size.

Consequence: We can limit the search to matroidal solutions, where the entropy of any subset of the edges is an integer.

HOW IT WORKS:

- Show that any multivariate distribution over finite alphabets can be approximated by a dyadic distribution, with an excess entropy of at most 2 bits regardless of the alphabet size.
- Extend the result to show that all marginal distributions can also be made dyadic, with a negligible excess entropy as the alphabet size increases.
- Dyadric distributions translate to rational entropies.
- Since the conditional entropies are also approximated with an arbitrary precision, the resulting solution is also implementable.

Note: the conjecture above aims at arbitrary random vectors, independent of any network setting or topology.

ASSUMPTIONS AND LIMITATIONS:

- Assuming noiseless links (common network coding setting).
- Large alphabet size: large block length, hence a large delay.
- Assuming each source is i.i.d. and memoryless operations in the nodes.

We may limit our attention (and the toolbox we use) to matroidal solutions.