



# Tree Normal Approximation

## 1 Why

TODO change name? should be something about approximating a normal.

What is the best tree density approximant to a normal density? What is the

## 2 Result

**Proposition 1.** *Let  $g$  be a normal density with mean  $\mu \in \mathbf{R}^d$  and covariance  $\Sigma \in \mathbf{S}_{++}^d$ . Let  $T$  be a Chow-Liu tree of  $g$ . Let  $f$  be a gaussian density with mean  $\mu$  and precision matrix  $P$  where*

- $P_{11} = \Sigma_{11}^{-1} + \sum_{pa_j=1} \Sigma_{j1}^2 \Sigma_{11}^{-2} \Sigma_{j|1}^{-1}$
- for  $i = 2, \dots, d$ ,  $P_{ii} = \Sigma_{i|pa_i}^{-1} + \sum_{pa_j=i} \Sigma_{ji}^2 \Sigma_{ii}^{-2} \Sigma_{j|i}^{-1}$
- $i, j = 1, \dots, d$  and  $i = pa_j$ ,  $P_{ij} = P_{ji} = -\Sigma_{ji} \Sigma_{jj}^{-1} \Sigma_{j|i}^{-1}$

*Then  $f$  is Chow-Liu density of  $g$ .*

*Proof.*

□