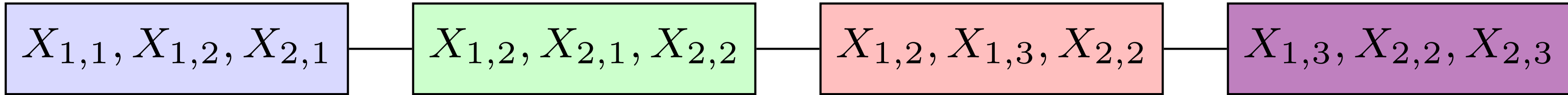


Graphic and junction tree

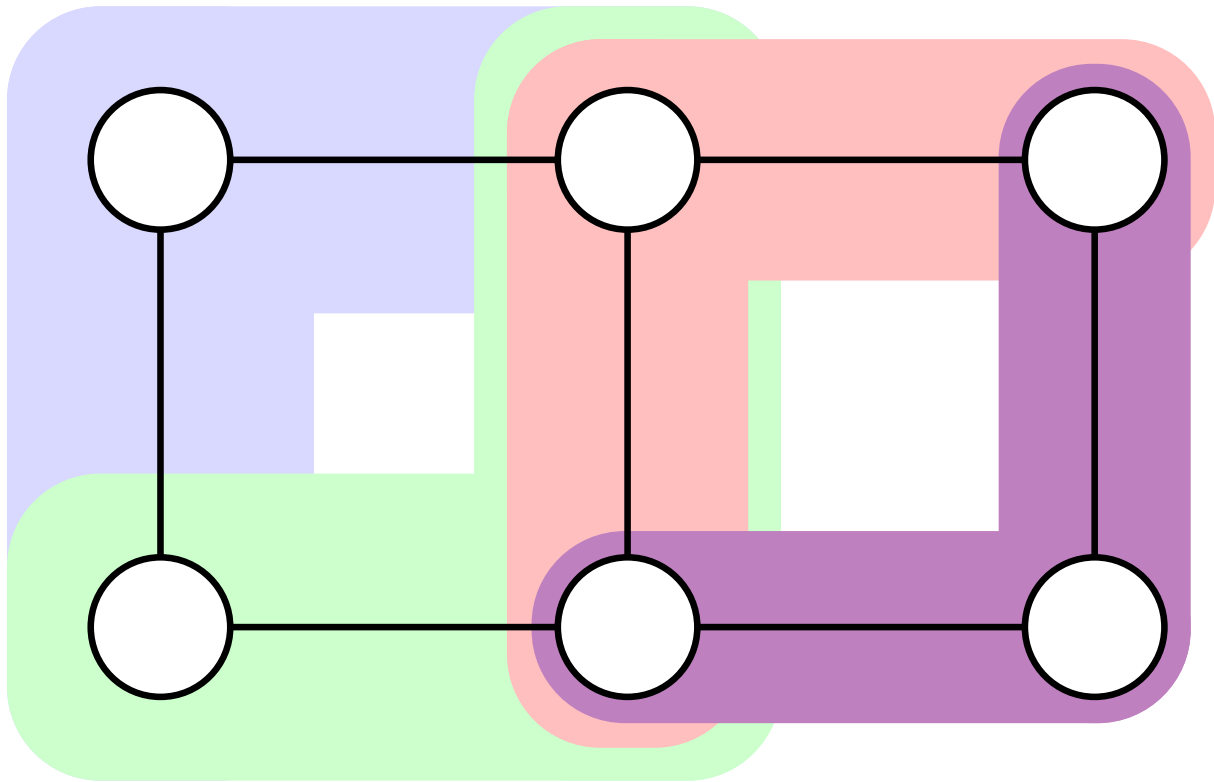
• informally, a junction tree “shows” a graph into a tree

- can use the tree structure to speed up Metro (allowed to forget the past)

- treewidth: a measure of graph complexity (if treewidth w , can forget history w steps away)

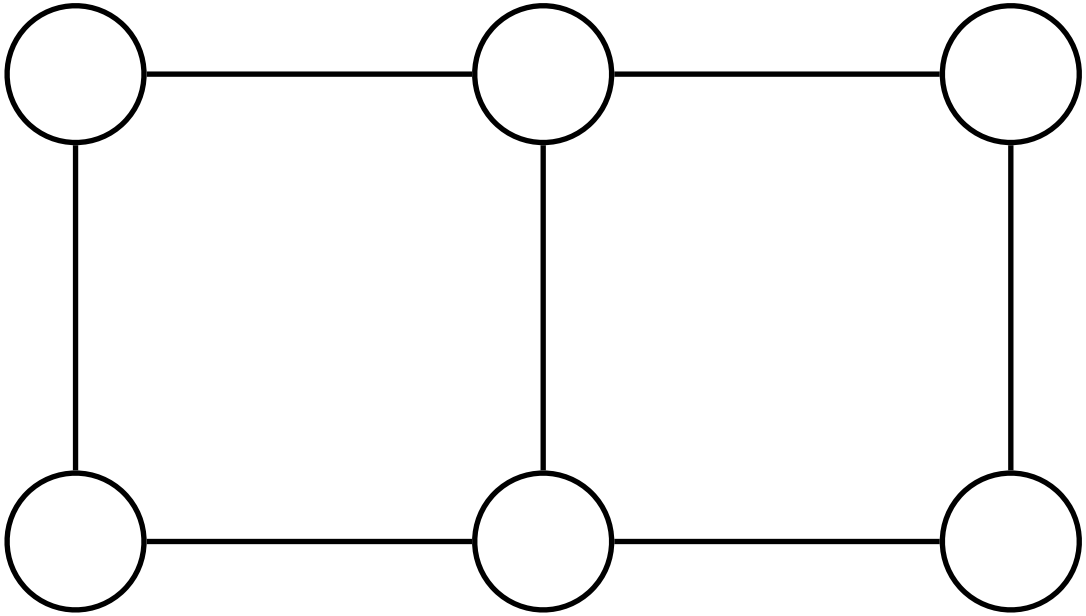


treewidth: largest node size minus 1



X_i independent of X_j given the remaining
variables if no edge connects i and j

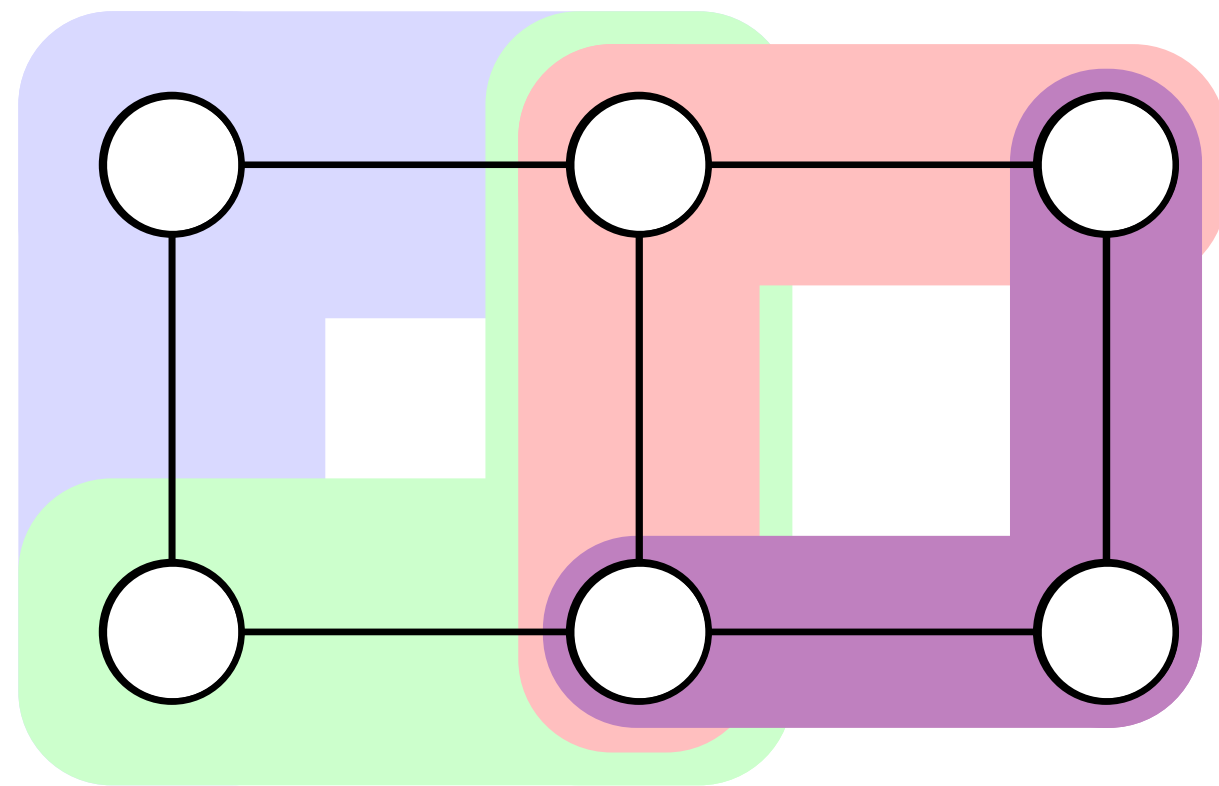
Using junction tree, Metrc has time complexity $\mathcal{O}(p2^w)$, w being the treewidth



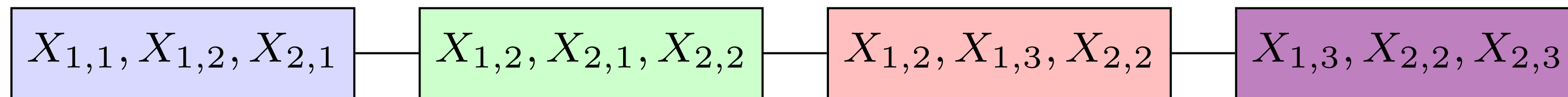
(this happens to be a chain;
could be a tree in general)

Graphical model and junction tree

X_i independent of X_j given the remaining variables if no edge connects i and j



- informally, a junction tree “shoehorns” a graph into a tree
- can use the tree structure to speed up Metro (allowed to forget the past)
- treewidth: a measure of graph complexity (if treewidth w , can forget history w steps away)



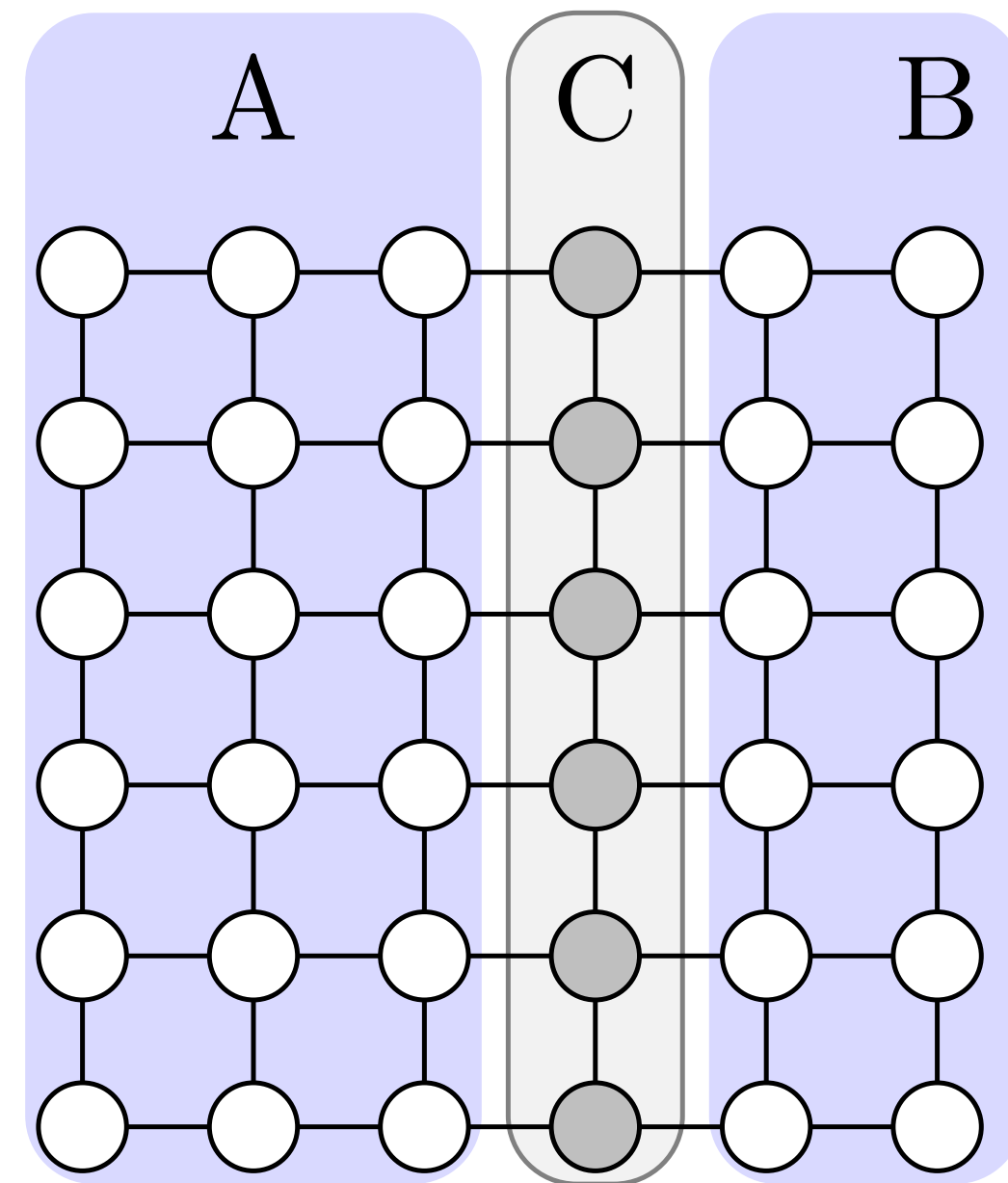
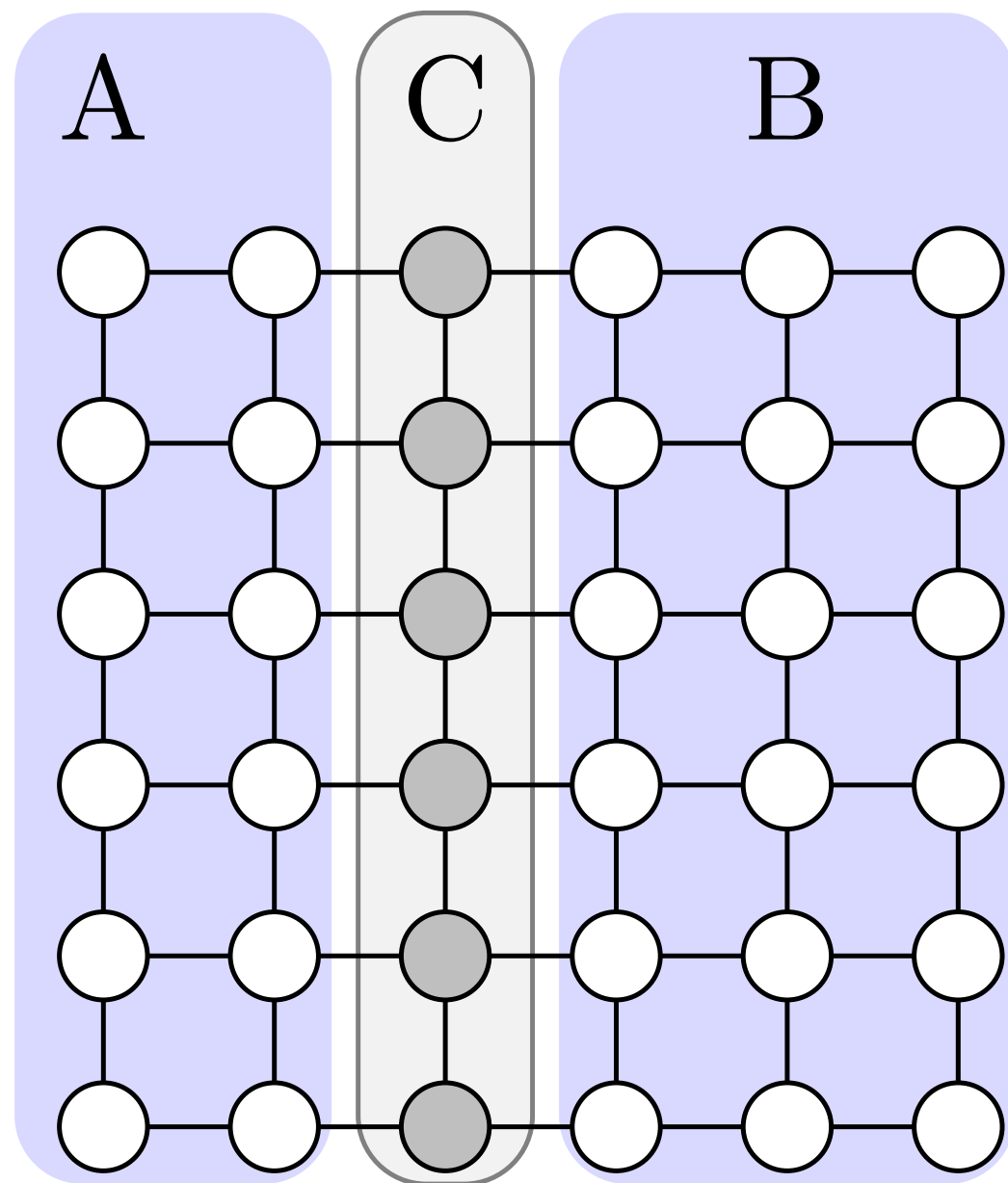
(this happens to be a chain;
could be a tree in general)

treewidth: largest node size minus 1

Using junction tree, Metro has time complexity $O(p2^w)$, w being the treewidth

Reduce treewidth by conditioning

A $d_1 \times d_2$ grid has treewidth $\min(d_1, d_2)$



two examples of conditioning to reduce the treewidth of a 6×6 grid from 6 to 3