Large Cuts with Local Algorithms

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Online manuscript
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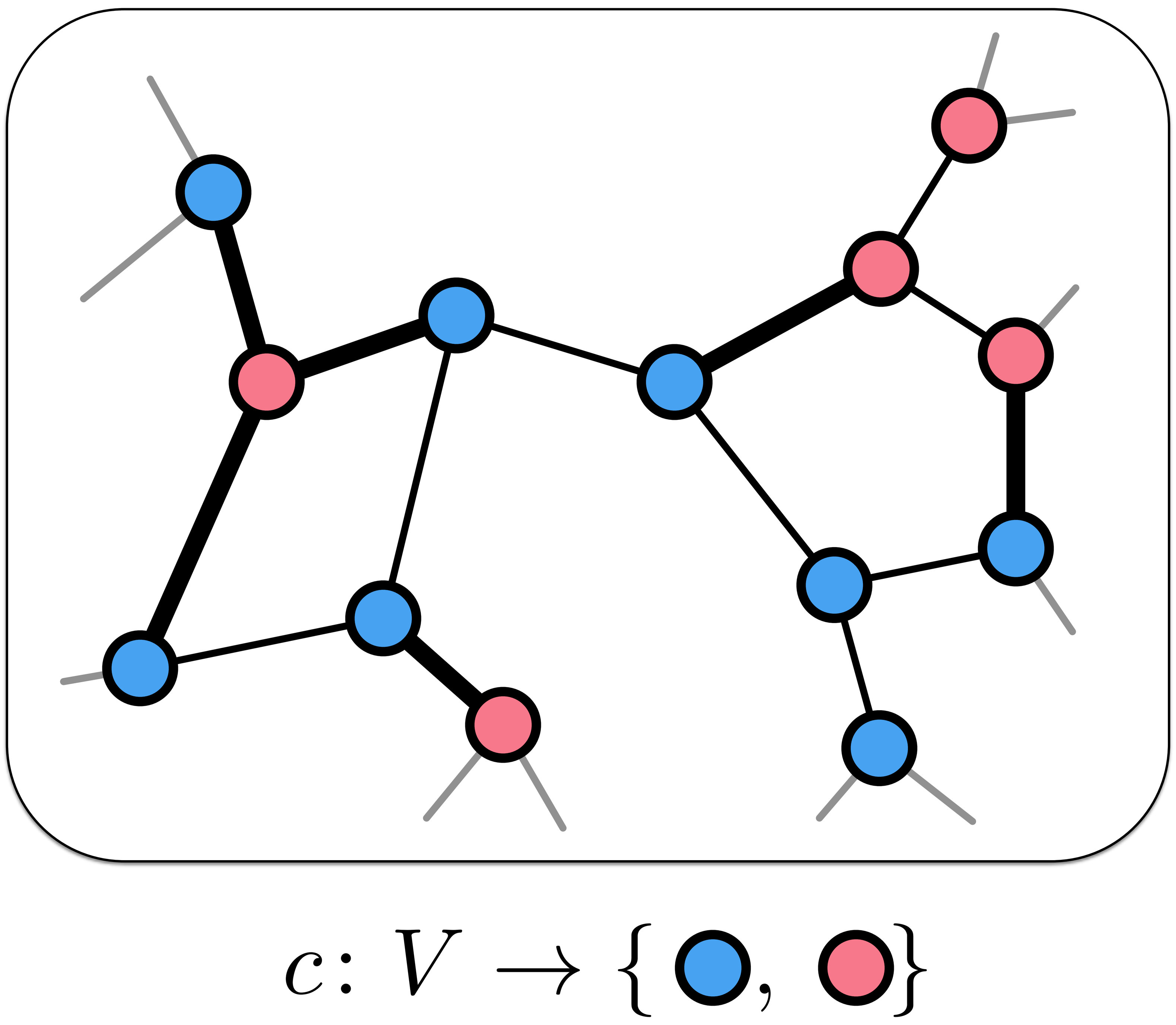
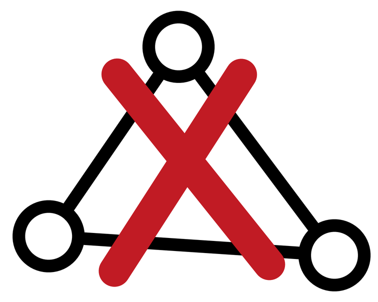


Input graph

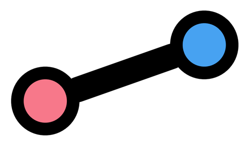
- *d*-regular
- triangle-free



Model of computing

- *n* nodes = processors
- *m* edges = communication links

Finding large cuts

- maximise number of *cut edges* 

Main result

- *one-round* randomized algorithm
- expected number of cut edges is

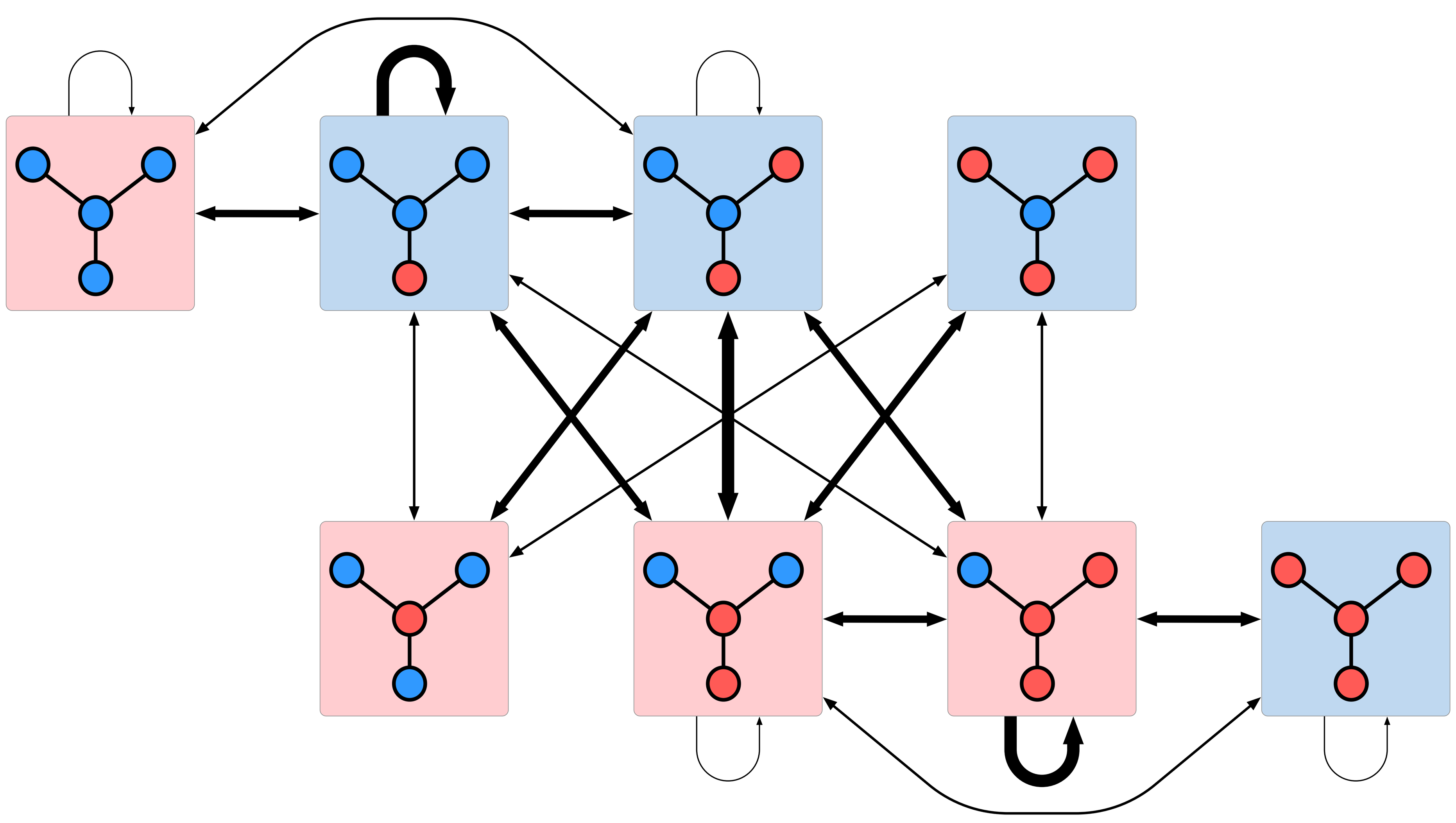
$$\left(\frac{1}{2} + \frac{0.23125}{\sqrt{d}}\right) m$$

Lower bound

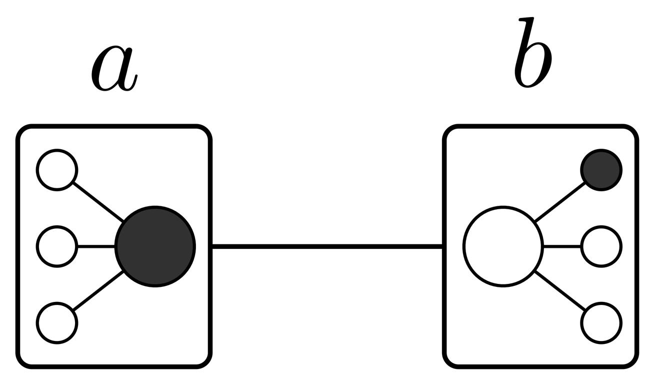
- no sub-logarithmic time algorithm can produce a cut larger than

$$\left(\frac{1}{2} + \frac{\sqrt{d-1}}{d}\right) m$$

Computational Algorithm Design



Neighbourhood graphs
heavy cut = good local algorithm



$$(x_a \vee x_b)\colon w(a,b)$$
$$(\overline{x}_a \vee \overline{x}_b)\colon w(a,b)$$

Weighted MAX-SAT
find *optimal* algorithms
for any fixed *d*