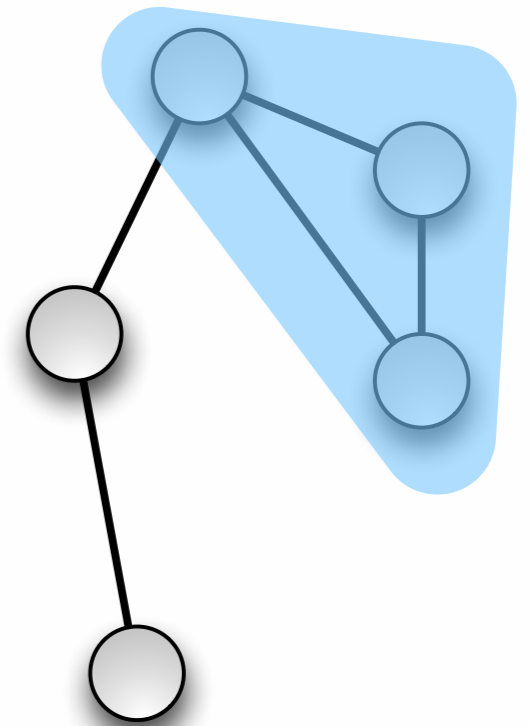


k -Clique formula

Fix $G = (V, E)$ with no k -clique

$$\bigvee_{v \in V} x_{iv} \quad \text{for } i \in [k]$$

$$\neg x_{iv} \vee \neg x_{jw} \quad \text{for } i \neq j, \{v, w\} \notin E$$



[Beyersdorff, Galesi, **L**, Razborov, 2012] conjecture length $|V|^{\Omega(k)}$

[Beyersdorff, Galesi, **L**, 2013] prove it for treelike resolution

[**L**, Pudlák, Rödl, Thapen, 2013] prove it for the “wrong” encoding

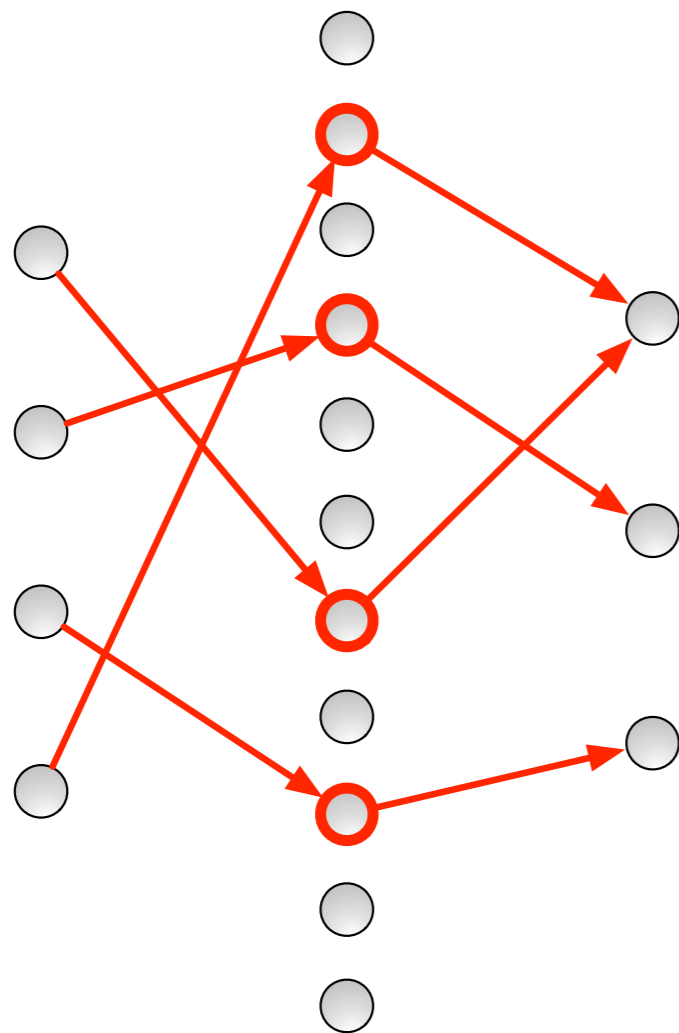
[Beame, Impagliazzo, Sabharwal, 2007] size $> 2^{\Omega(|V|)}$ for $k=|V|$

Parameterized Proof Complexity

[Dantchev, Martin, Szeider 2011] discuss resolution proofs for the claim:

“CNF formula F has no SAT assignment with at most k ones”

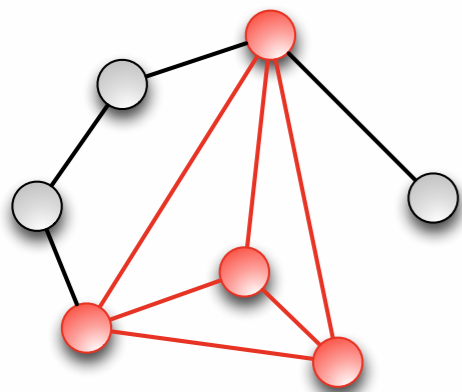
and ask for formulas that require proof length $|Vars|^{\Omega(k)}$



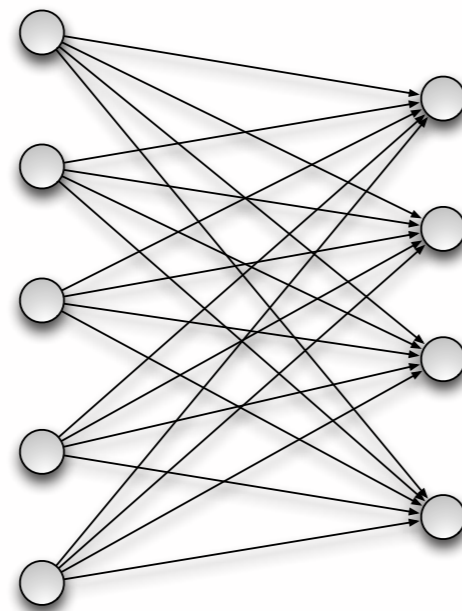
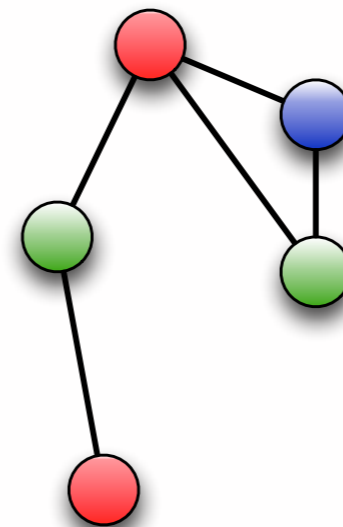
[Dantchev, Martin, 2014] candidate

DIMACS for proof complexity benchmarks

K-clique

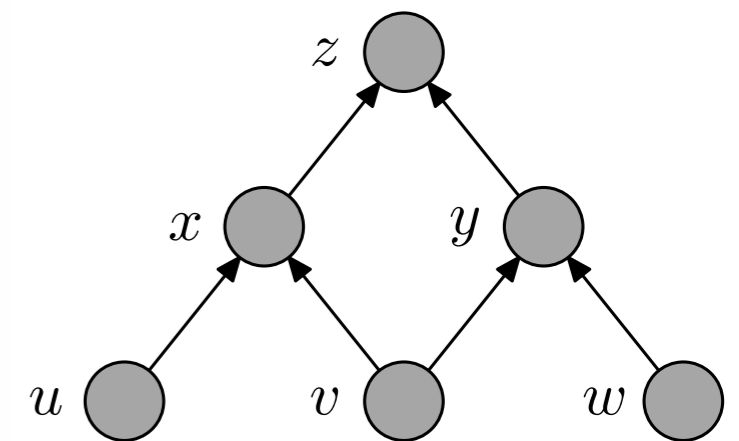


3-COL



Pigeonhole Principle

Pebbling formula



[pic. by J.Nordström]

<https://github.com/MassimoLauria/cnfgen>