Independence ratio of large girth regular graphs

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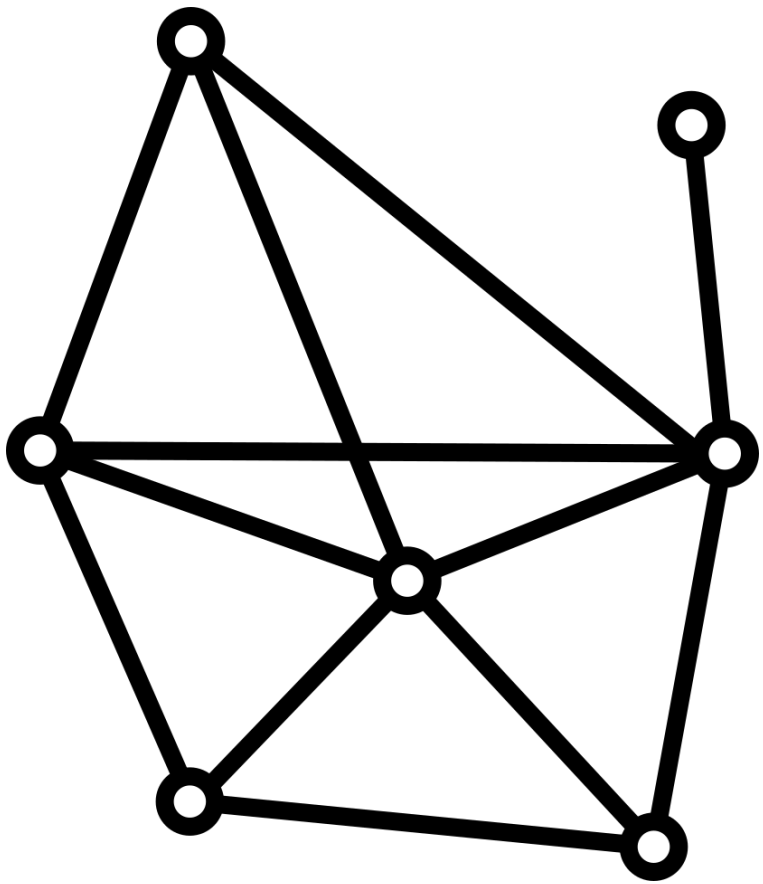
Joint work with Endre Csóka

MTA Rényi Institute

MTA Cloud Workshop
2017 February 17

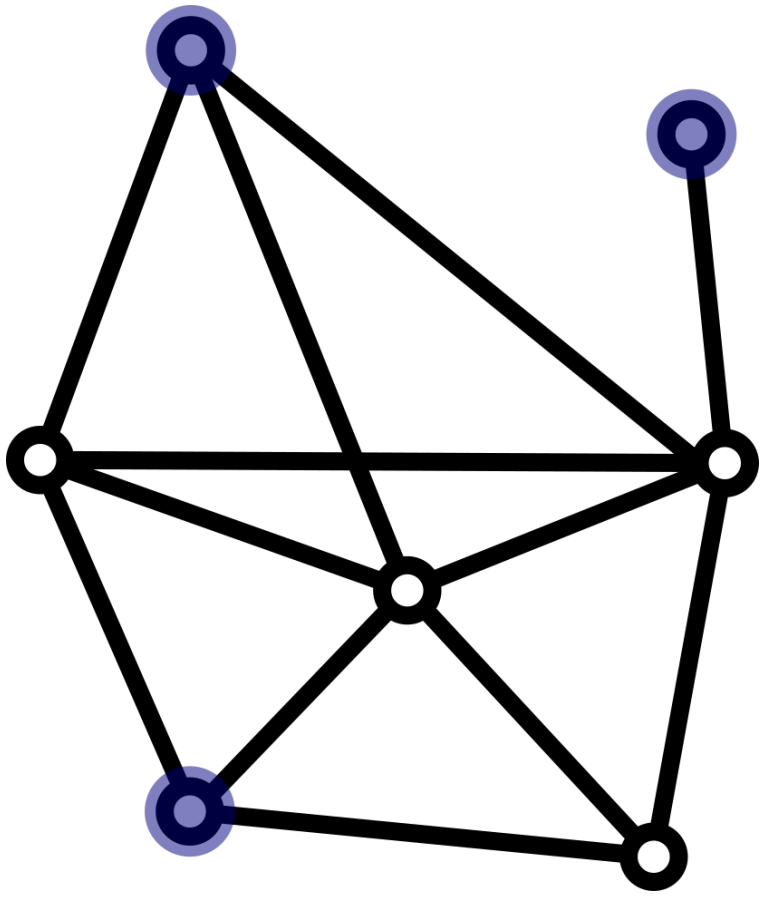
Independent sets

Structural properties of graphs

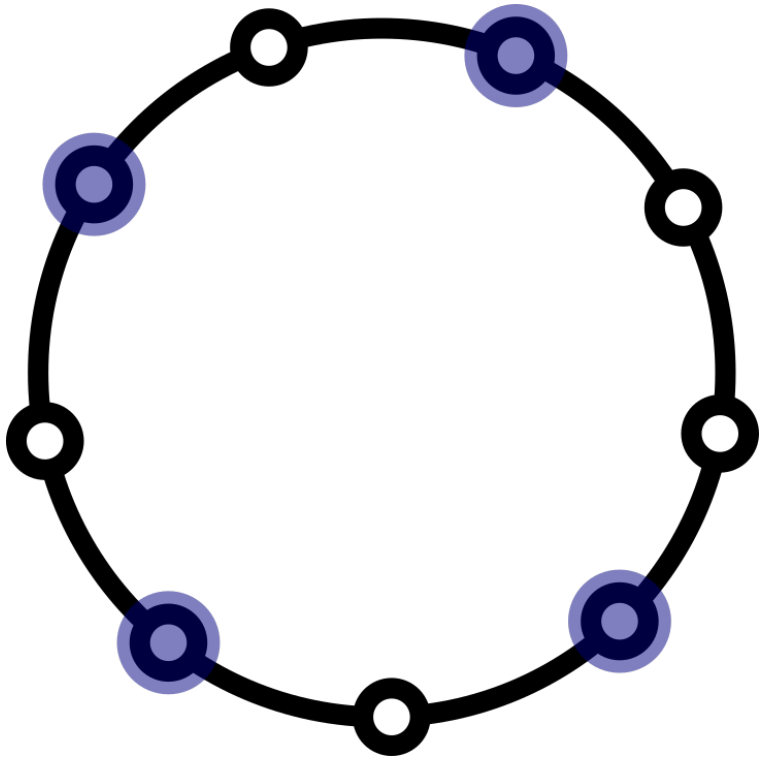


Independent sets

Structural properties of graphs

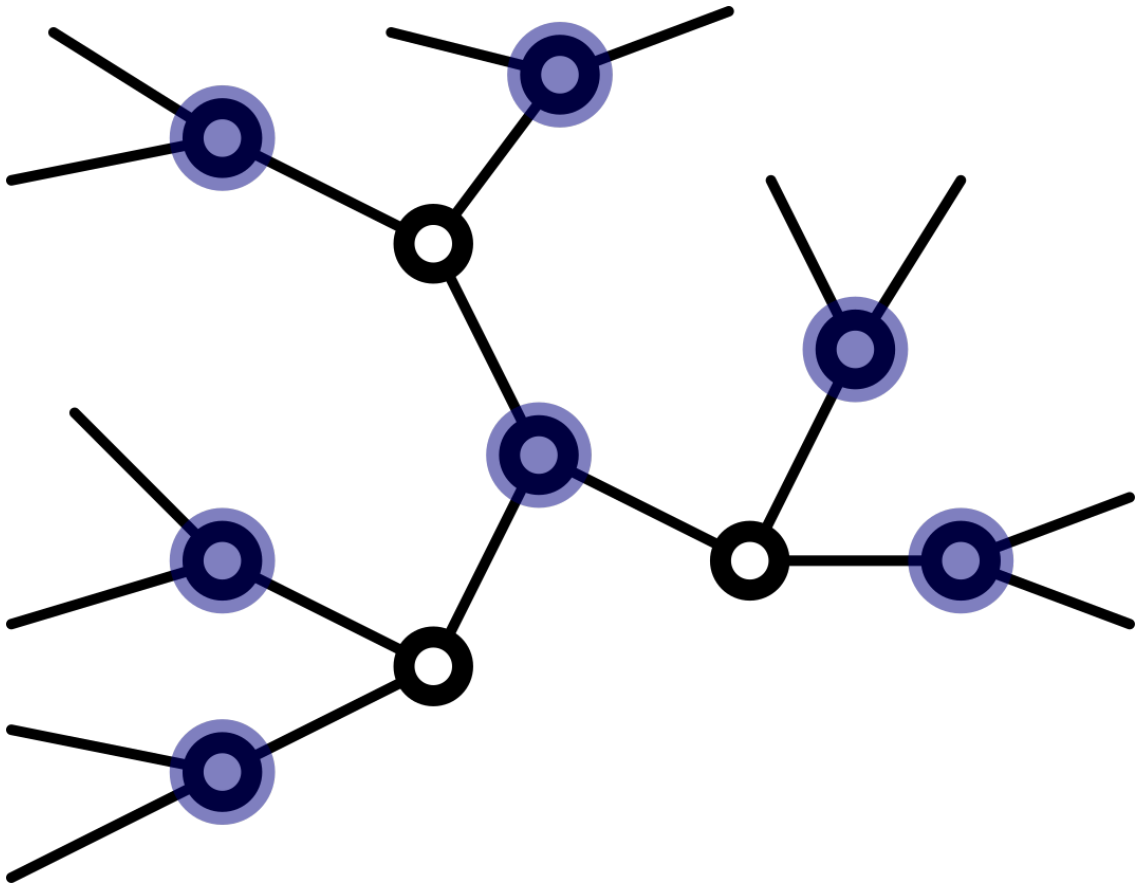


Size of independent sets

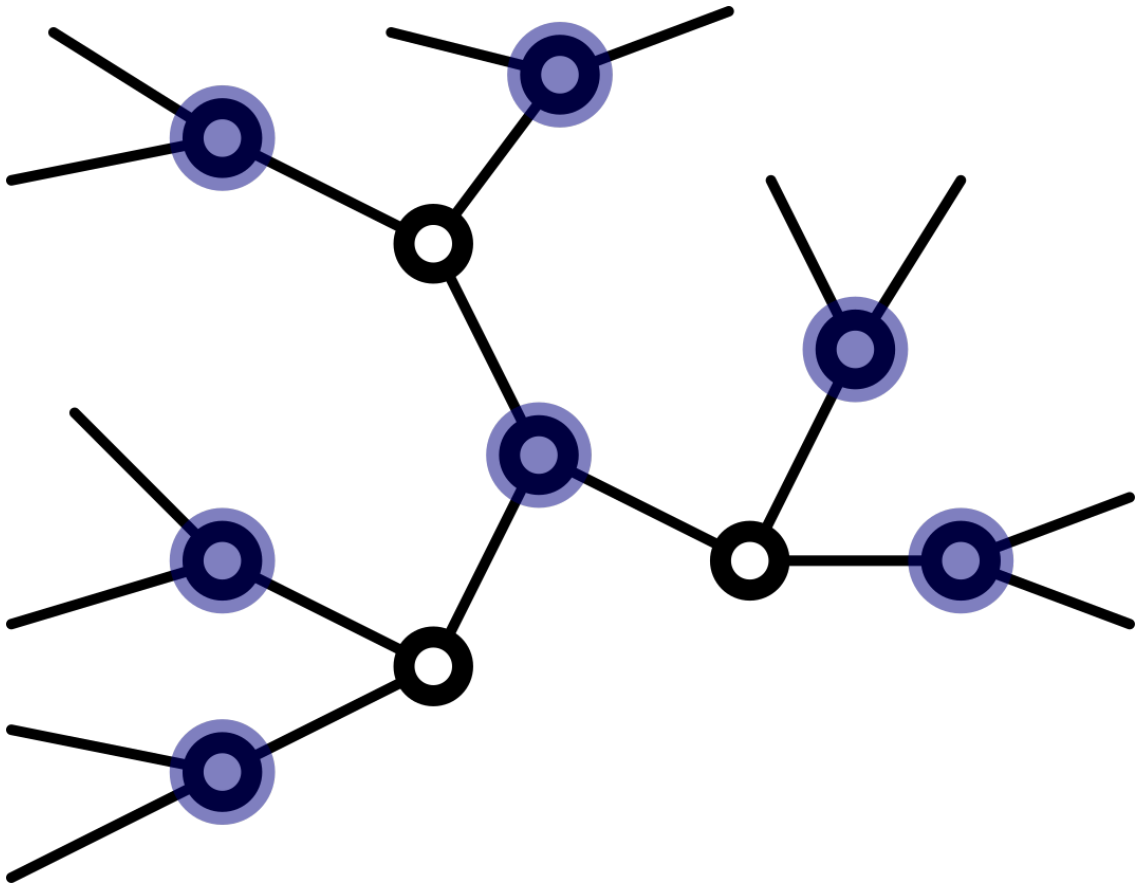


Independence ratio $\to 0.5$

Current target: 3-regular graphs



Current target: 3-regular graphs



Bollobás: Independence ratio < 0.46

Goal: lower bound

Lower bound by constructing independent sets.

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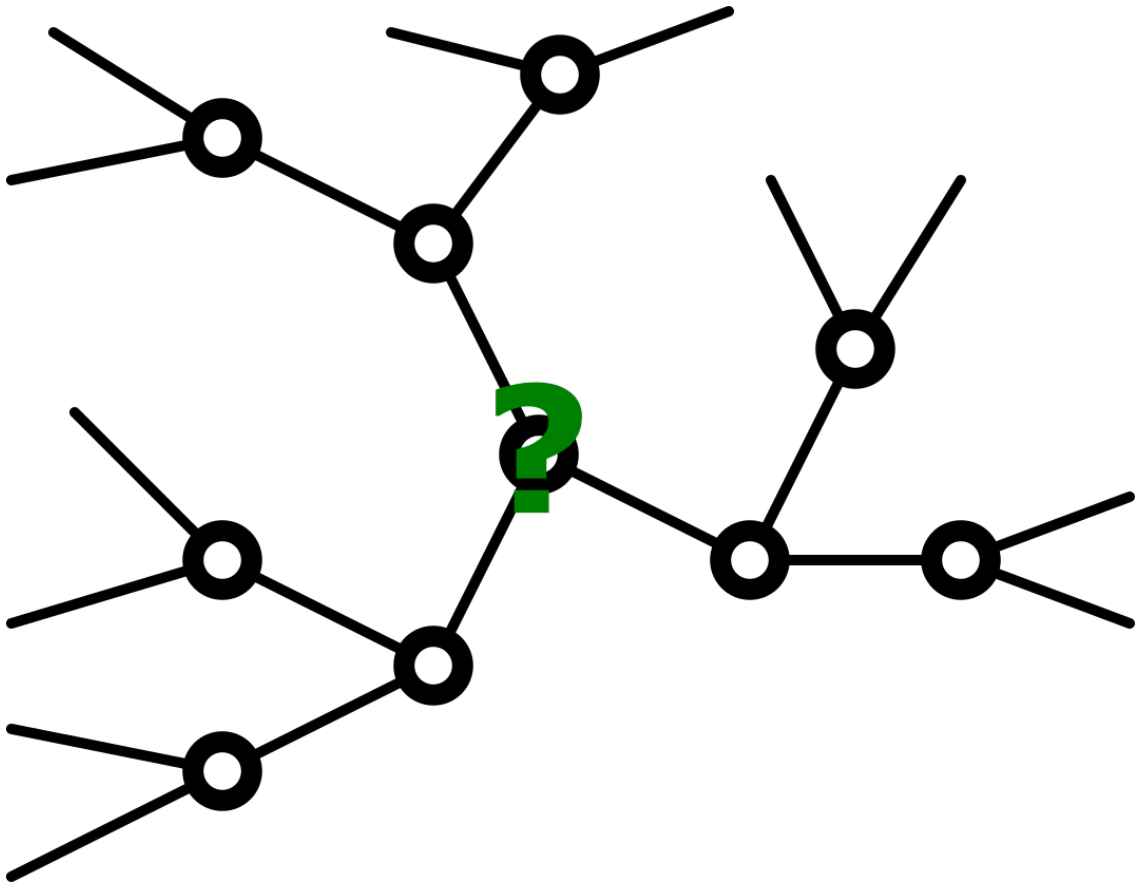
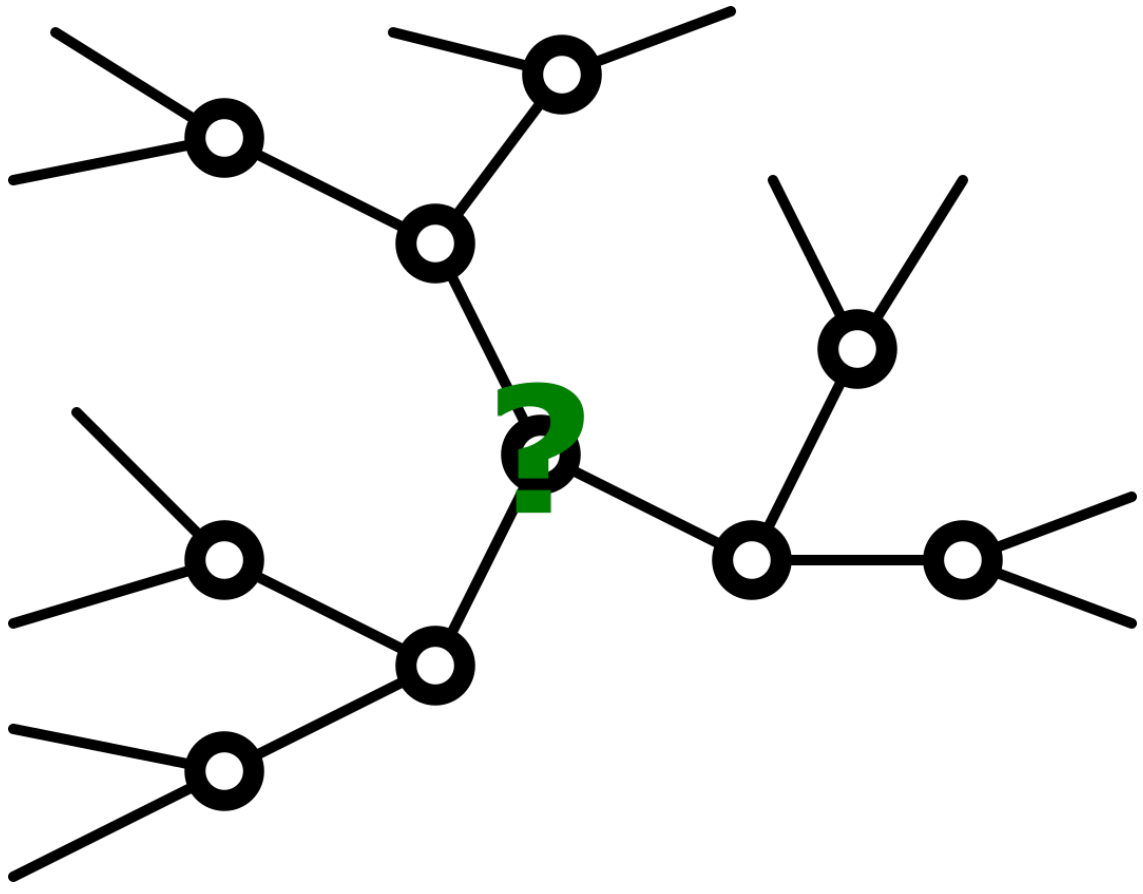
Lower bound by constructing independent sets.

Finding independent sets by local algorithms.

Local algorithms

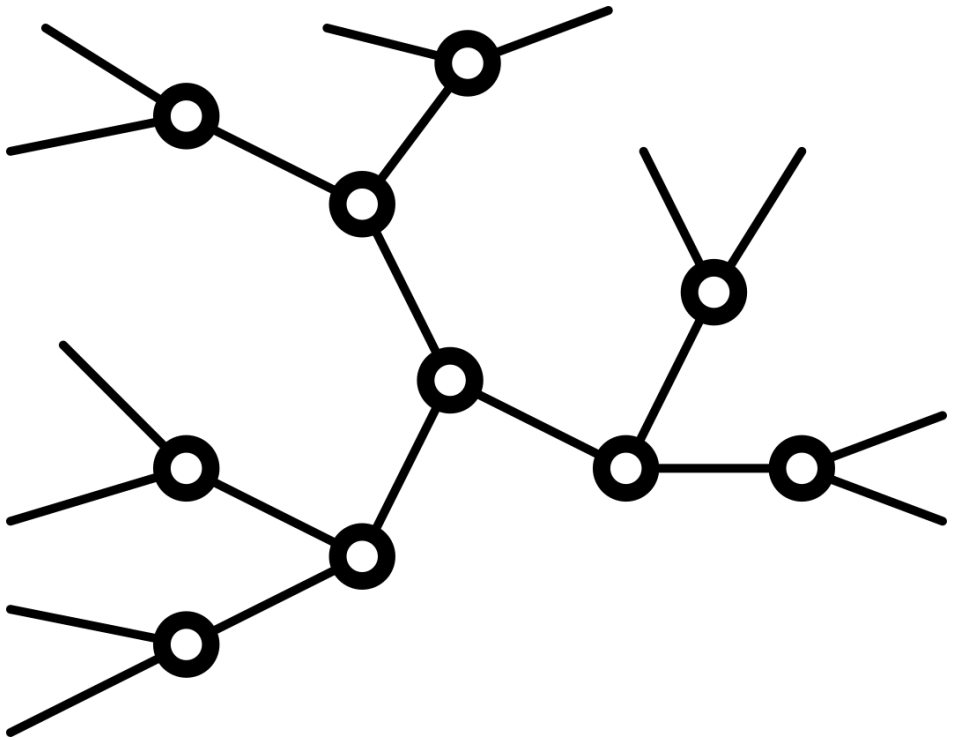


Local algorithms

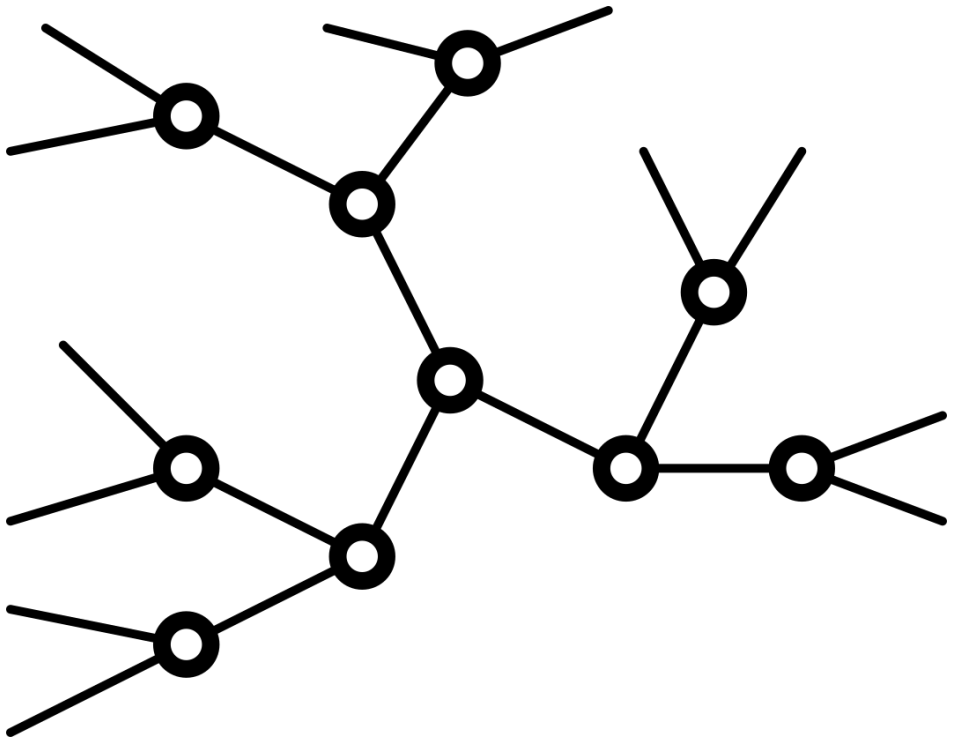


Consistent local output leads to global independent set.

Example

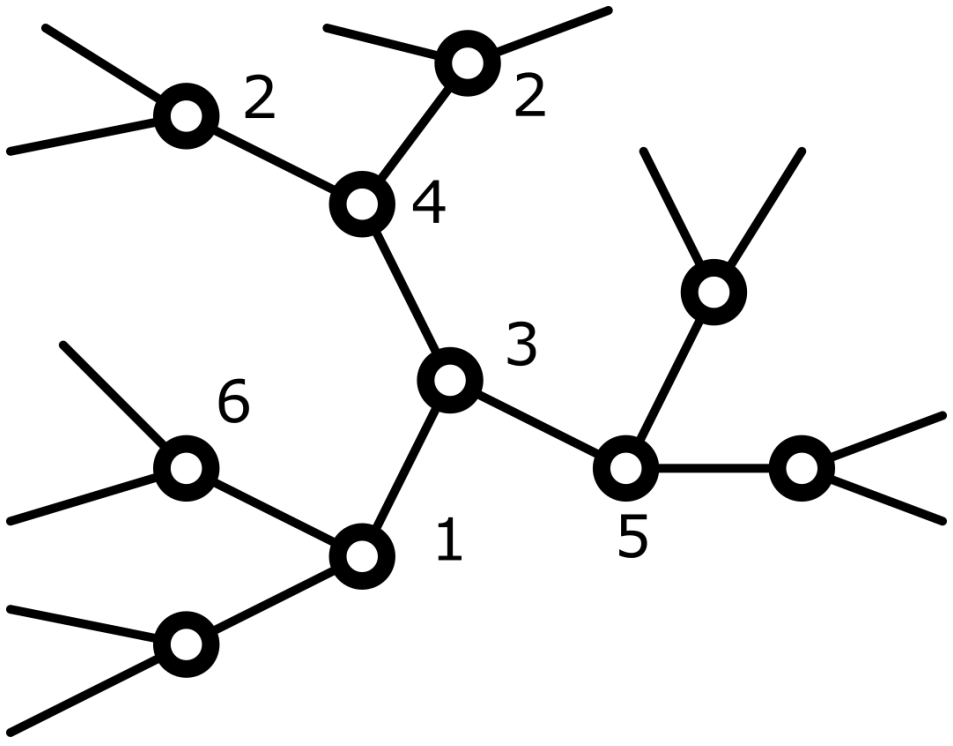


Example



„Roll a dice at each node.”

Example



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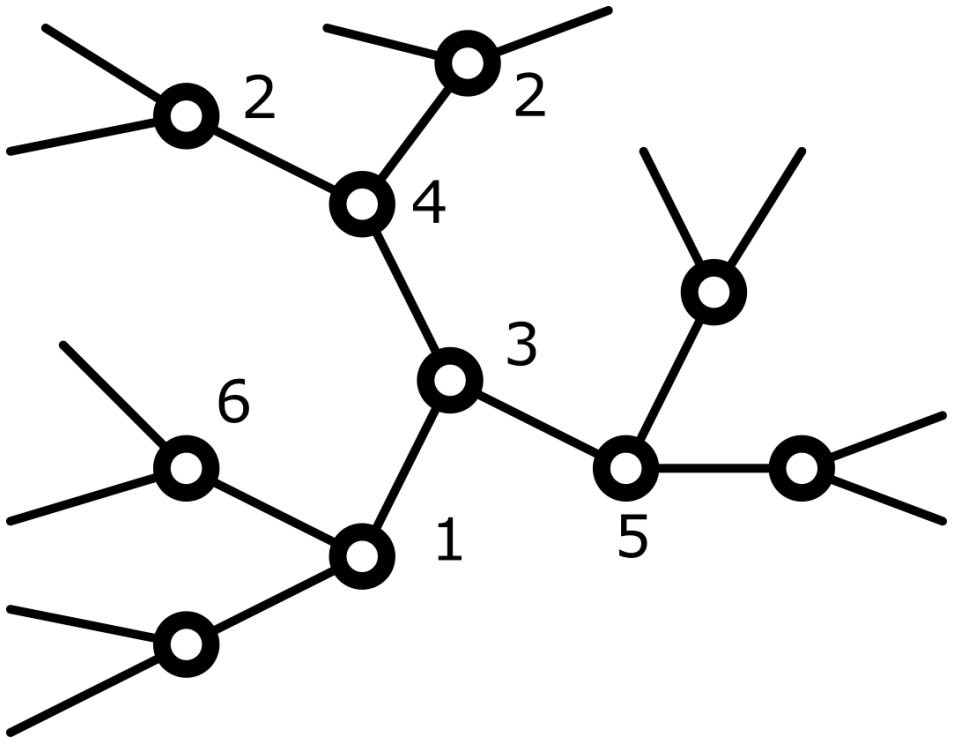
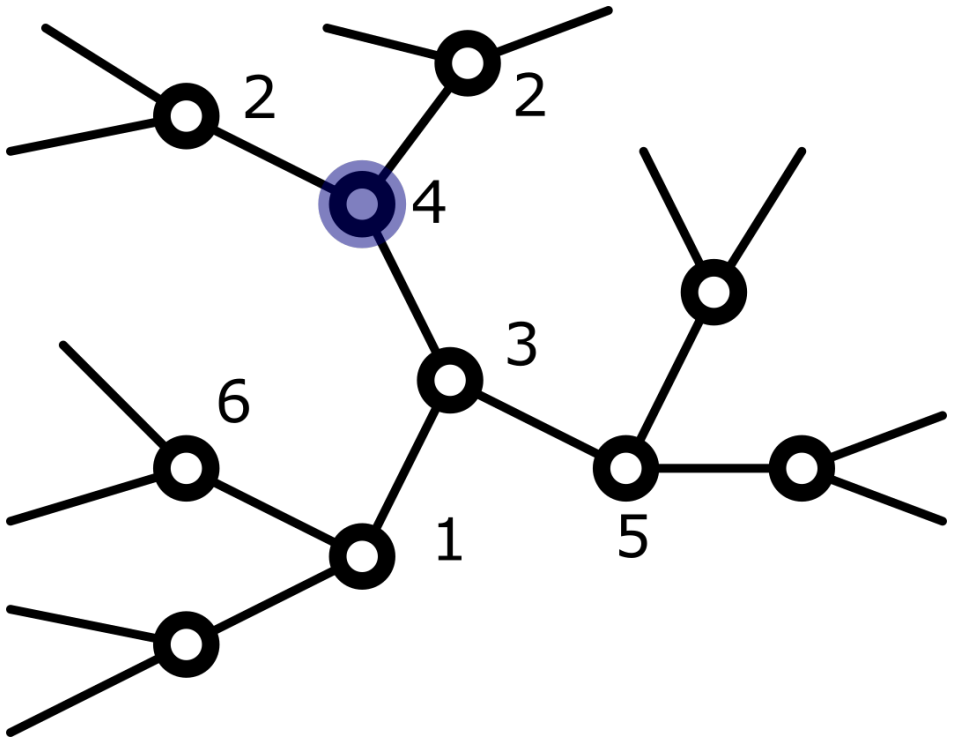


„Roll a dice at each node."
„Select if higher than all neighbors."

Example



„Roll a dice at each node.”
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Evaluation of local algorithm

Consistency of local algorithm:

only formal proof makes sense.

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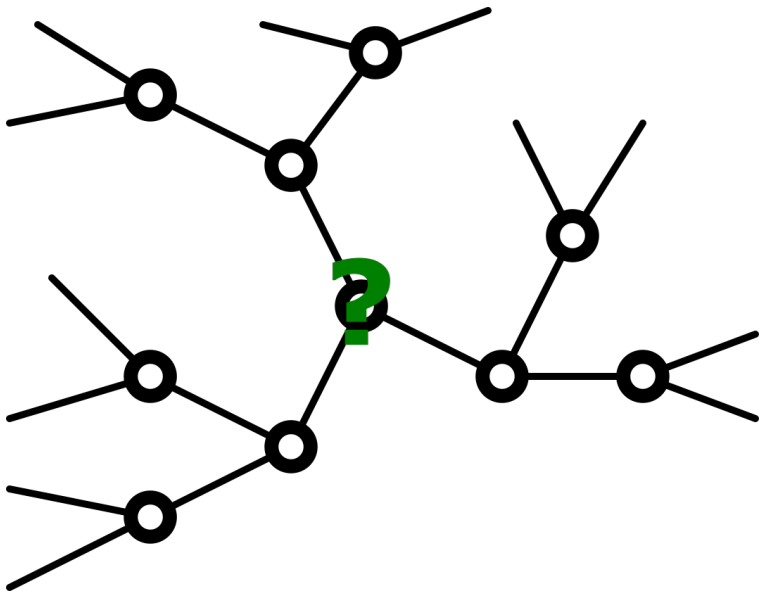
Size of independent set,
Independence ratio:

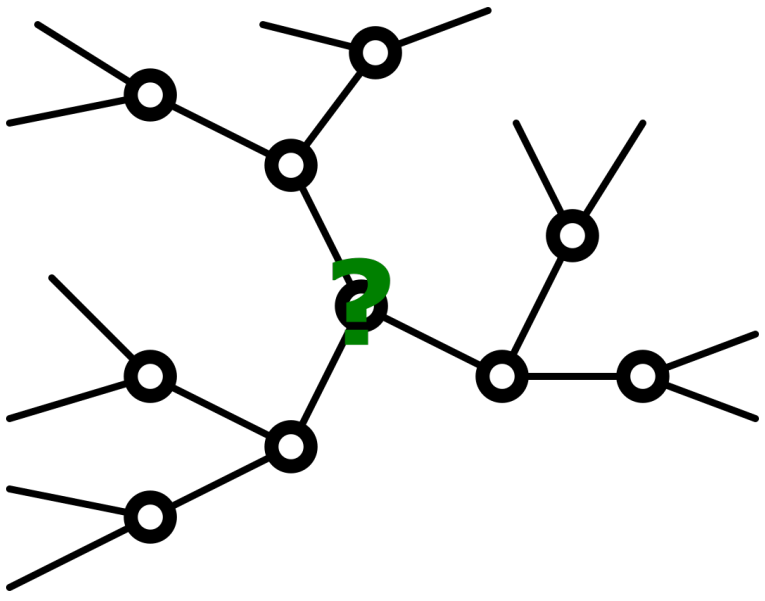
numerical estimates feasible,
using MTA Cloud resources.

Calculations



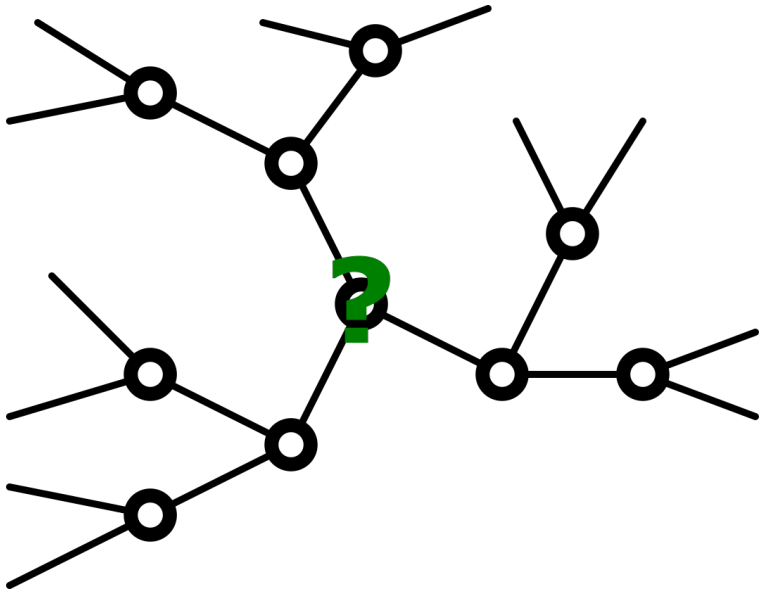
Count nodes

Calculations



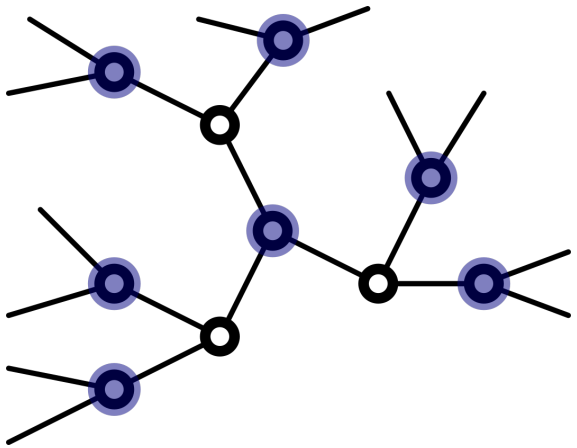
Count nodes $\rightarrow$ sample nodes

Calculations

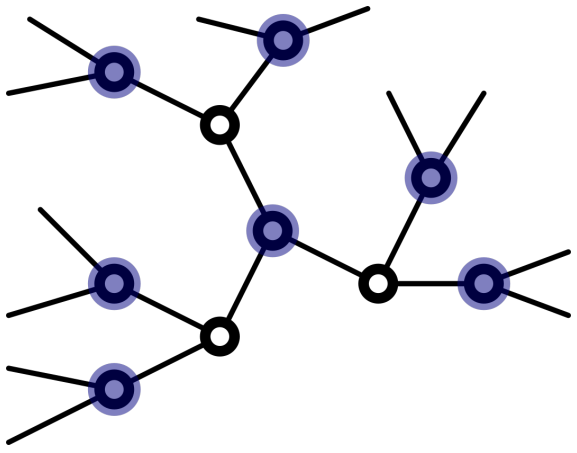


Count nodes $\rightarrow$ sample nodes $\rightarrow$ repeat algorithm

Summary

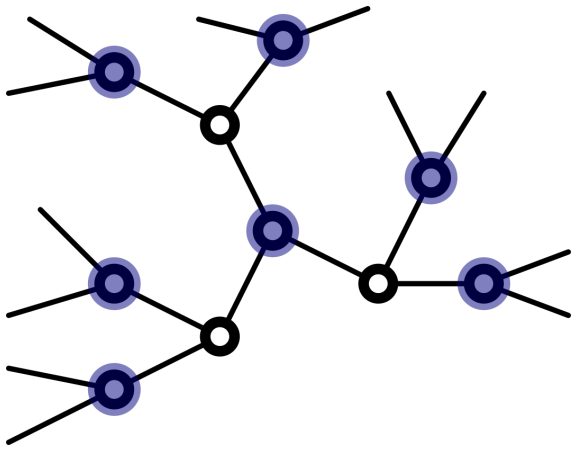


Summary



Independence ratio

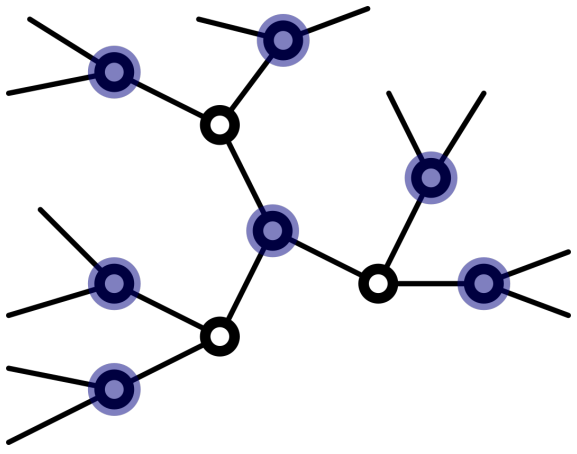
Summary



Independence ratio

Structure

Summary

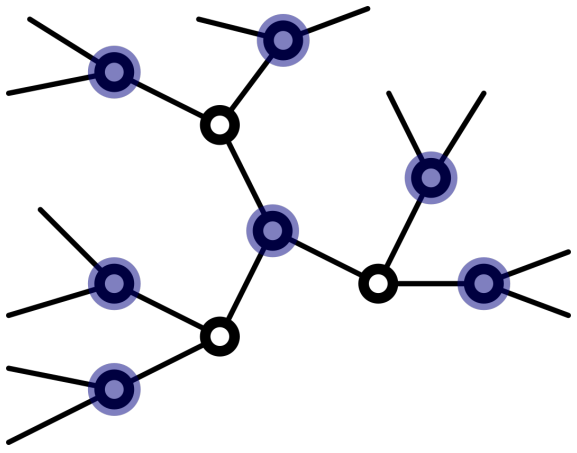


Independence ratio

Structure

Algorithm

Summary



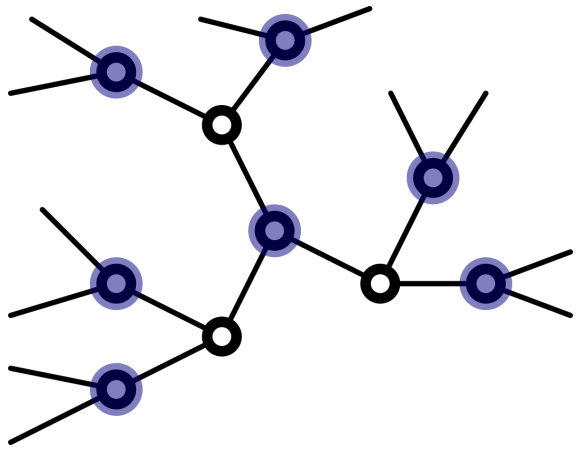
Independence ratio

Structure

Algorithm

Proof

Summary



Independence ratio

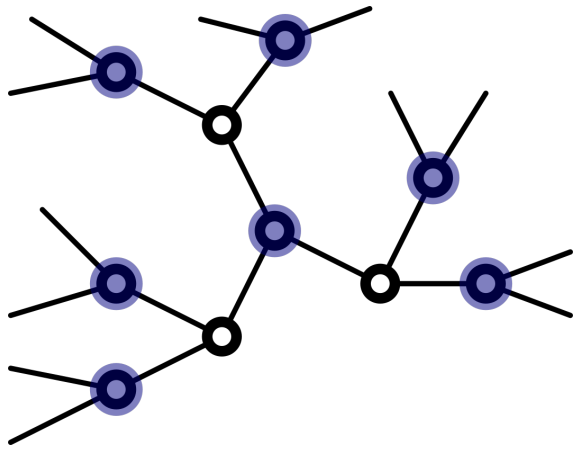
Structure

Algorithm

Proof

Calculation

Summary

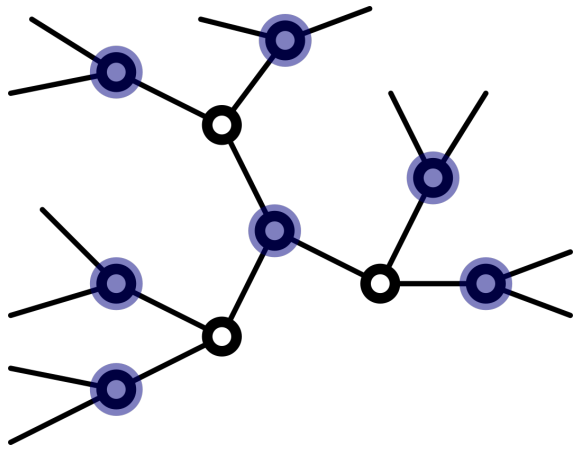


Independence ratio Structure

Algorithm Proof

Calculation Statistics

Summary



Independence ratio Structure

Algorithm Proof

Calculation Statistics 0.4??? $\pm$?

Thank you!