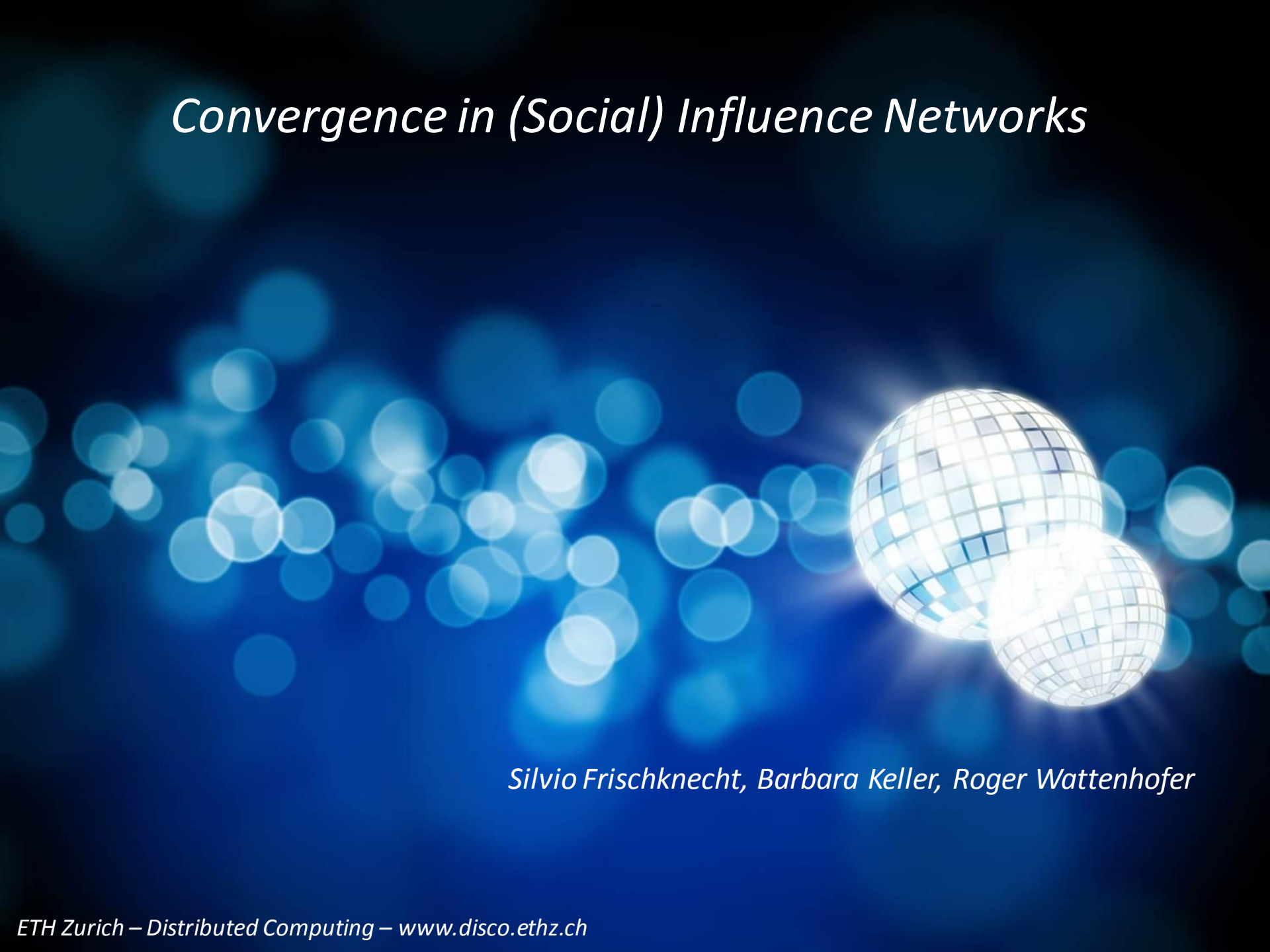
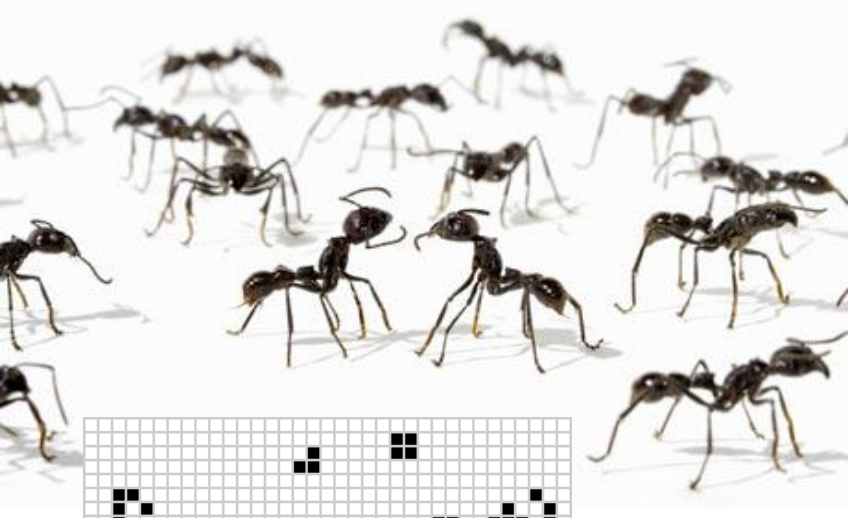
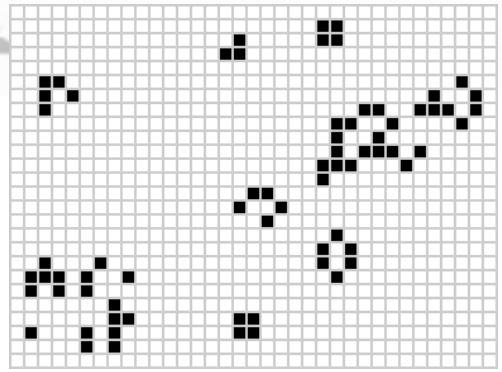
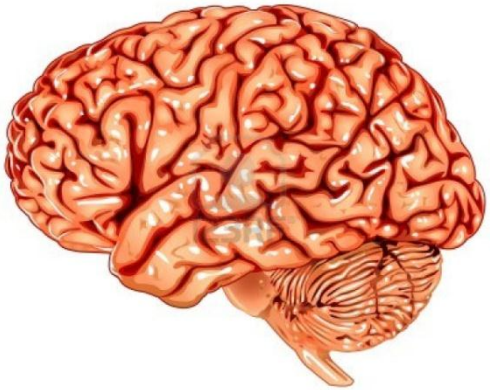
Convergence in (Social) Influence Networks

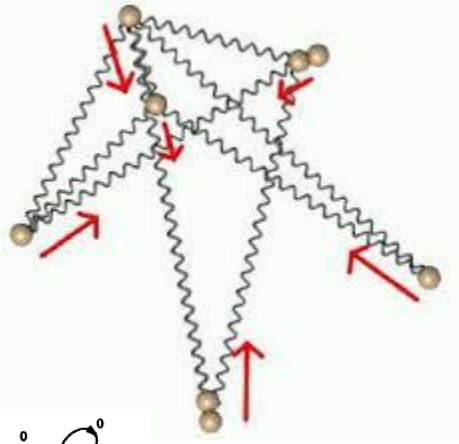


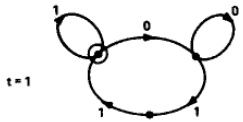
Silvio Frischknecht, Barbara Keller, Roger Wattenhofer







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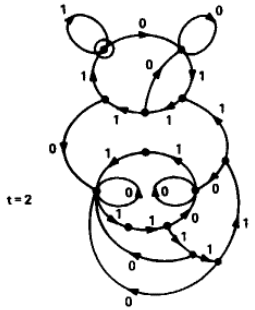
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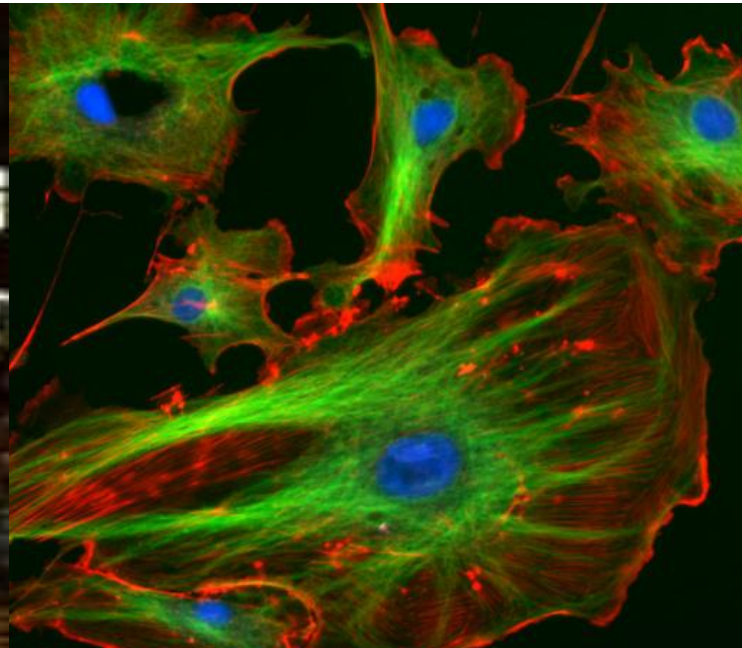
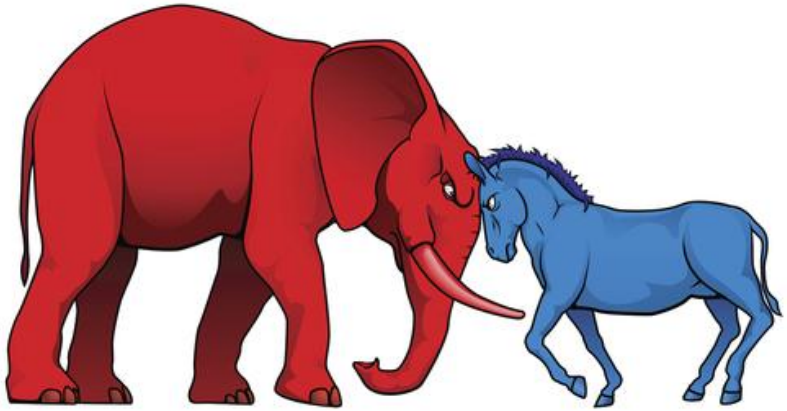
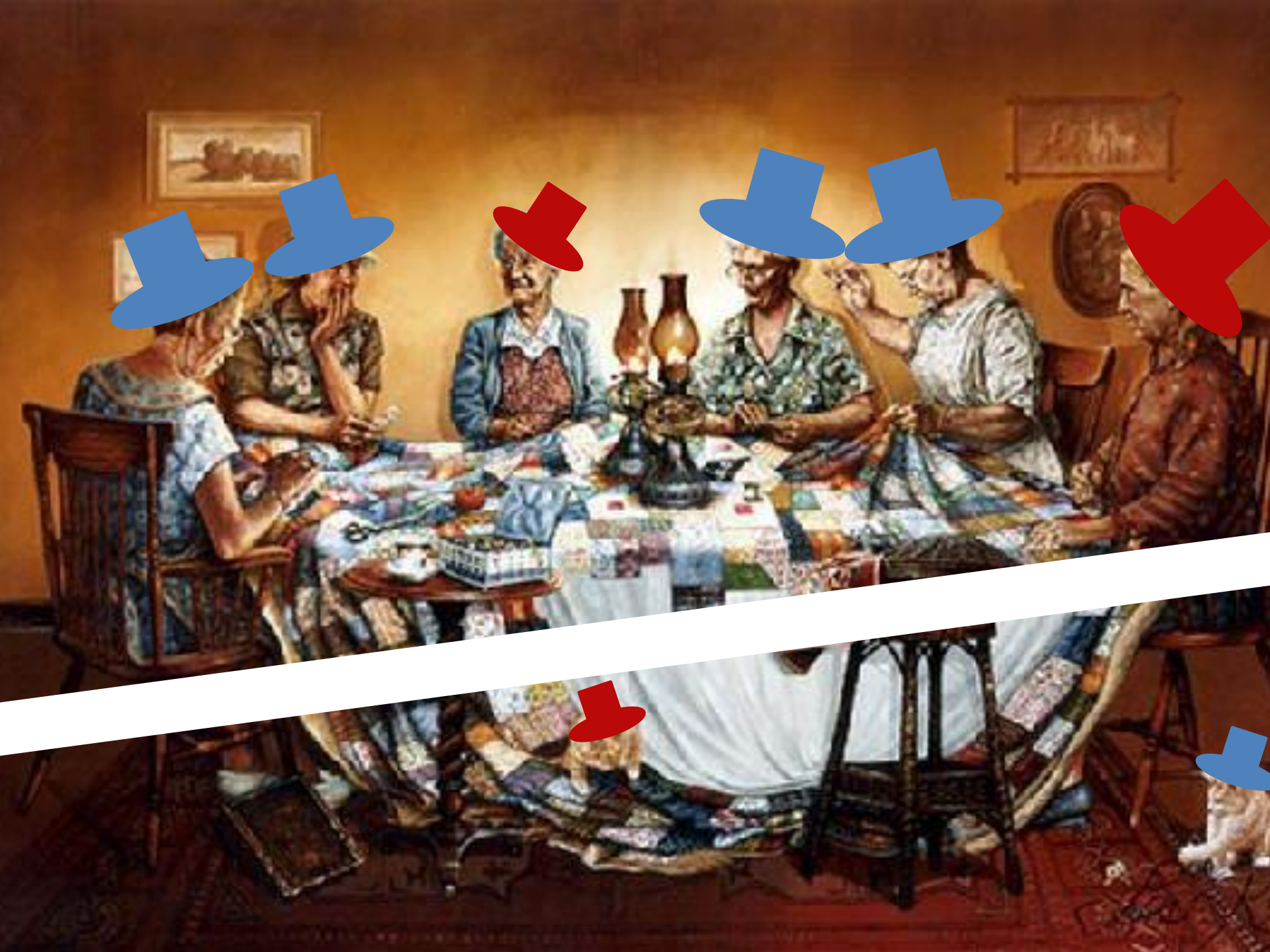


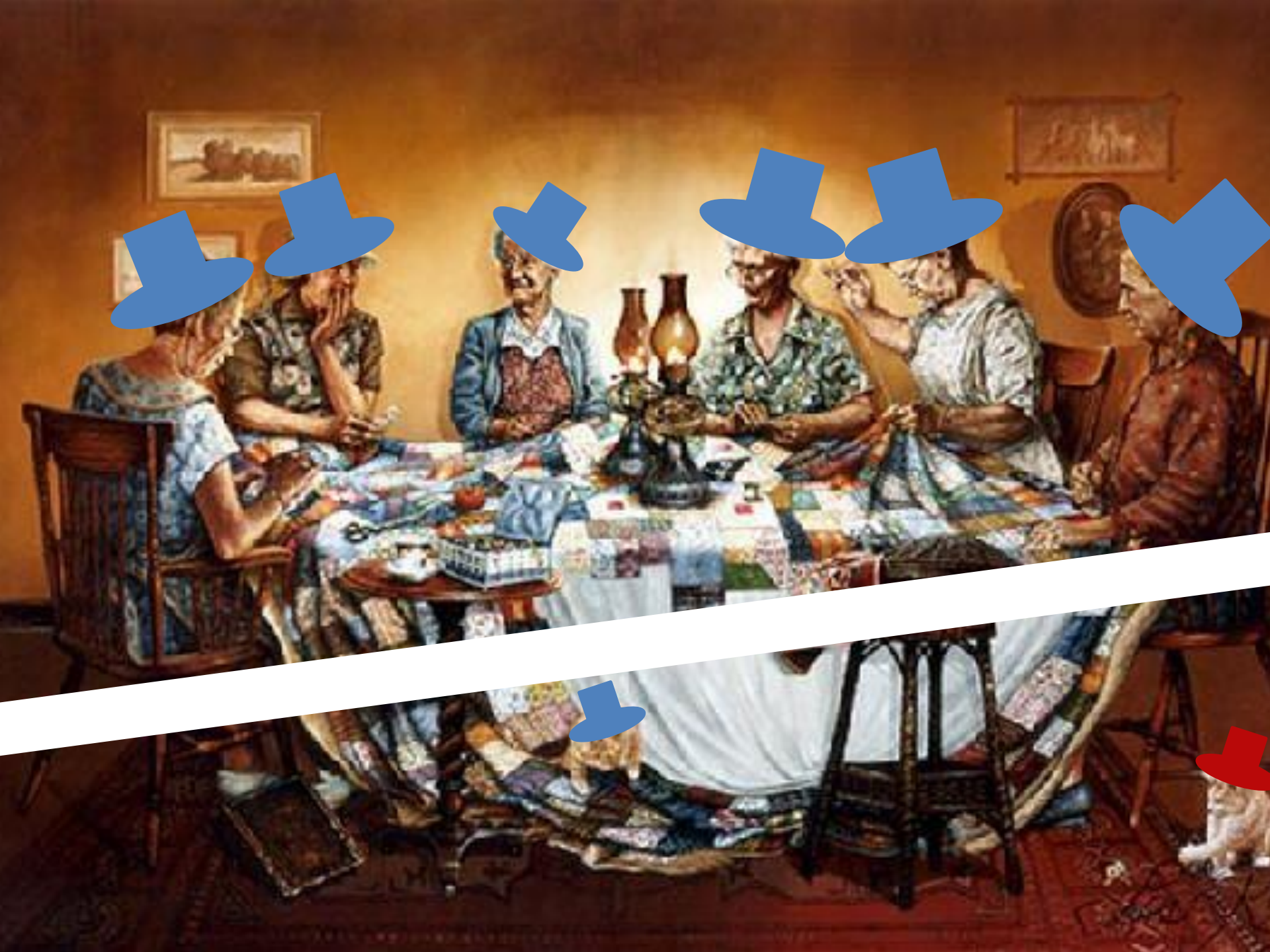
Simple World

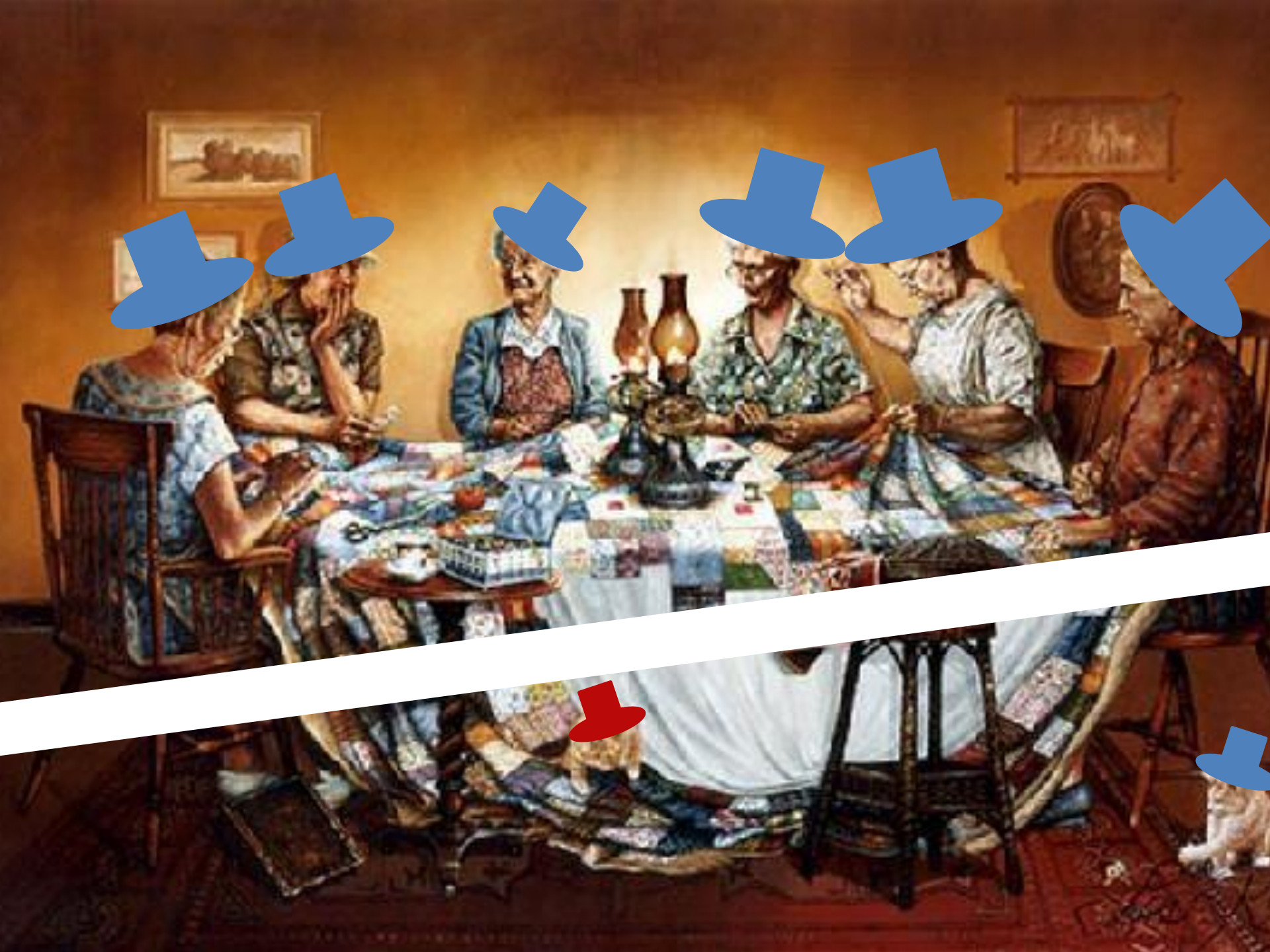
2 Opinions:

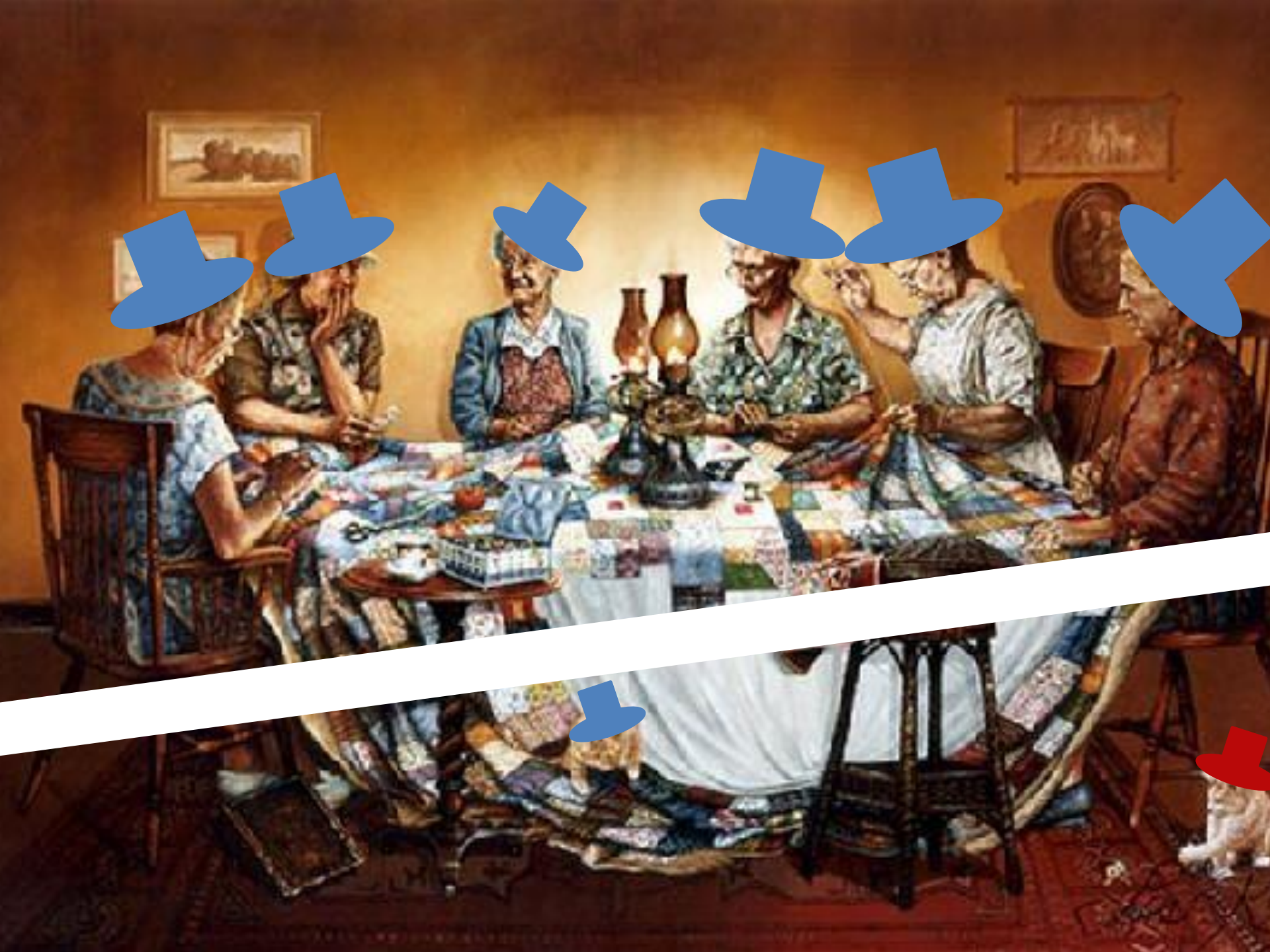


Opinion changes: Whatever the majority of my friends think









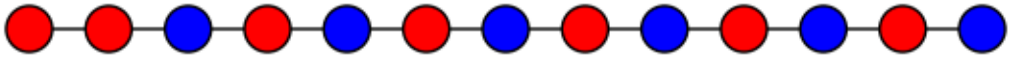
What Can Happen?

and/or

Goles and Olivios 1980


MONDAINE
SBB CFF FFS
OFFICIAL RAILWAYS CLOCK DESIGN

Easy Lower Bound: Ω(n)



Easy Lower Bound: Ω(n)

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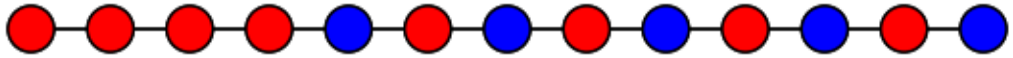

Easy Lower Bound: Ω(n)

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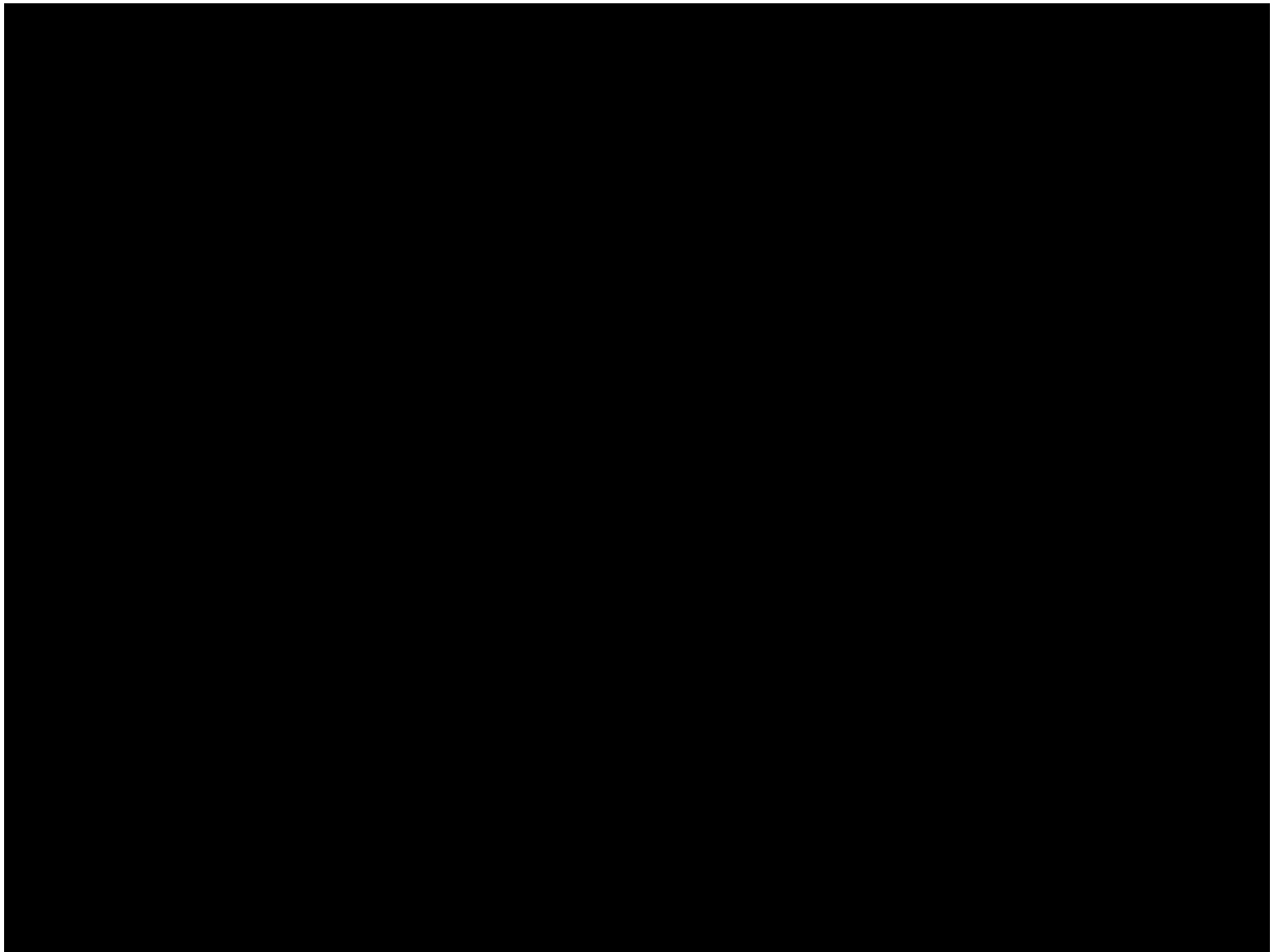
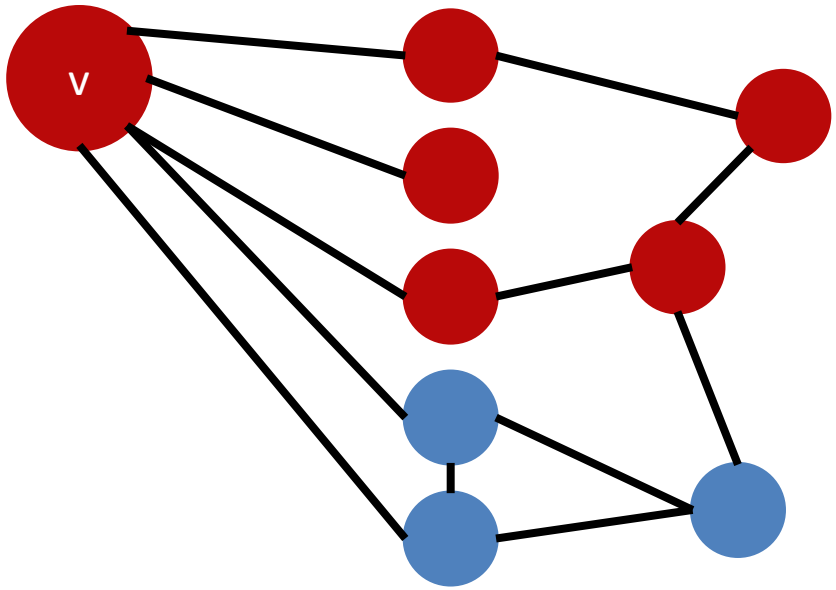
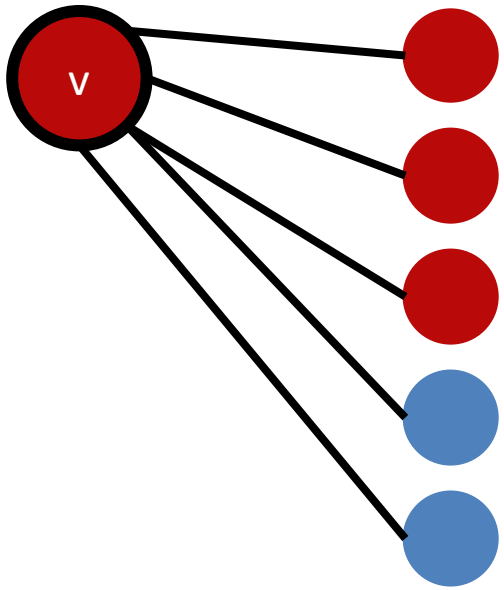


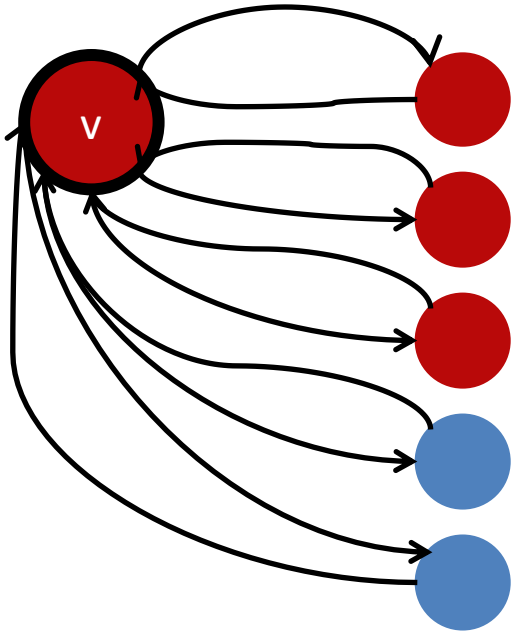
Upper Bound: $O(n^2)$



Upper Bound: $O(n^2)$



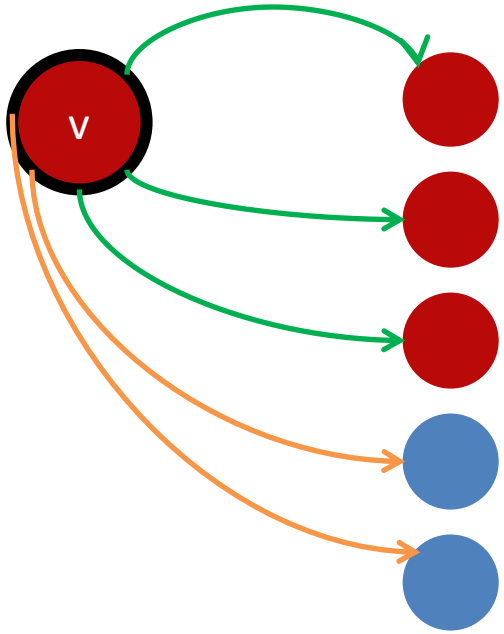
Upper Bound: $O(n^2)$



Upper Bound: $O(n^2)$

Good edge: Friend takes advised opinion on next day

Bad edge: Friend does not take the proposed opinion



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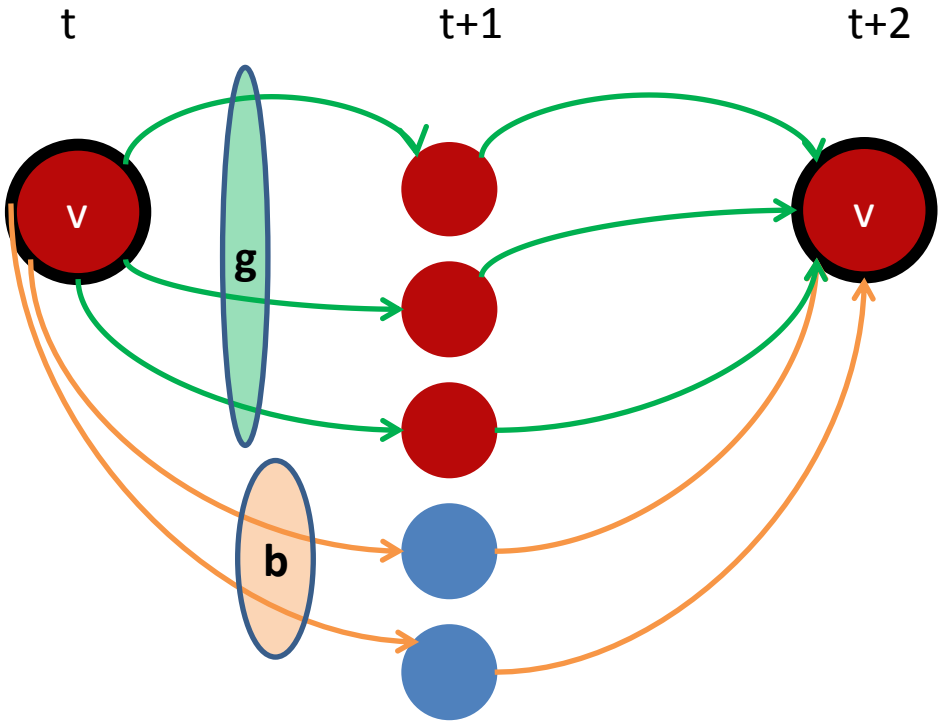

g: Nr. of good edges

b: Nr. of bad edges

case g > b

Upper Bound: $O(n^2)$

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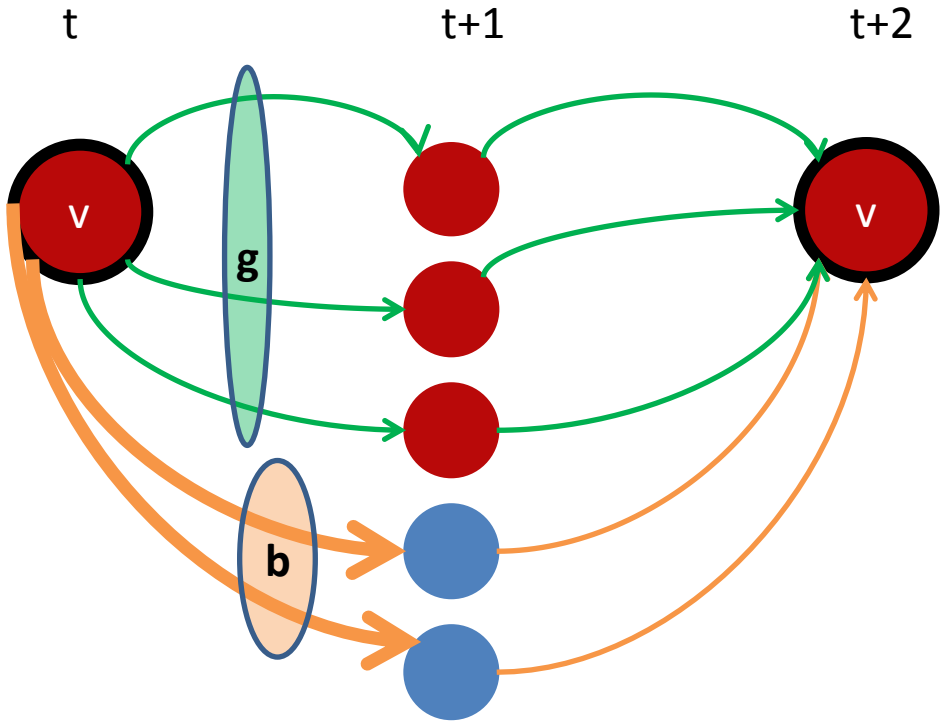

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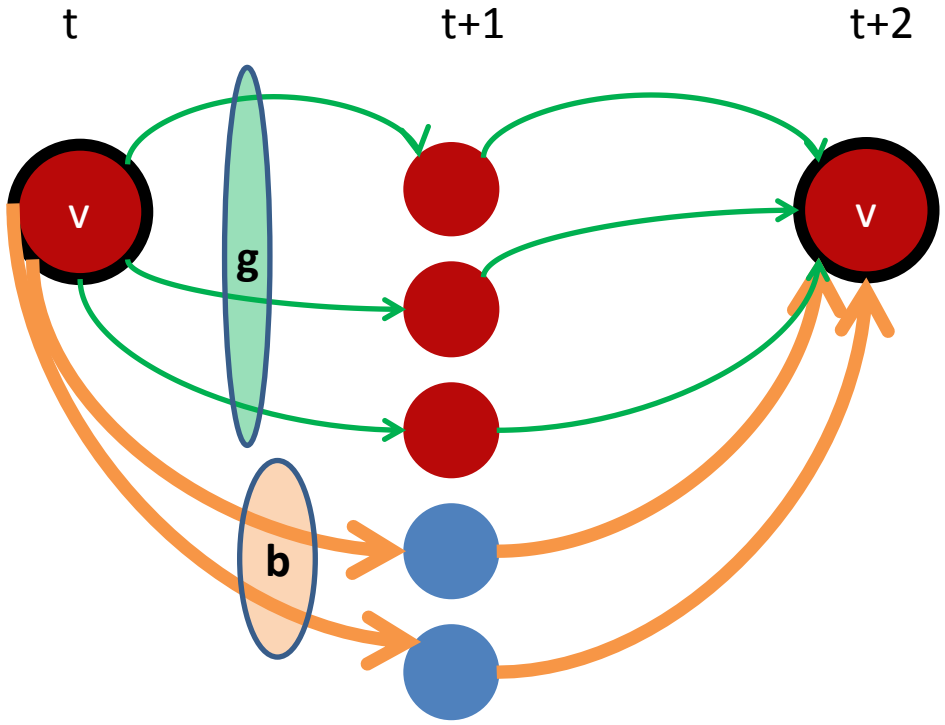

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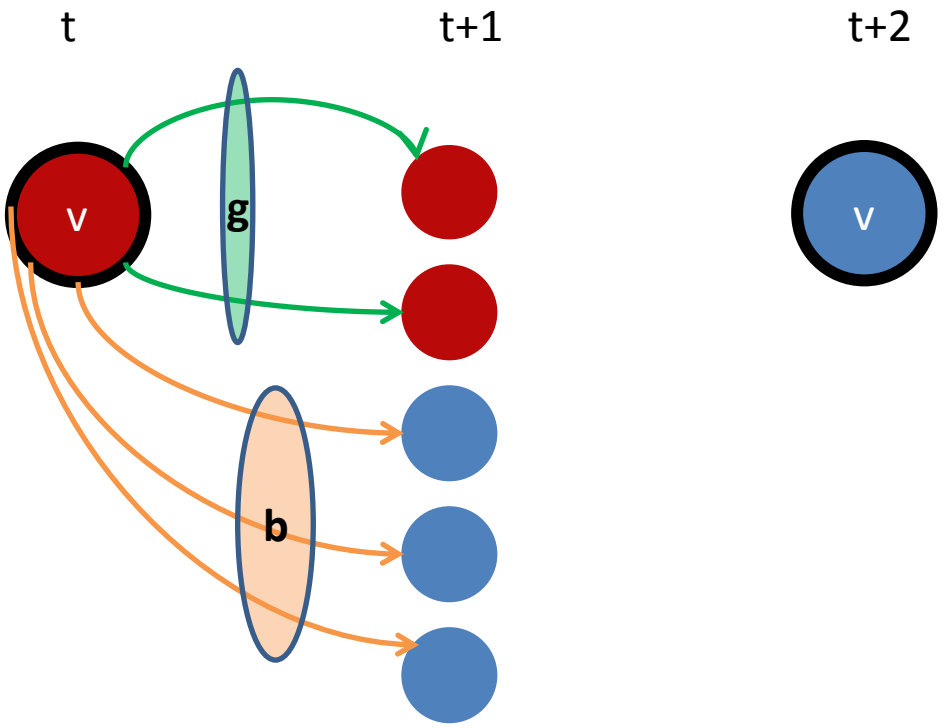

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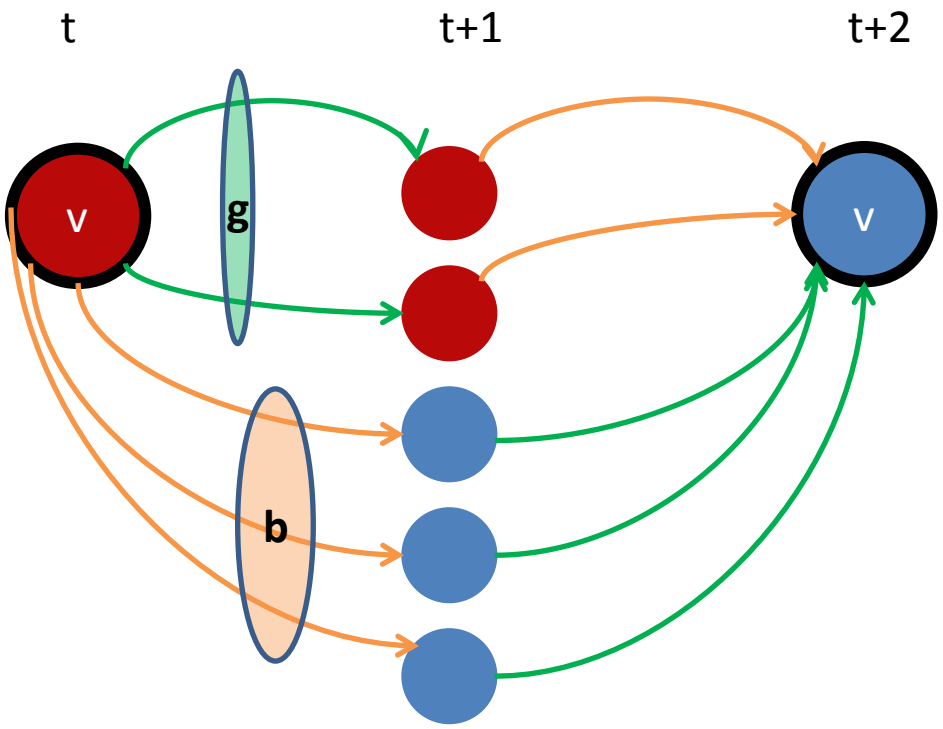

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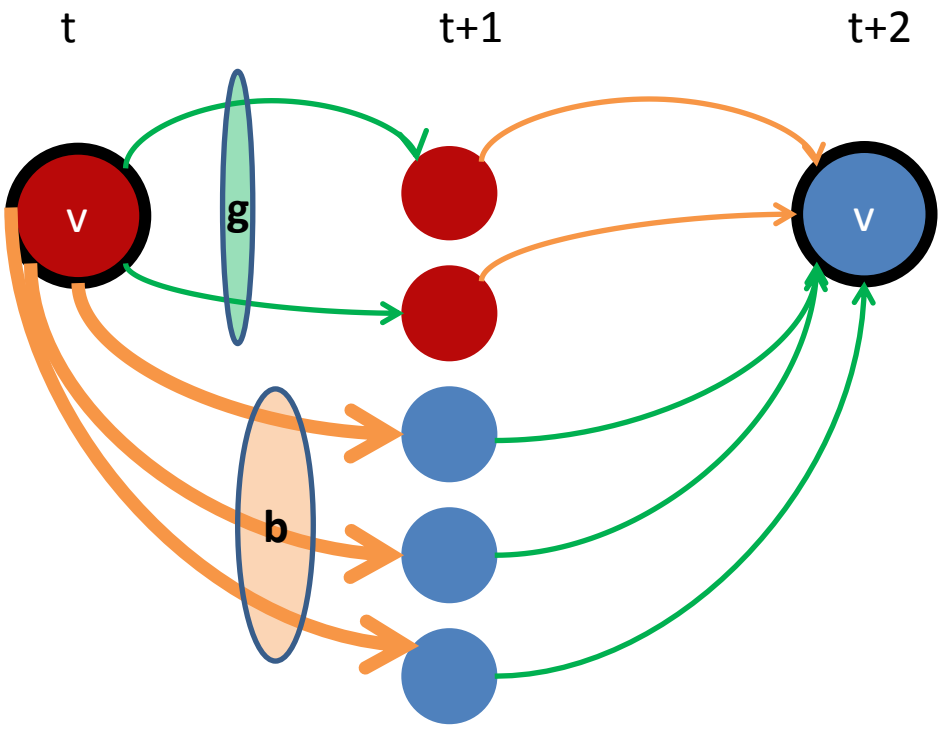

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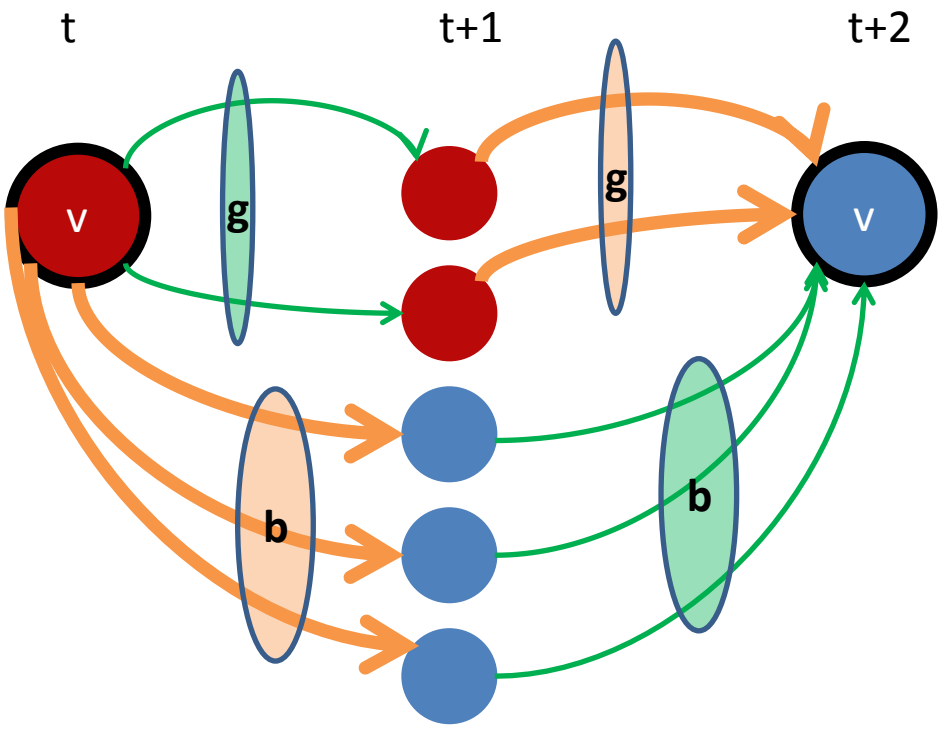
Upper Bound: $O(n^2)$



g: Nr. of good edges

b: Nr. of bad edges

case b > g

Tight Bound?

Lower bound

n

vs.

Upper bound

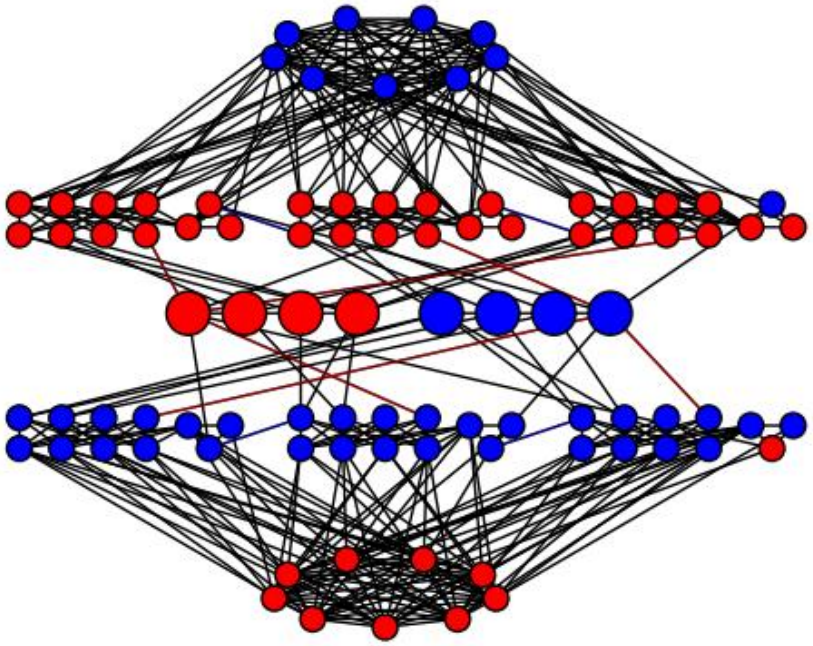
n^2

Let`s Vote

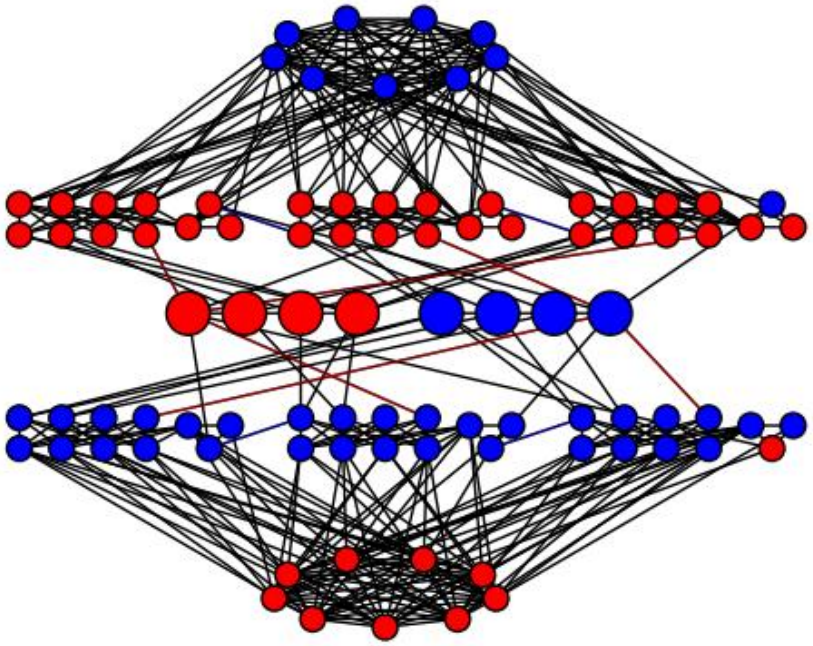
n vs. n^2

$$\frac{n^2}{\log^2 n}$$

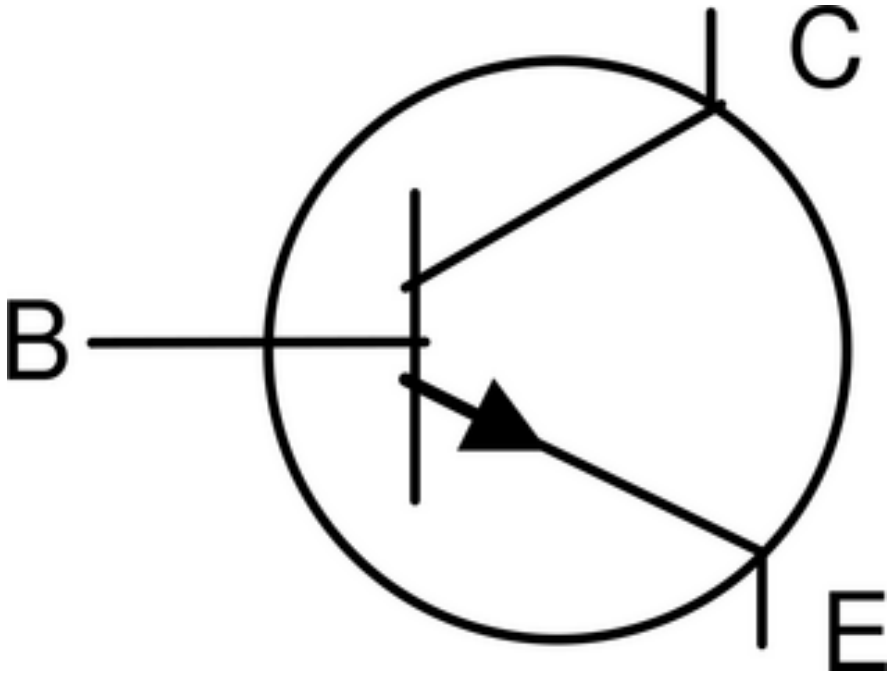
Simpler Example: $n\sqrt{n}$



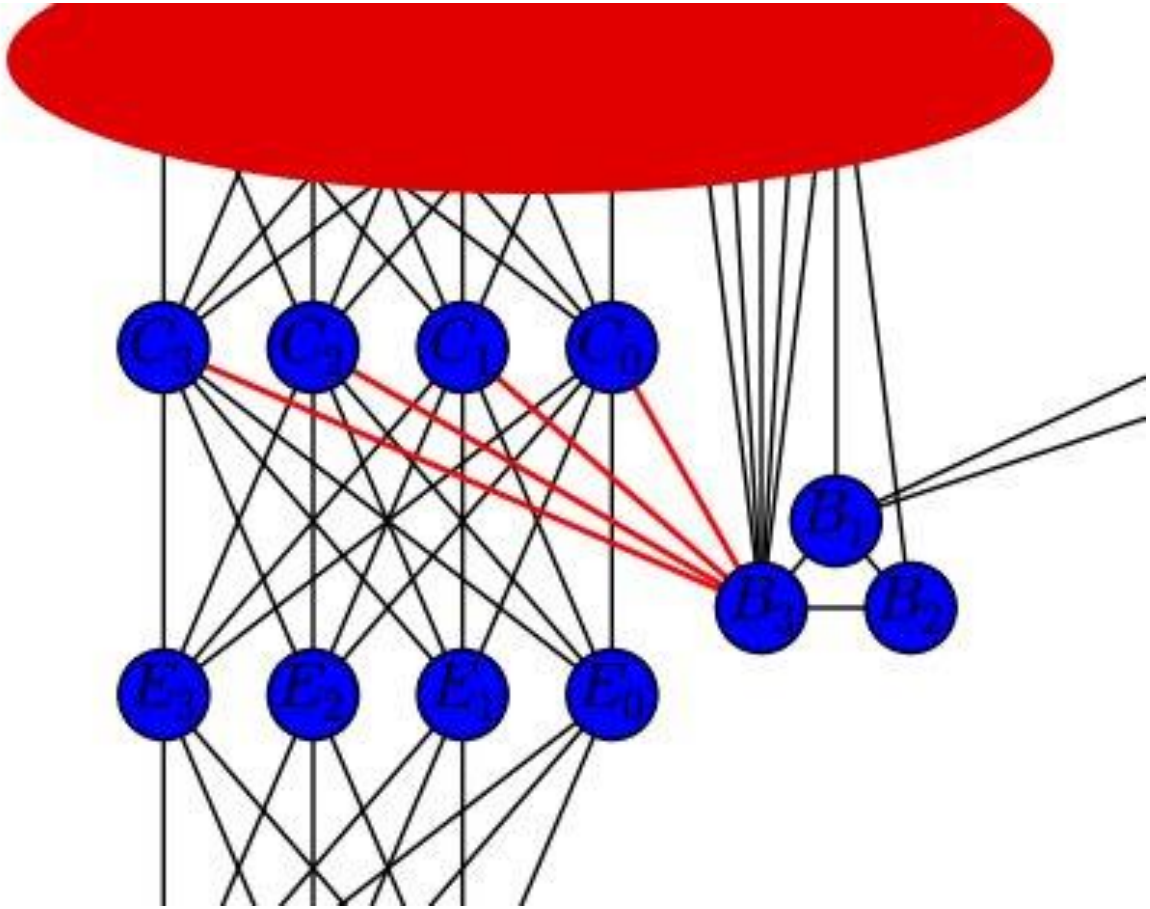
Simpler Example: $n\sqrt{n}$

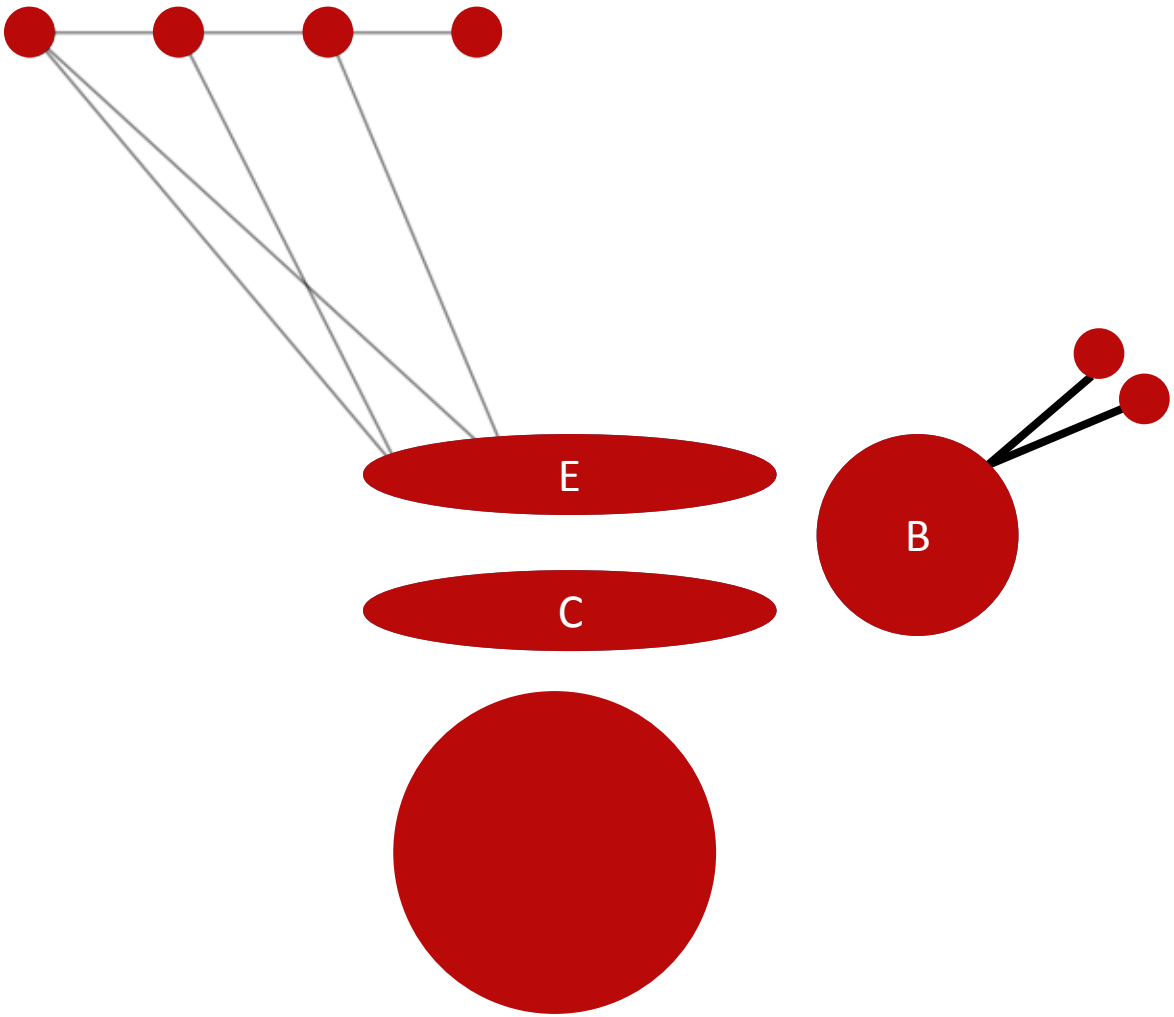


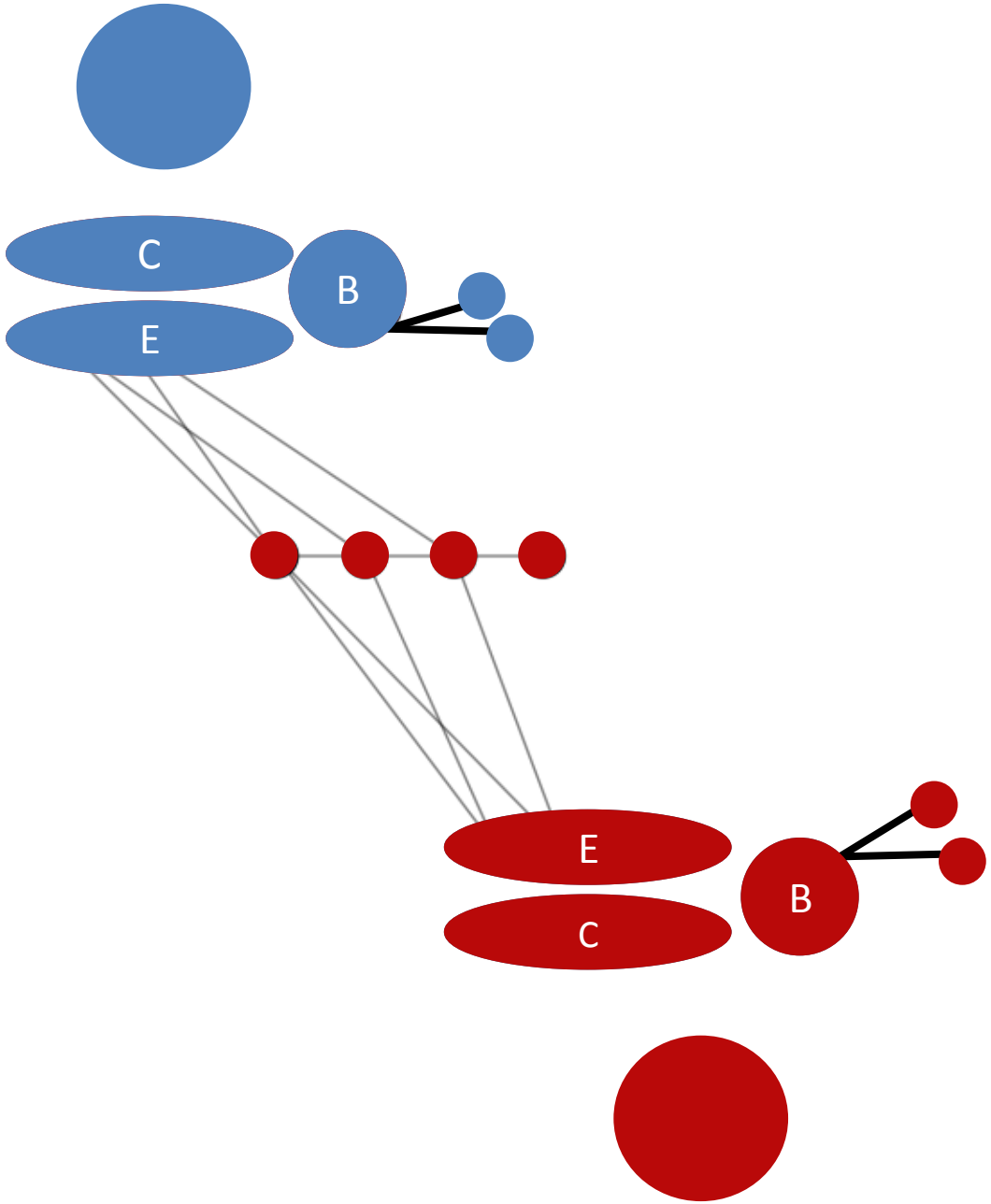
A Transistor

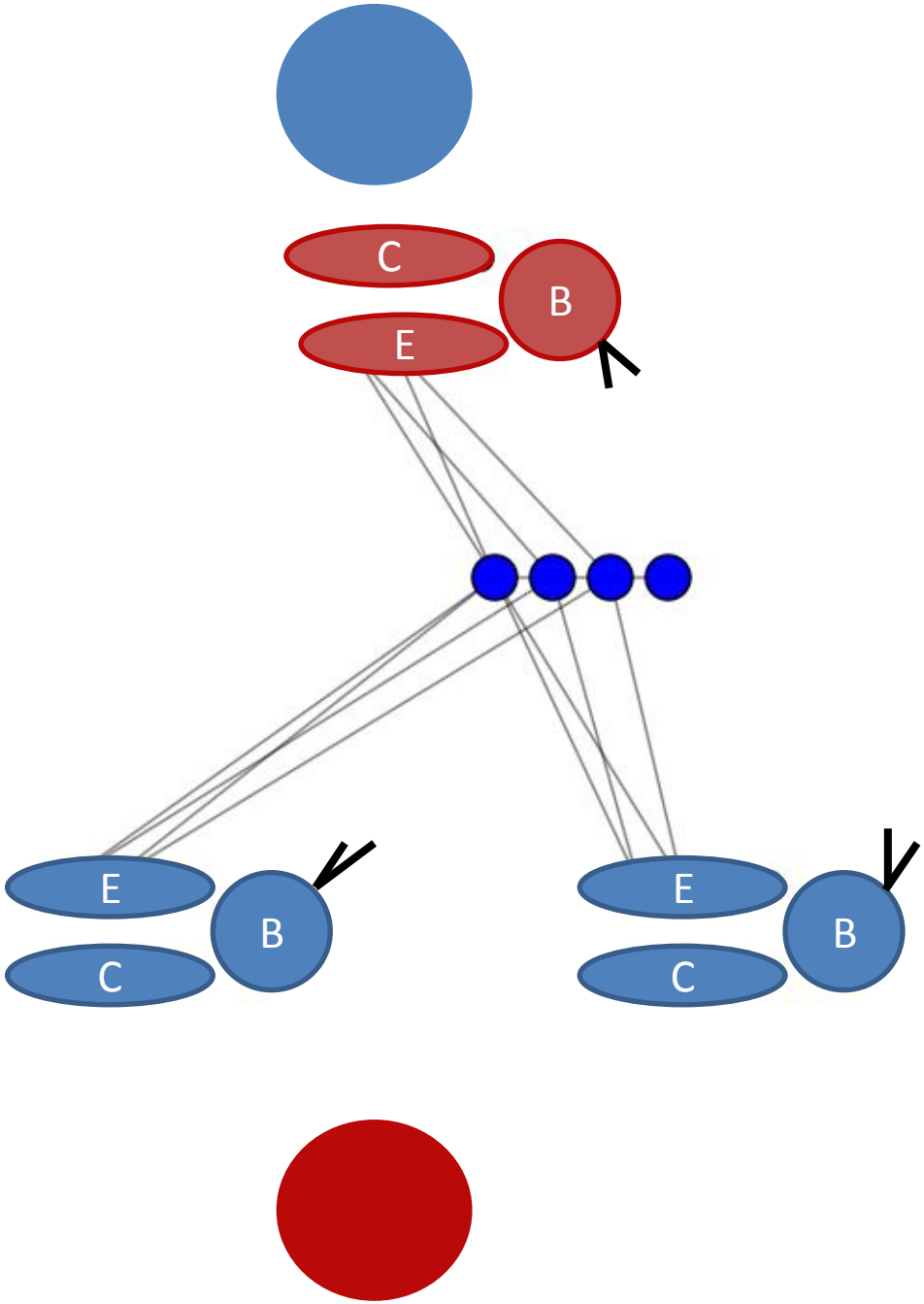


A Transistor




E
B
C


C
B
E
E
B
C


C
B
E
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C
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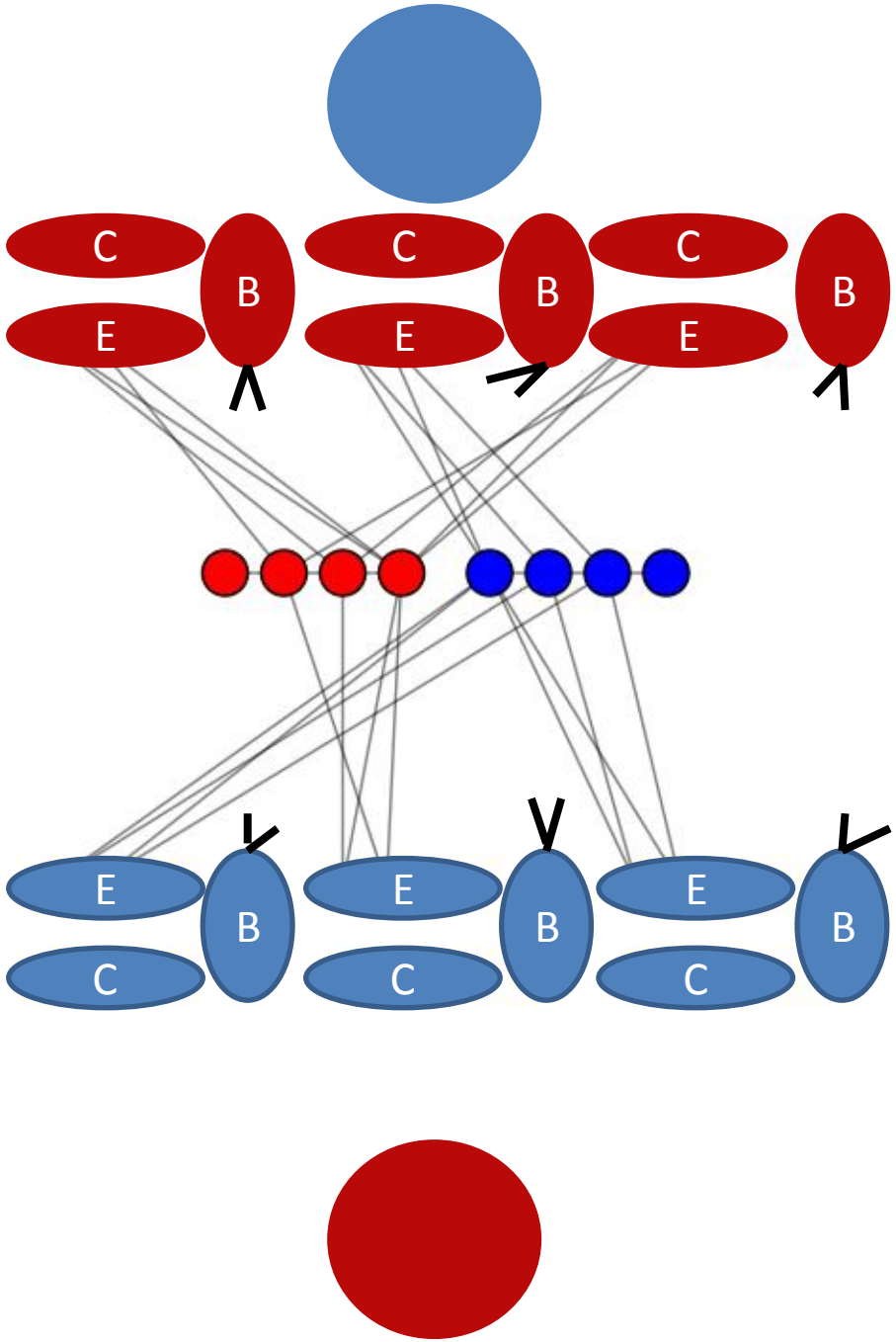
C


C
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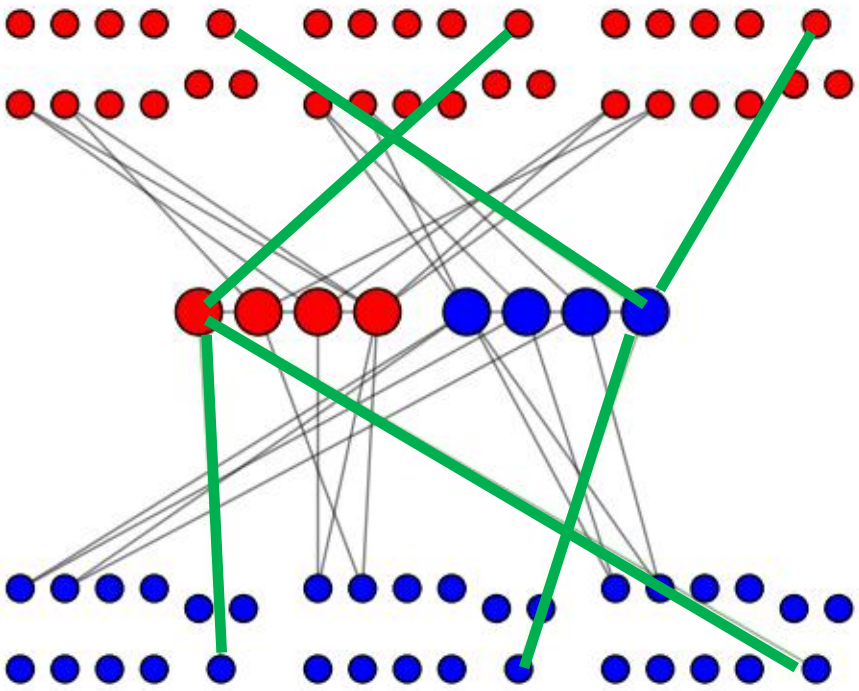
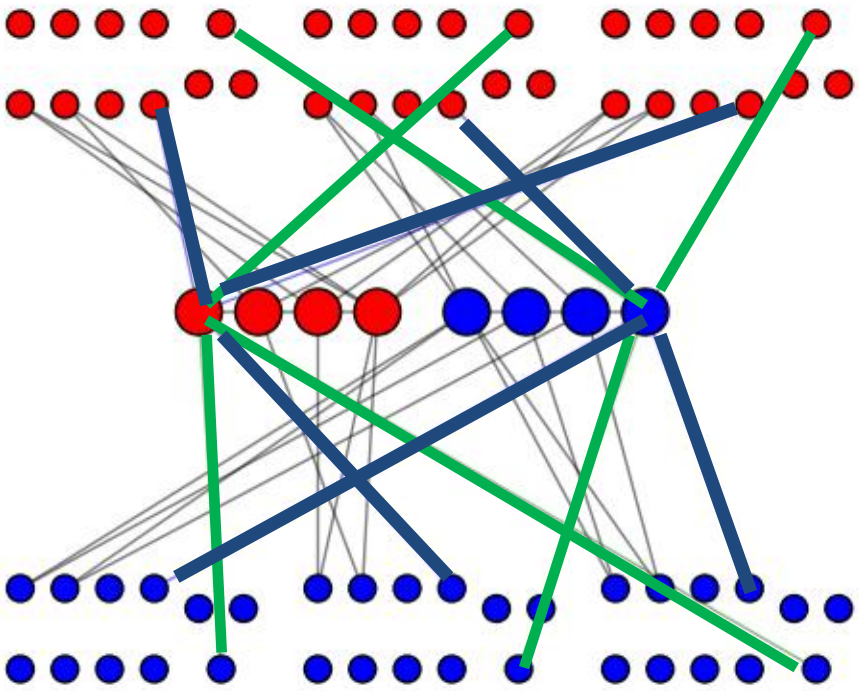
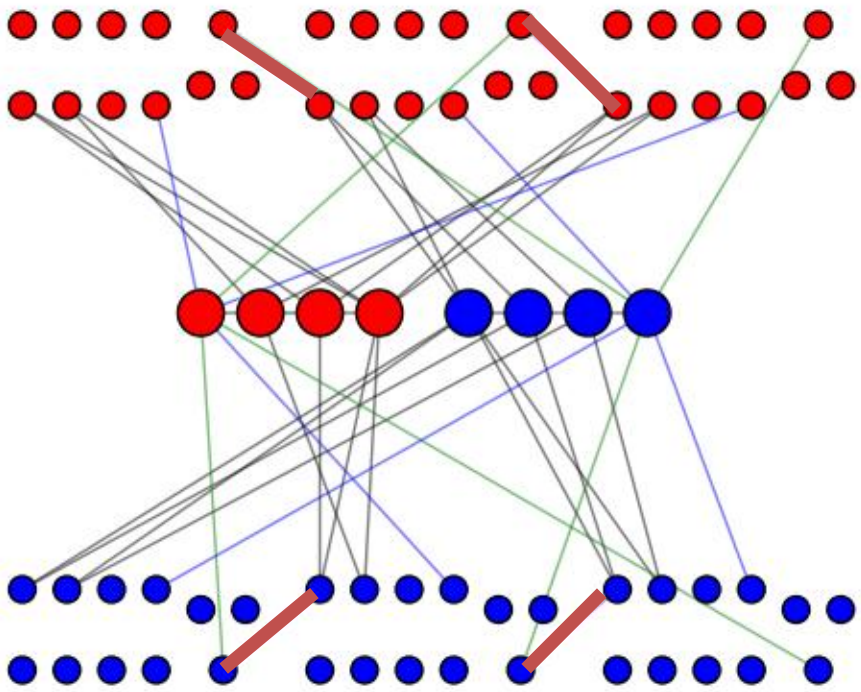
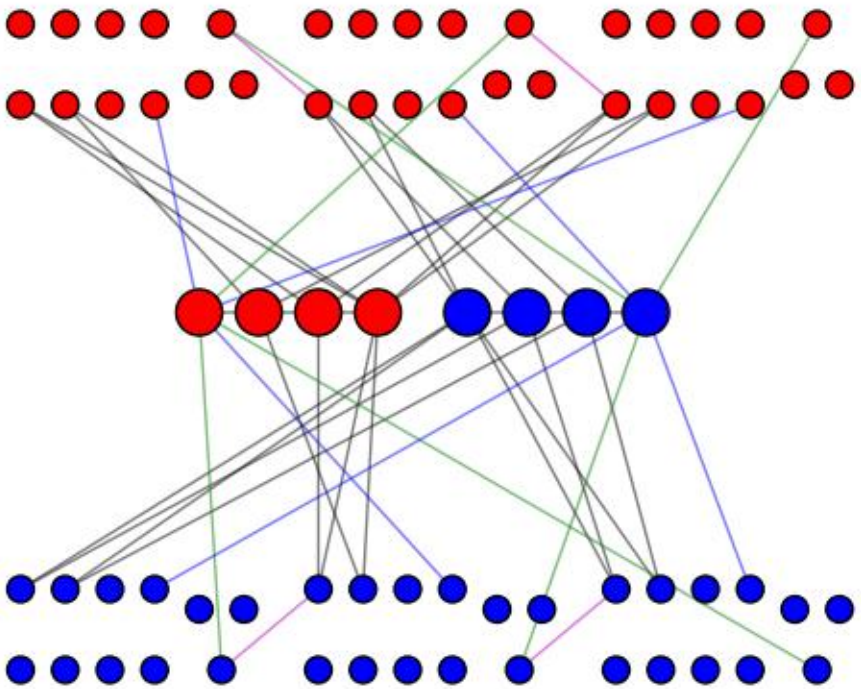






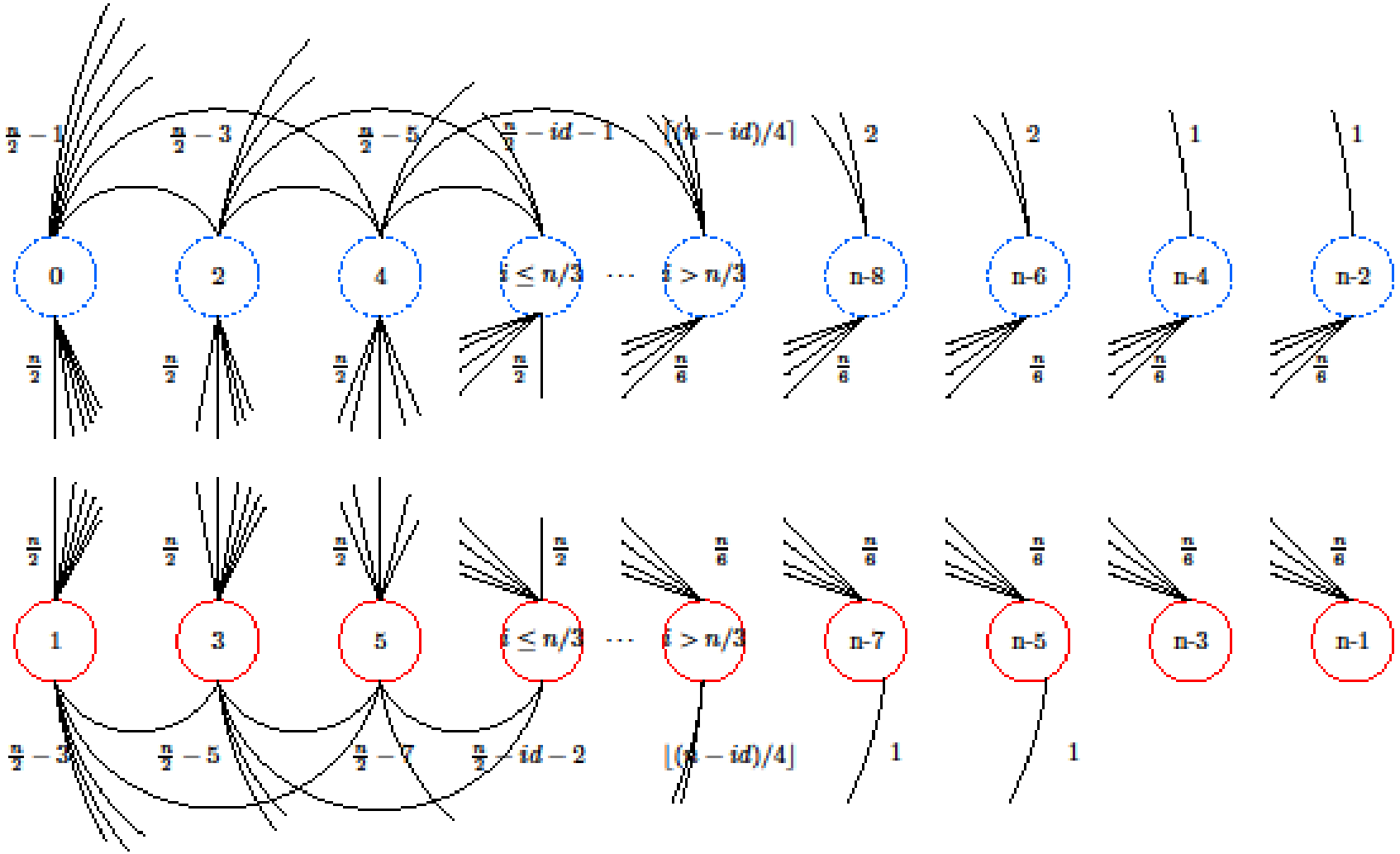


Other Results

Iterative model: Adversary picks nodes instead of synchronous rounds:

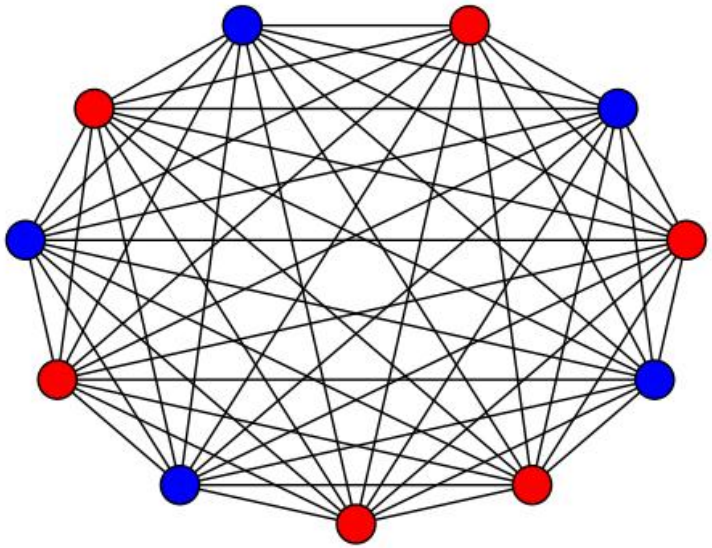
1 Step = 1 node change its opinion

Convergence Time: $\theta(n^2)$



Iterative Model

Benevolent algorithm: $\theta(n)$



תודה רבה