Aalto University

Distributed Algorithms 2020

9 Round elimination

This week's plan

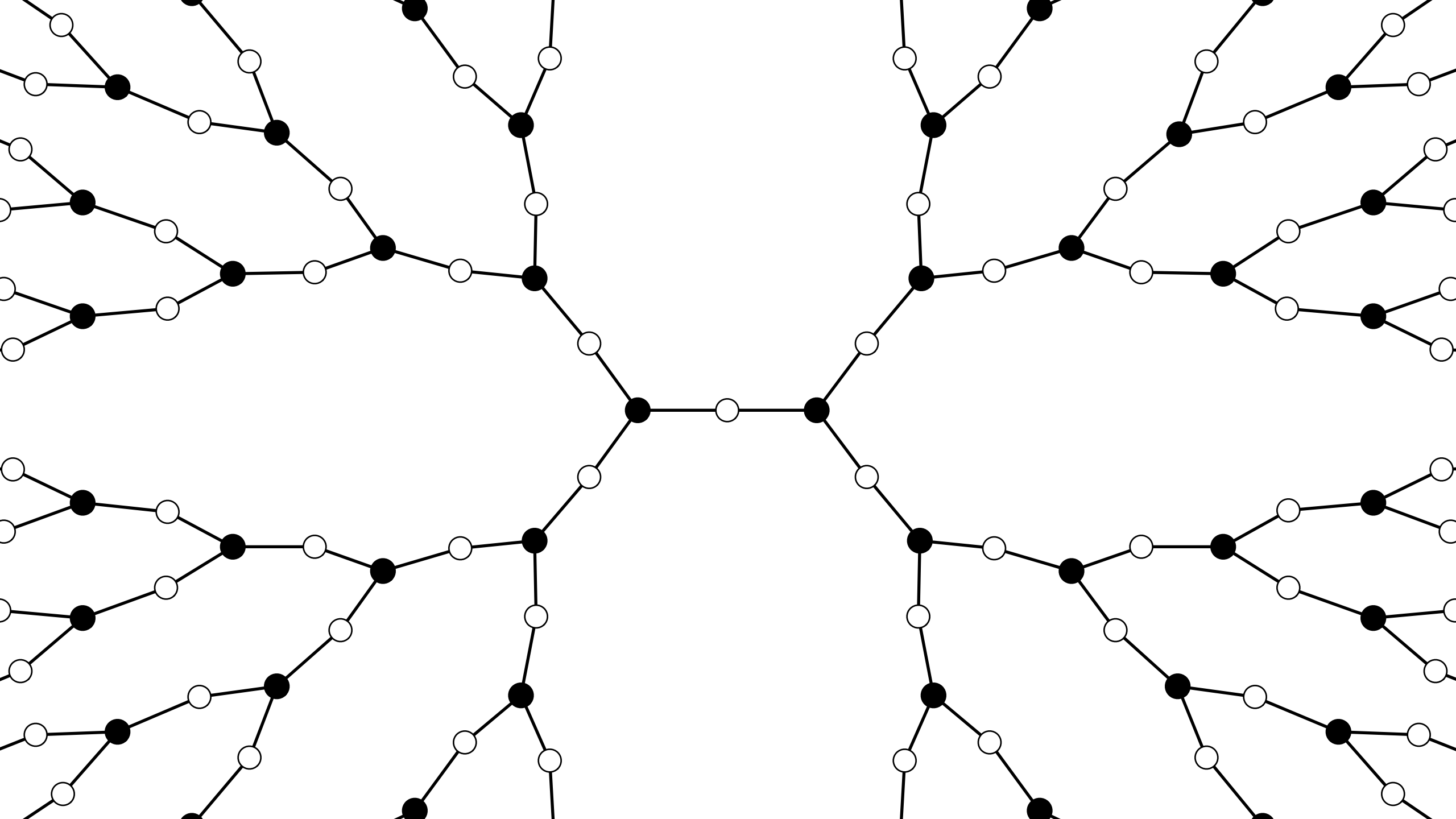
- **Topic:** ***round elimination***
  - function that maps problem X with complexity T to problem $X' = \mathrm{re}(X)$ with complexity $T - 1$
- **Video:** how to ***use*** round elimination
  - "re" was a black box
- **Today:** how to ***do*** round elimination
  - what happens inside the black box and why?

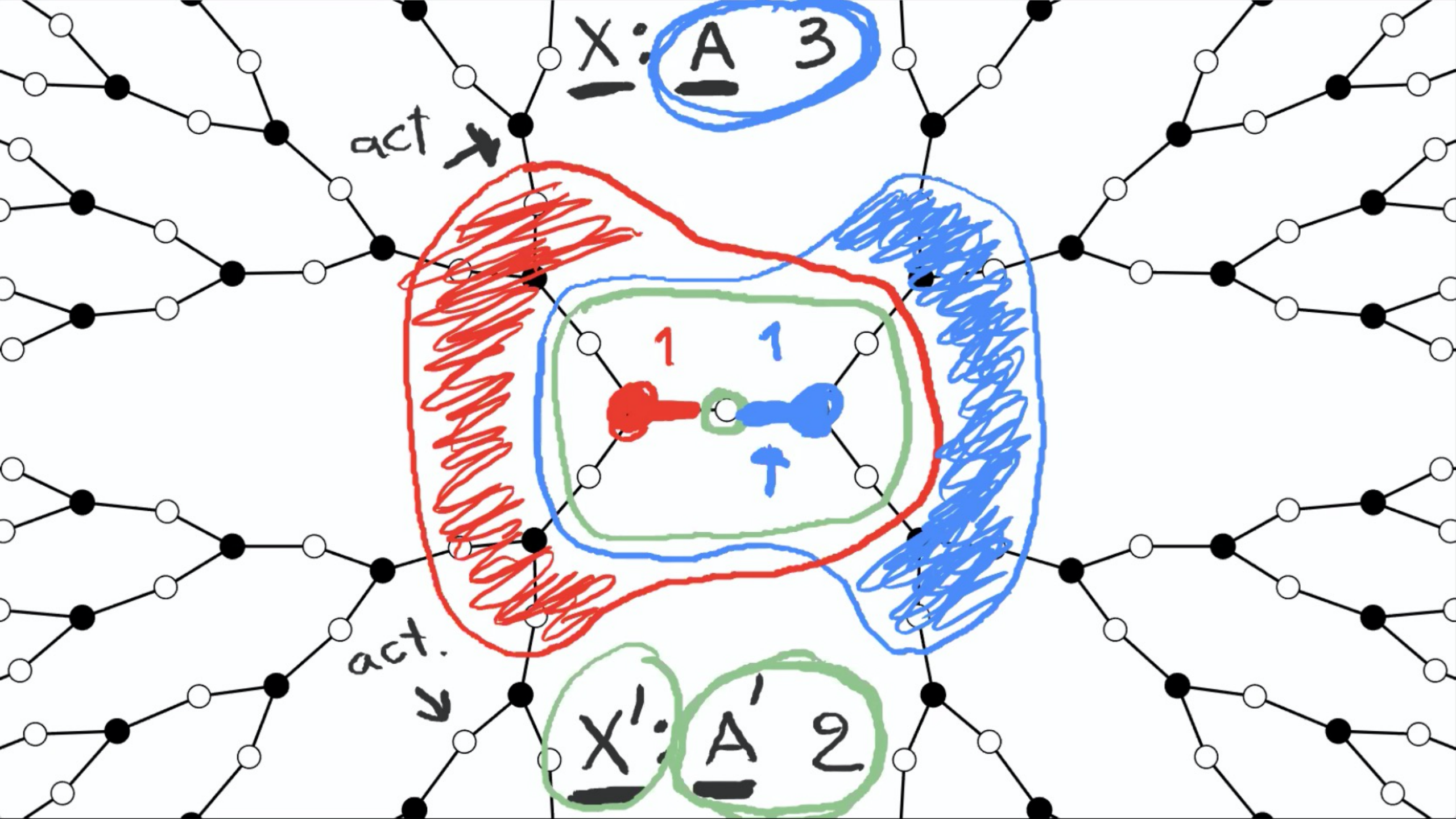
Round elimination

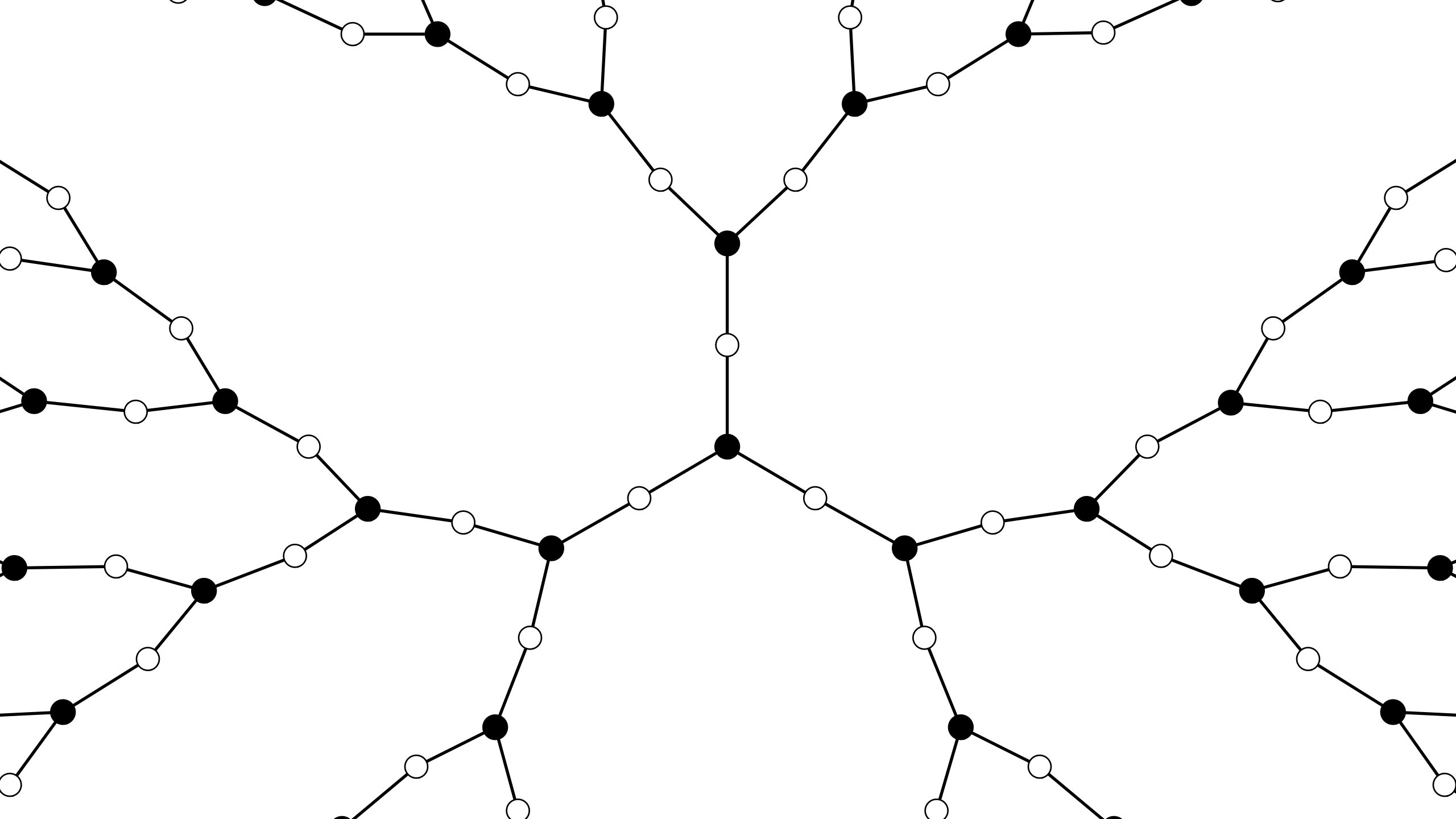
- Basic idea already used by Linial (1987)
  - *"it is not possible to 3-color cycles in* $o(\log^* n)$ *rounds"*
- Until 2015 it was thought this is an ad-hoc trick that only works for graph coloring
- **Lots** of new applications since 2016
- General idea formalized in 2019

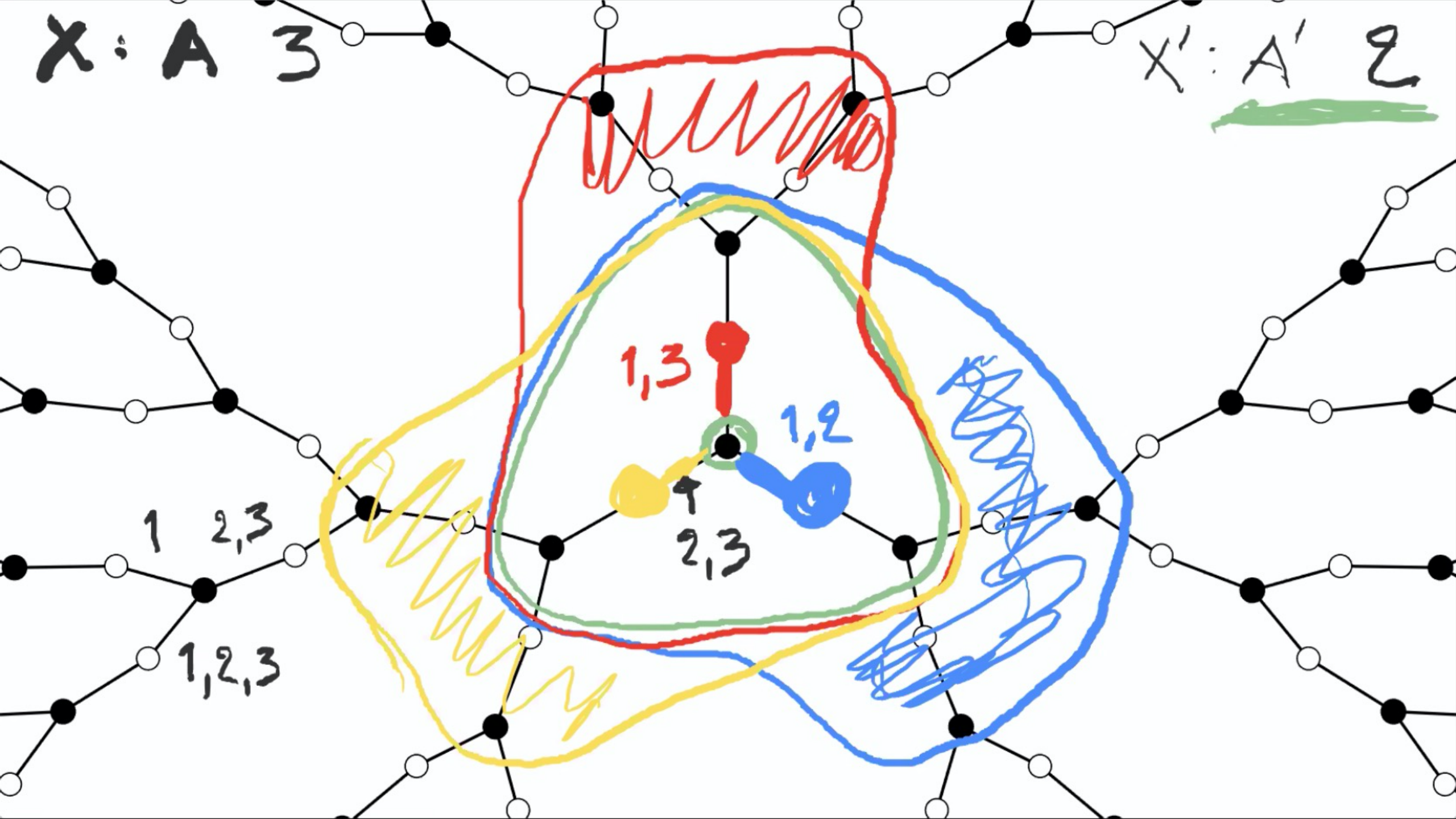
Weak 3-labeling

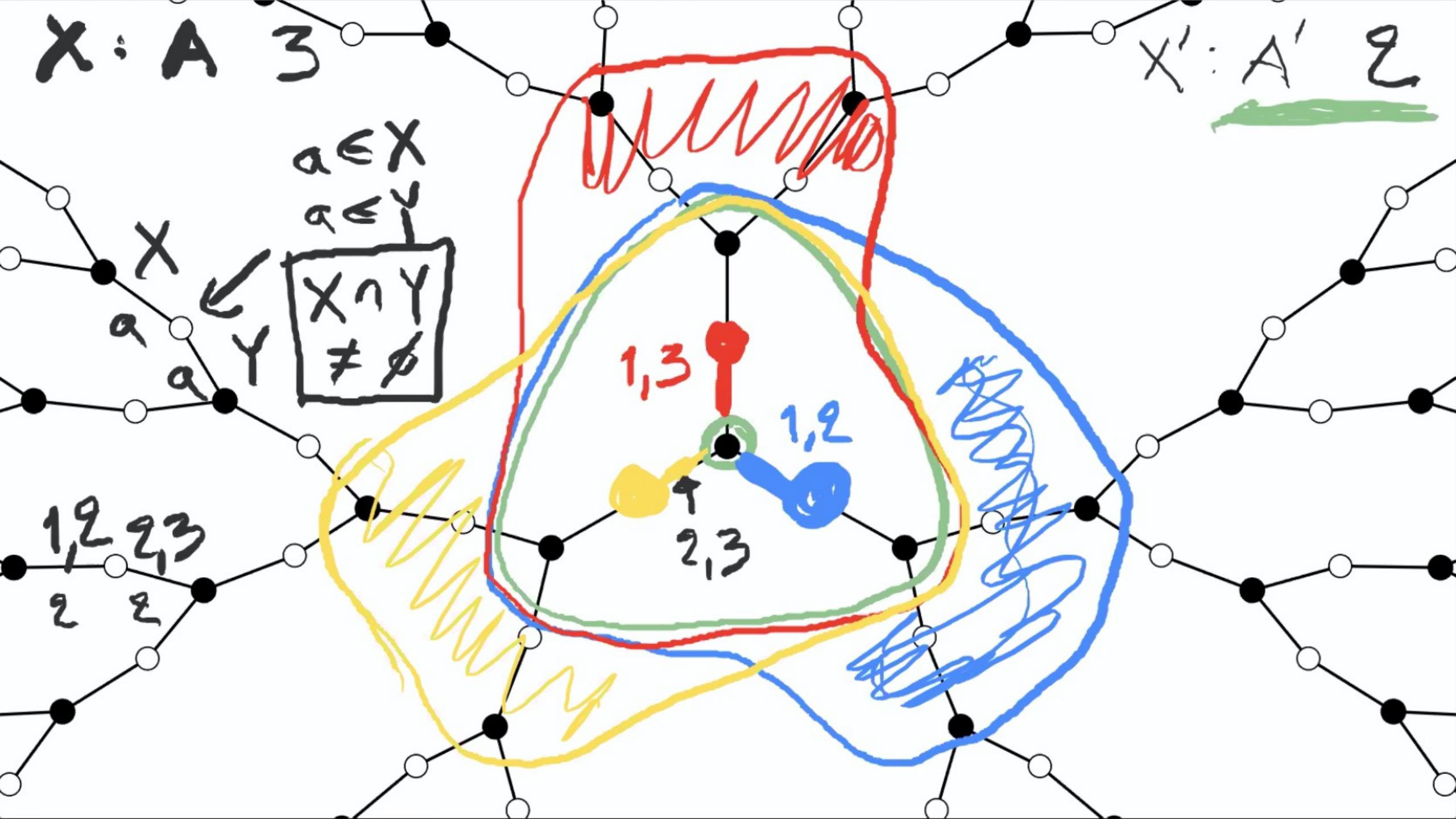
- **Labels:** 1, 2, 3
- **Active nodes:**
  - degree 3
  - not all labels same
- **Passive nodes:**
  - degree 2
  - both labels same




X: A 3
act
1
1
act.
X': A' 2




X : A 3
X' : A' 2
1,3
1,2
2,3
1
2,3
1,2,3


X : A 3
X' : A' 2
a ∈ X
a ∈ Y
X
a
a
Y
X ∩ Y
≠ ∅
1,3
1,2
2,3
1,2 2,3
2 2