

# Node Removal Effect on Polarization in Social Networks

Student: Iancu A. Popp (I.Popp@student.tudelft.nl)

Supervisor: Dr. Anna Latour

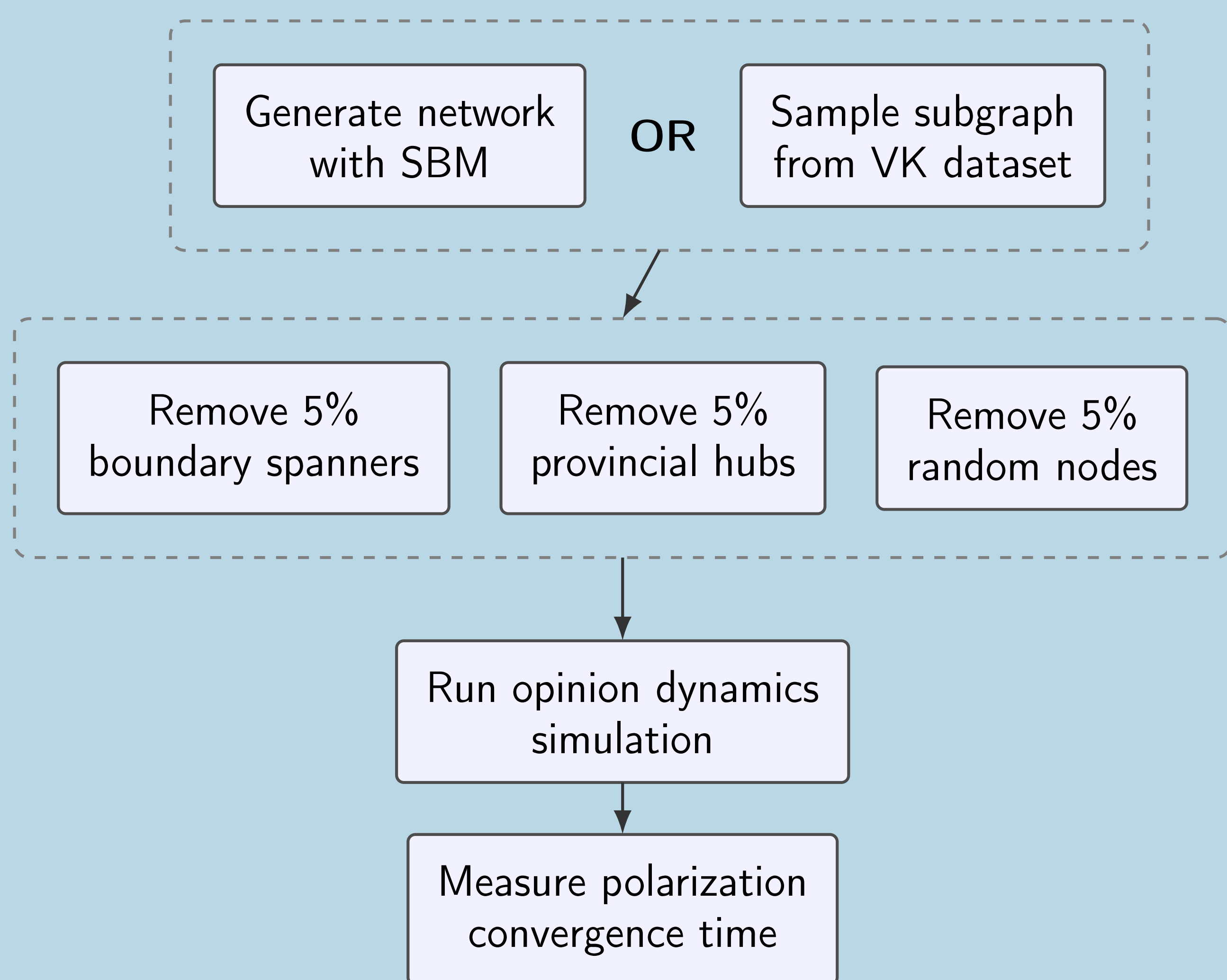
## Research question

Can removing specific nodes change how quickly a network polarizes?

Bridges between communities  
Leaders within communities  
Random nodes

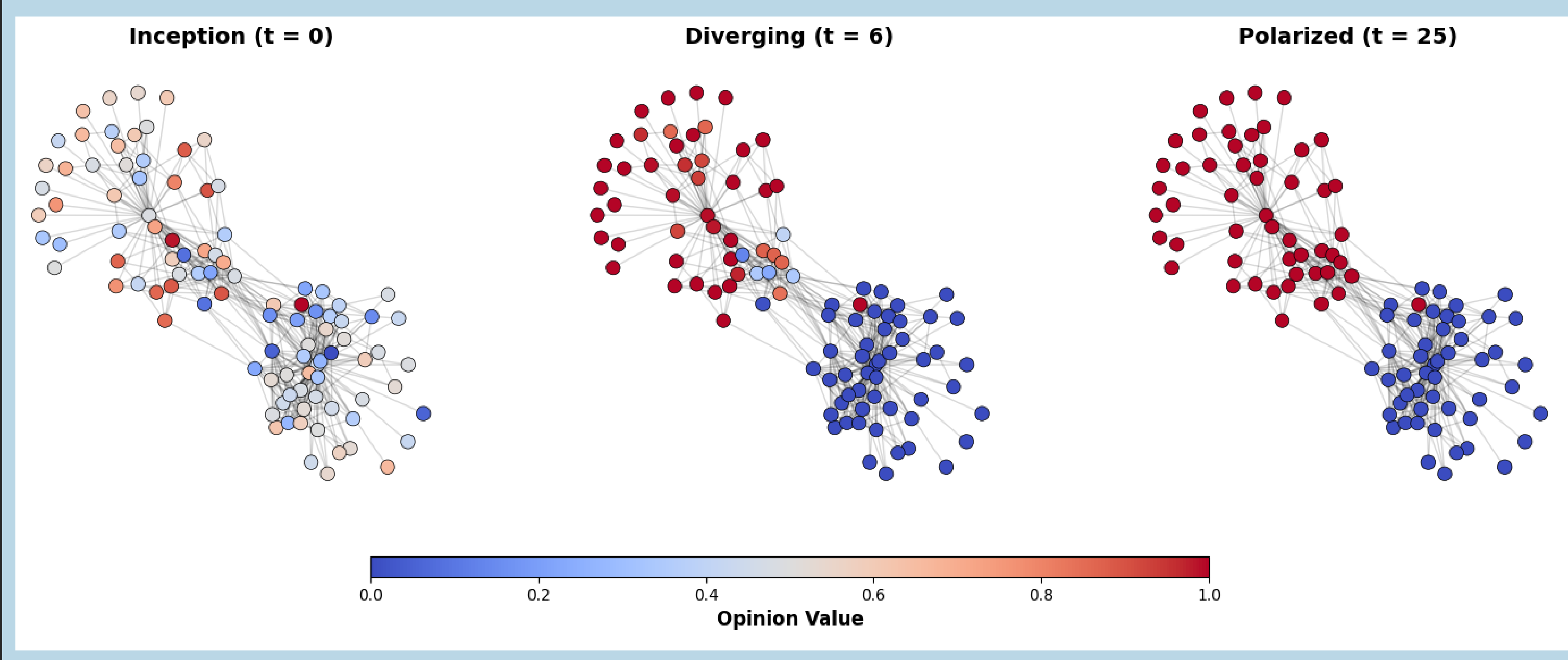
Boundary spanners  
Provincial hubs  
Baseline

## Methodology

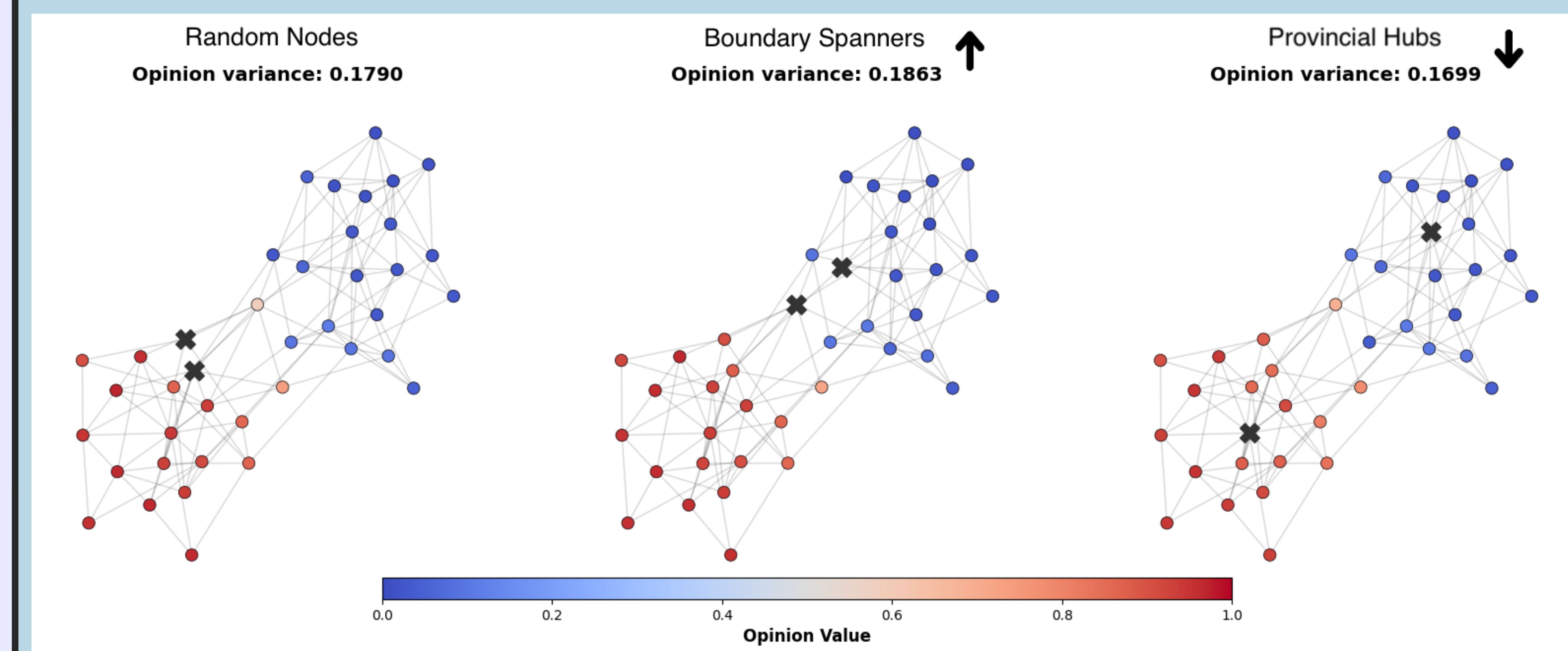


- **Networks:** 2 communities of 50 nodes each
- **Opinions:** [0, 1] range
- **SBM:** Stochastic Block Model
- **VK:** Online social network
- **Convergence time:** Number of update steps before opinions stabilize
- **Boundary spanners:** high bridging centrality
- **Provincial hubs:** high within-module degree, low participation coefficient

## Network Evolution



## Findings



- Removing boundary spanners **sped up** polarization
- Removing provincial hubs **slowed down** polarization

Monte Carlo results. Positive  $\Delta\tau$  indicates slower convergence (more steps taken to converge). The average baseline convergence time was 34.52 for SBM and 41.40 steps for VK.

Network	Strategy	$\Delta\tau$	$p$ -value
SBM ( $M = 1000$ )	Boundary Spanners	-7.69	$1.17 \times 10^{-47}$
	Provincial Hubs	+2.73	$2.07 \times 10^{-7}$
VK ( $M = 1094$ )	Boundary Spanners	-1.55	$3.73 \times 10^{-2}$
	Provincial Hubs	+4.93	$5.23 \times 10^{-9}$

## Conclusions

- Results suggest that:
  - Boundary spanners may act as **mediators** between the 2 communities.
  - Provincial hubs may act as **influential leaders**, radicalizing each community.
- Synthetic vs. empirical:
  - **Less structural separation** in empirical graphs may explain the lower impact of removing boundary spanners (more **redundant cross-community links**).
  - **Higher heterogeneity** within empirical communities may explain the higher impact of removing provincial hubs (more **uneven degree distribution**).