

Threshold Phenomenon in Information Spreading

네트워크 상에서 정보가 퍼져나갈 때
생기는 threshold 현상

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Goal

- Develop a model of information spreading on networks.
- Analyze threshold phenomenon in this model theoretically.
- Find out threshold phenomenon in real social networks.

- Construct effective advertisement in social networks.
- Explain interesting social phenomena
 - Diffusion of a rumor
 - Political opinion spreading
 - Fashion
 - Epidemic spreading

Model Definition

- Threshold Model
 - *Pedro Domingos and Matt Richardson, Mining the Network Value of Customers. SIGKDD'01*
- A node can be only two states
 - Accepted
 - Not Accepted
- If one node accepts information once, it's state accepted forever
- Acceptance rate
 - The numerical value represents that how easily a node accepts the information.
 - The value selected randomly from a specific distribution.
- If the number of neighbor nodes that accepted the information exceed its acceptance rate, then the node accepts the information.

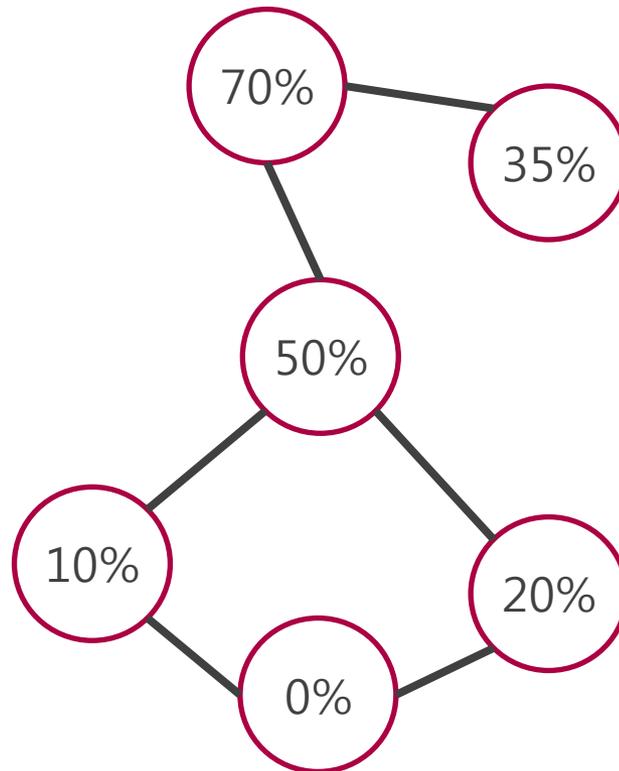


I'll buy an iphone if at least 10% of my neighbor buy it

Process of Spreading

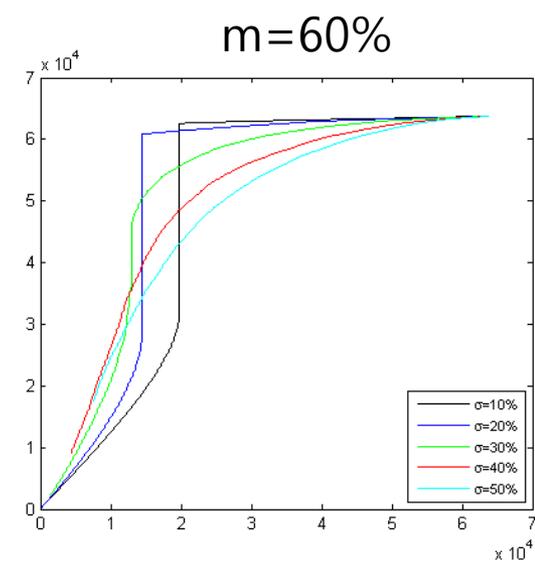
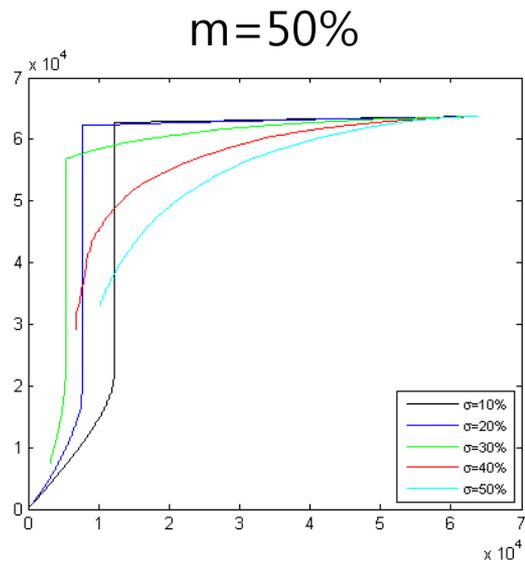
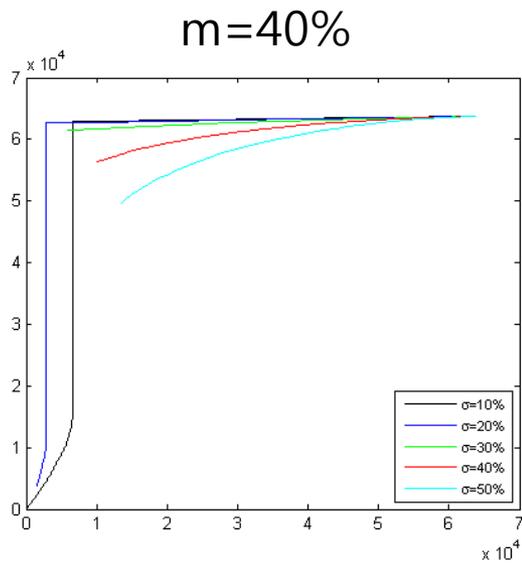
- Select initial k nodes randomly that starts spreading the information.
- Update nodes who can accept the information because of currently accepted nodes.
- Repeat above 2 steps until there is no one to accept the information.
- Find out the relationship between k with the number of nodes finally accepted the information.

Process of Spreading



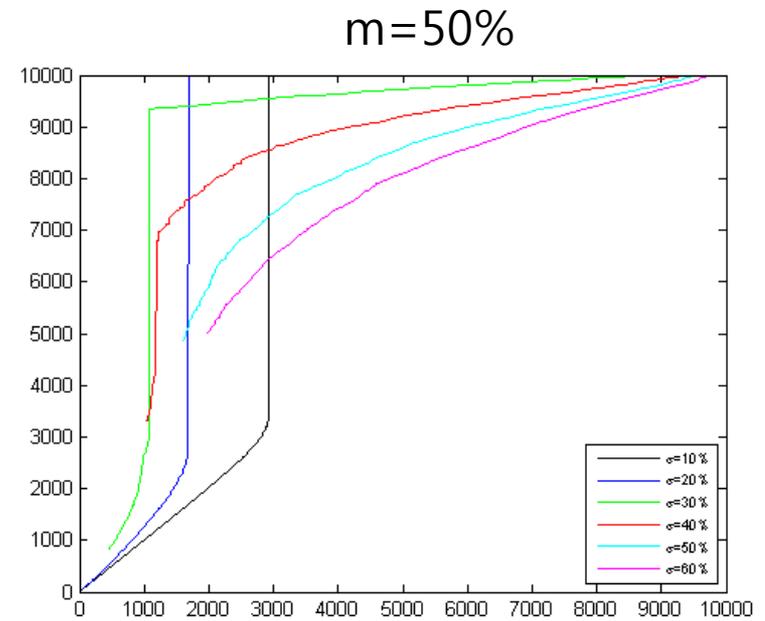
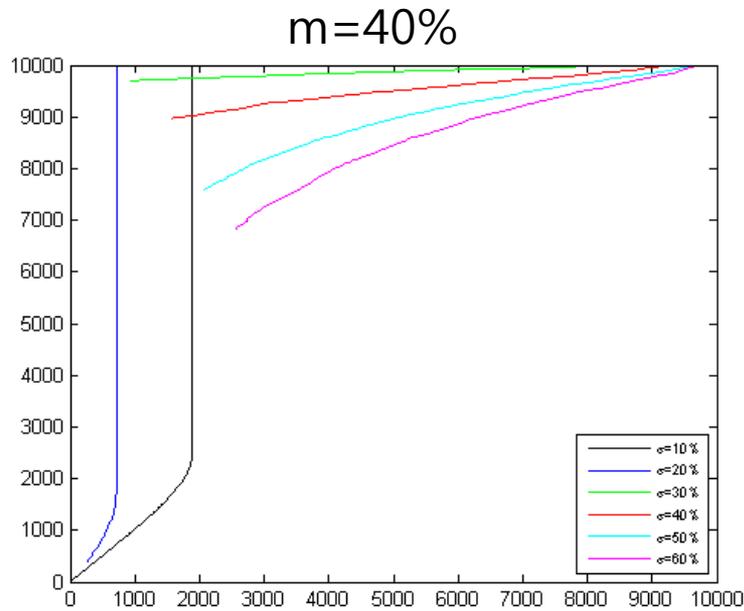
Initial = 1
Result = 4

Results_facebook



- N=63731
- Average degree=25.3

Results_Erdős–Rényi random graph



- N=10000
- P=160/10000

Future Works

- Prove the threshold phenomenon on random graph model.
- Change the distribution of the acceptance rate and find threshold phenomenon.
- Find other conditions that induce the threshold phenomenon besides the number of trigger nodes.
- Explain real-world information spreading phenomenon.

Thank you
