

CS-103 Announcements

- HW9 due 9pm Mon Nov 20
- Instead of lab quiz, there will be project
 - **Nov 30: JavaScript I.** Choose public JavaScript utility and modify for use in your own website.
 - **Dec 7: JavaScript II.** Based on classmate recommendations, choose another public JavaScript utility and modify for use in your own website.

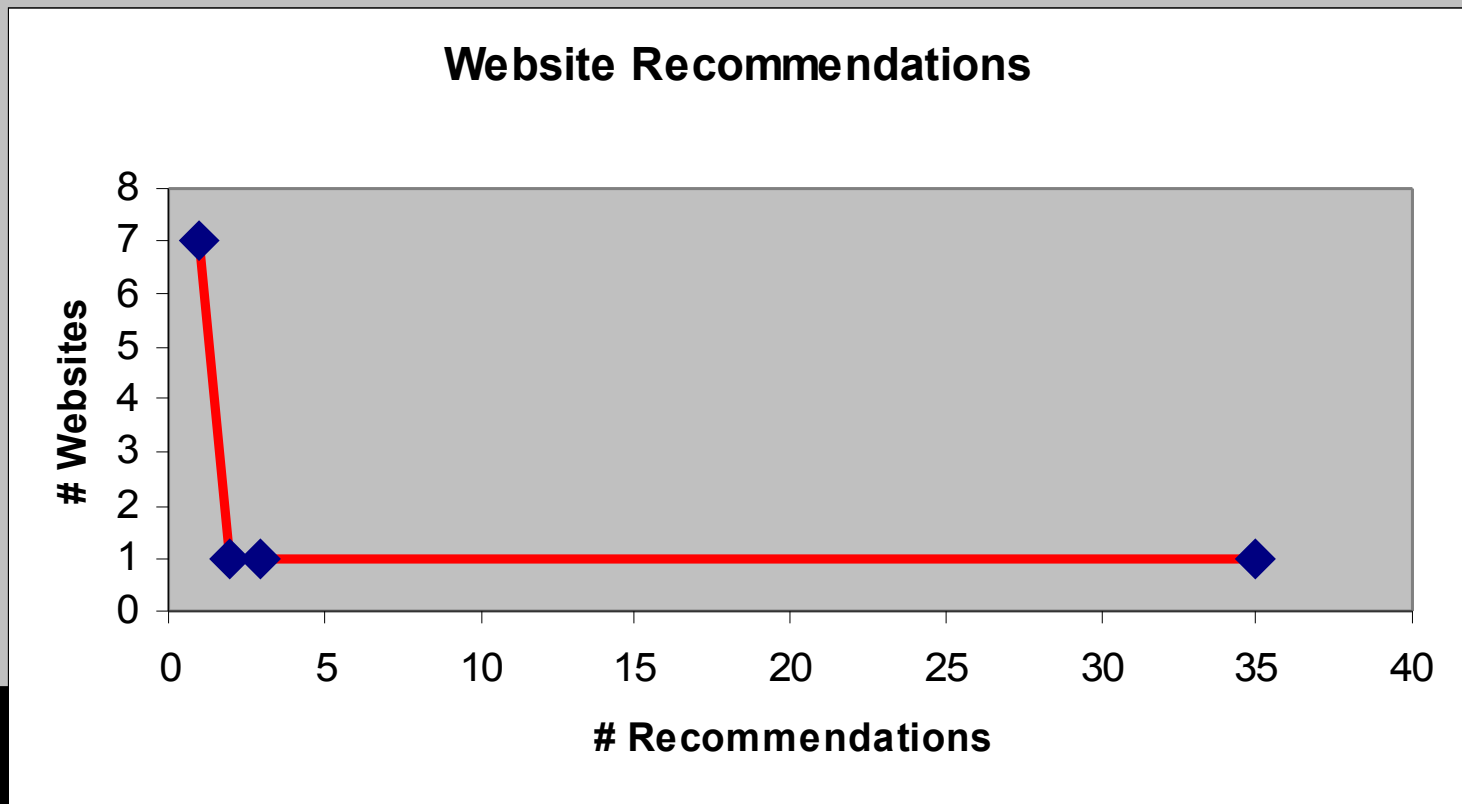
HW9 Status

Wikipedia: 35

AltaVista: 2

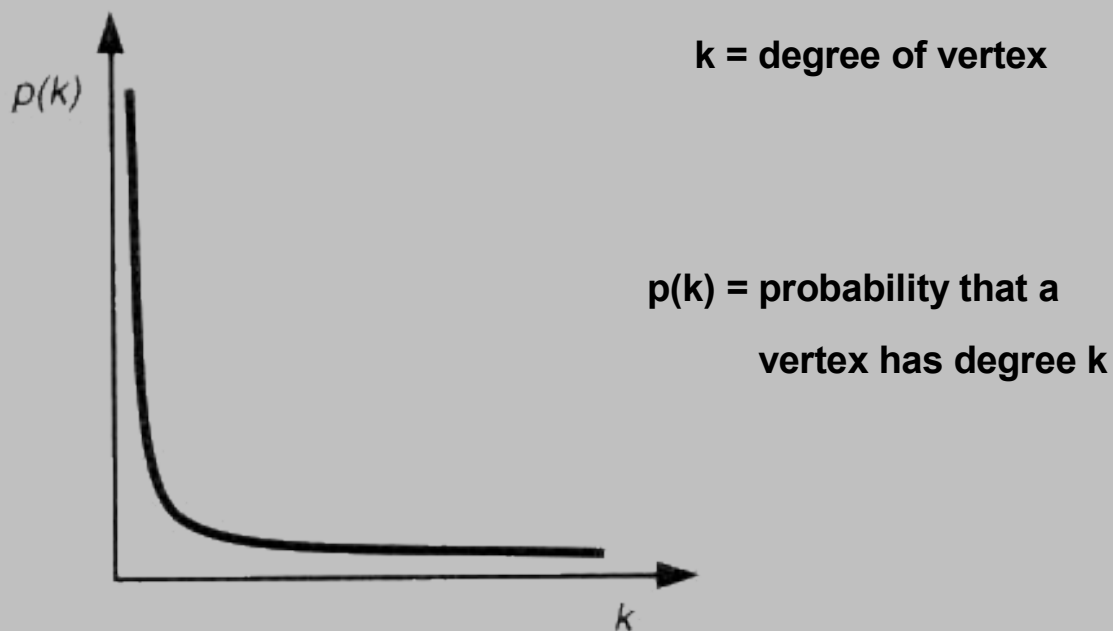
Epicurious: 3

Seven others: 1 each



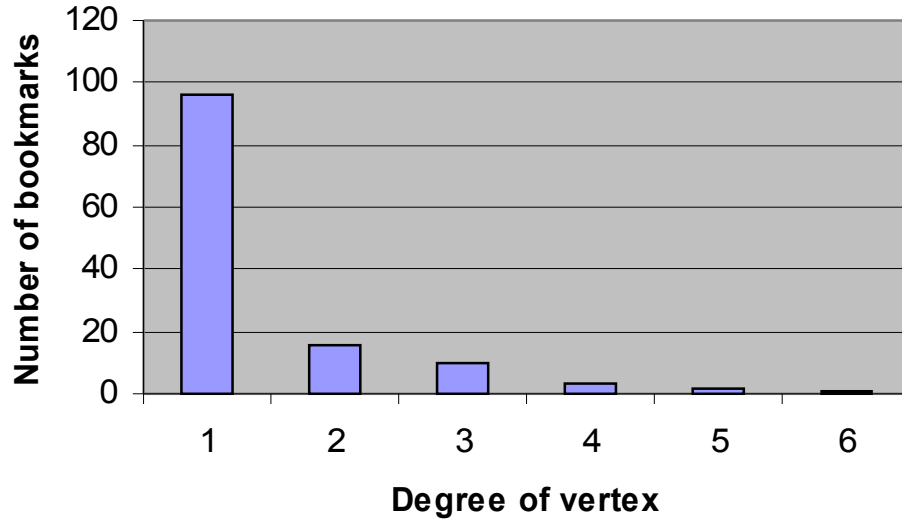
Scale-free networks

- Any network where the distribution of vertex degree looks like



Recall bookmarks vs discussion

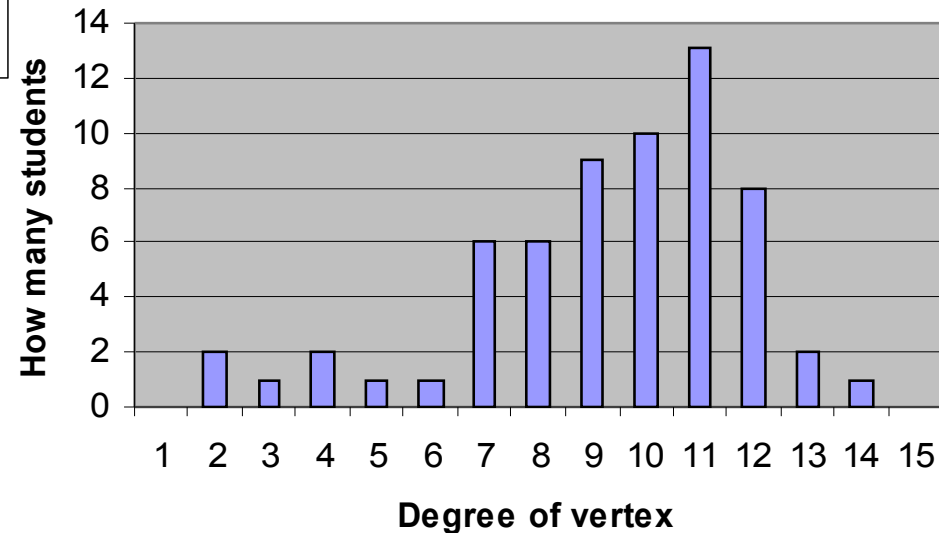
Class Bookmark Network



Where are new edges most likely to form in each case?

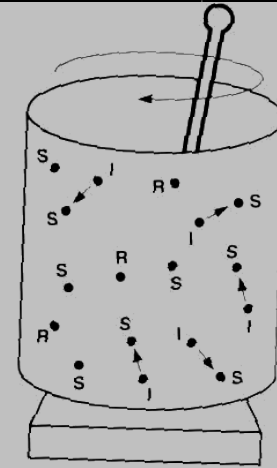
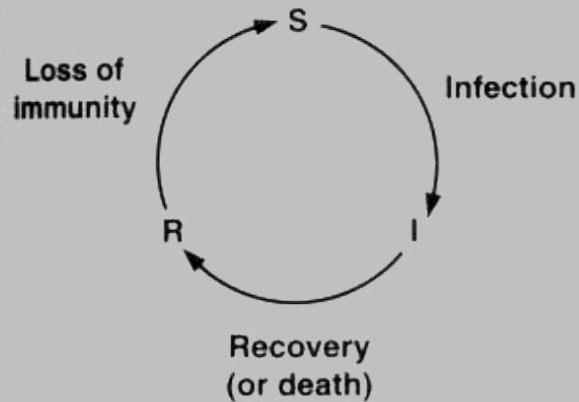
What is the limit to maximum degree (or “scale”) in each case?

Class Discussion Network



SIR model

- SIR
 - Susceptible
 - Infectious
 - Removed



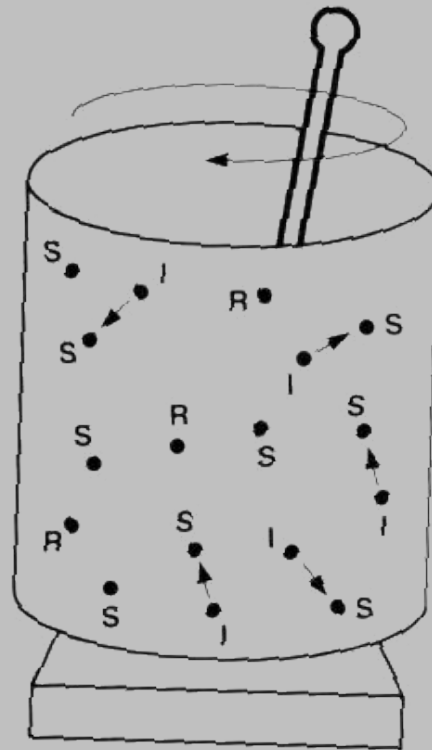
- We brought up three enhancements to SIR in class...

Enhancements to SIR model

- Enhancements to SIR model that we brought up in class...
 - Structure of relationships
 - Inherent resistance to infection
 - Countermeasures against infection

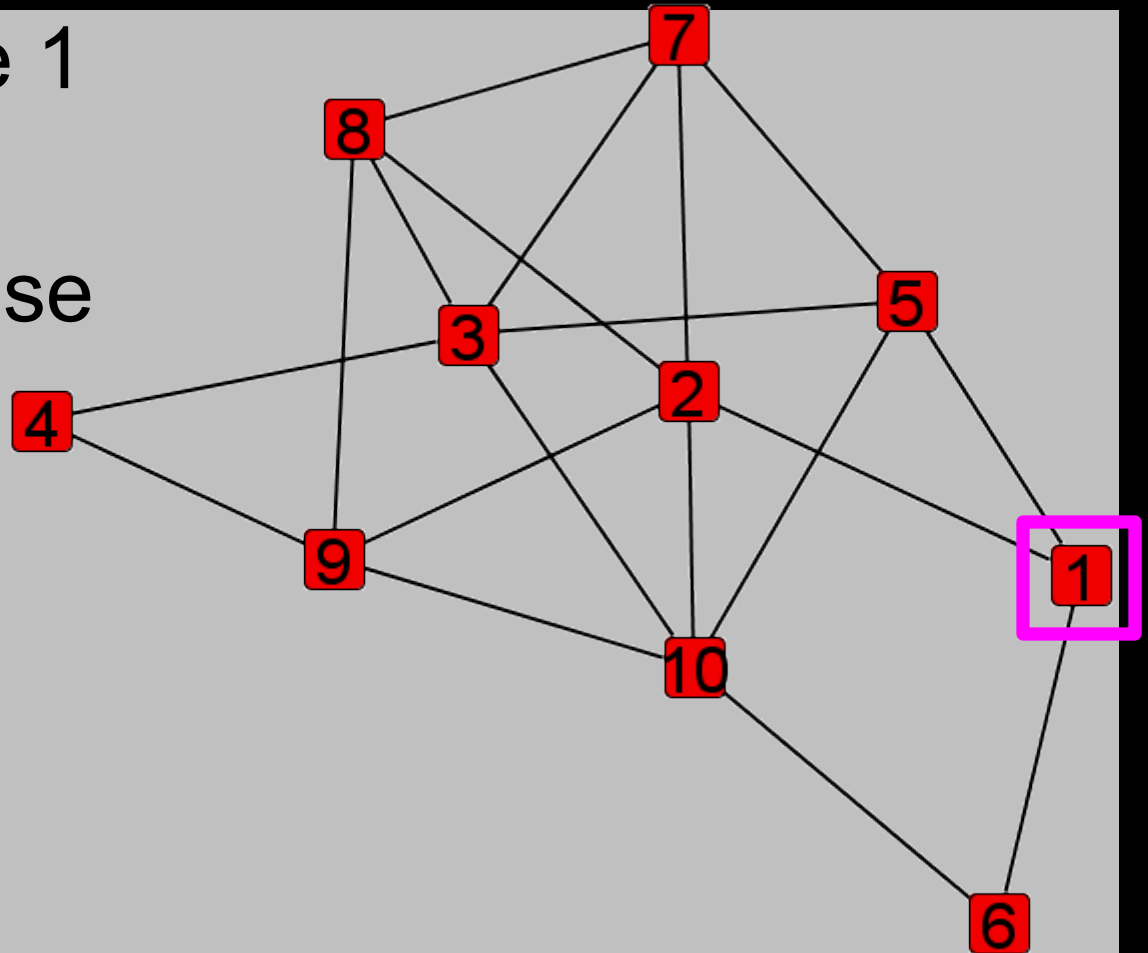
Structure of relationships

- How to model structure of relationships?

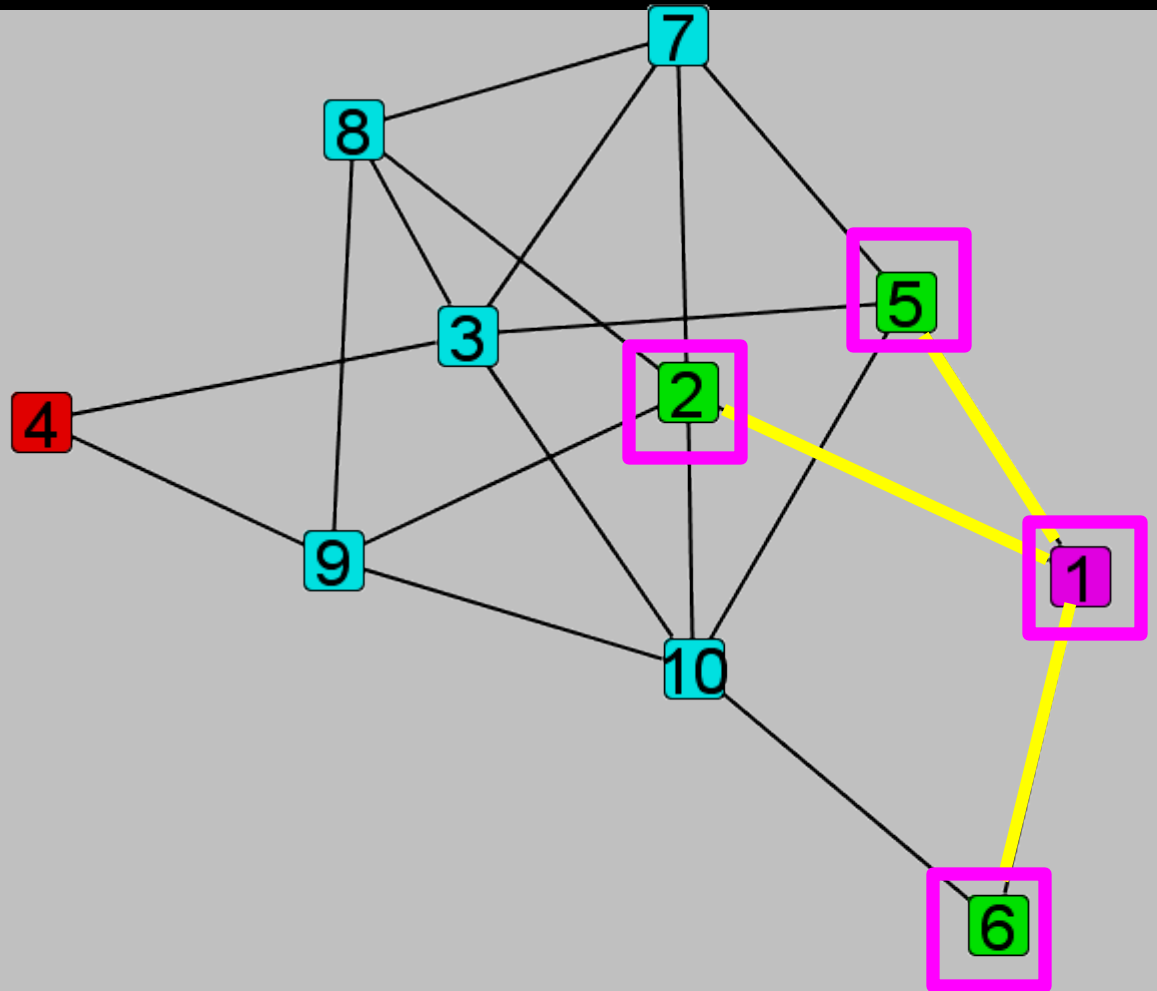


Epidemics in networks

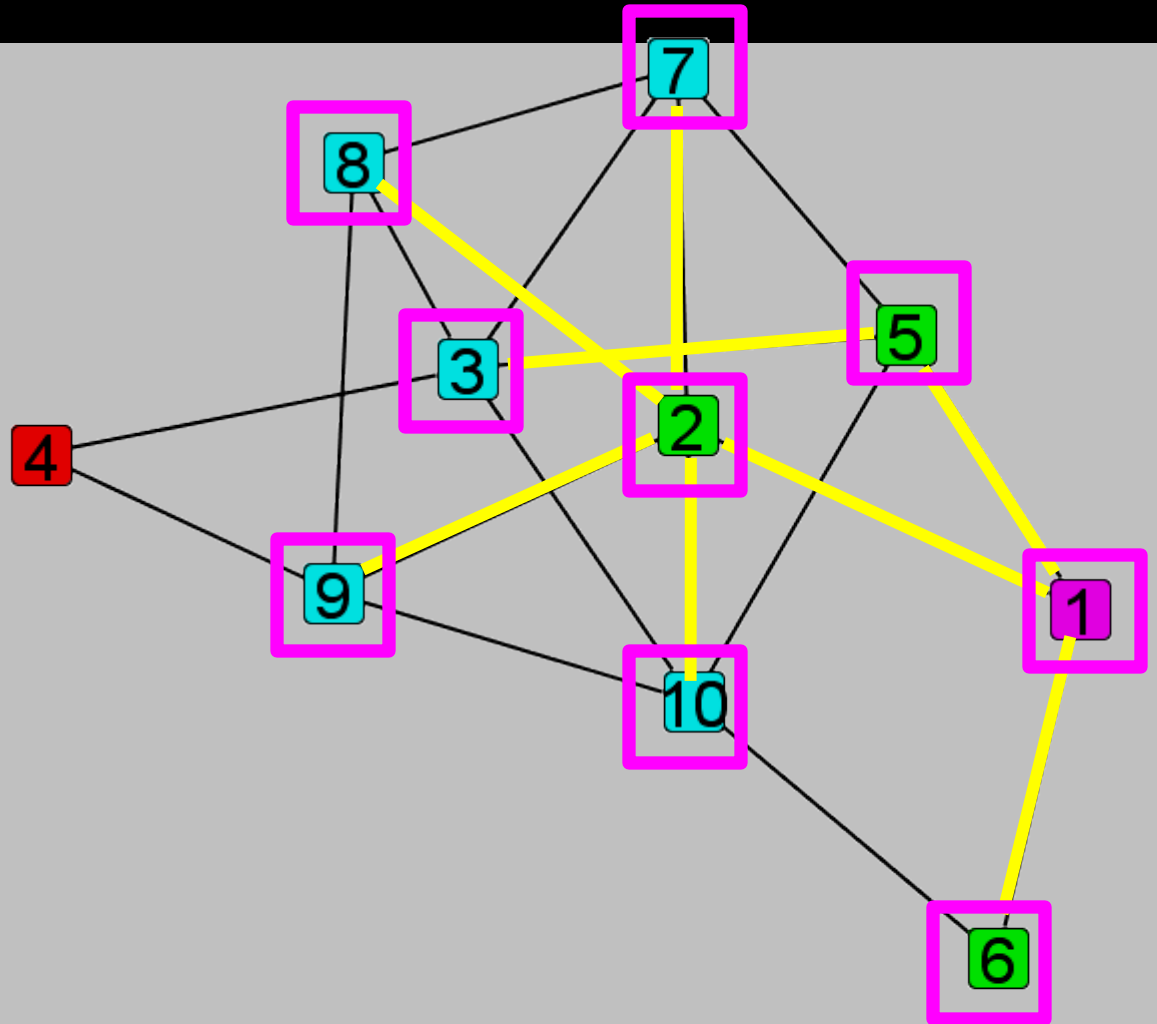
- Suppose node 1 is contagious
- How will disease spread?



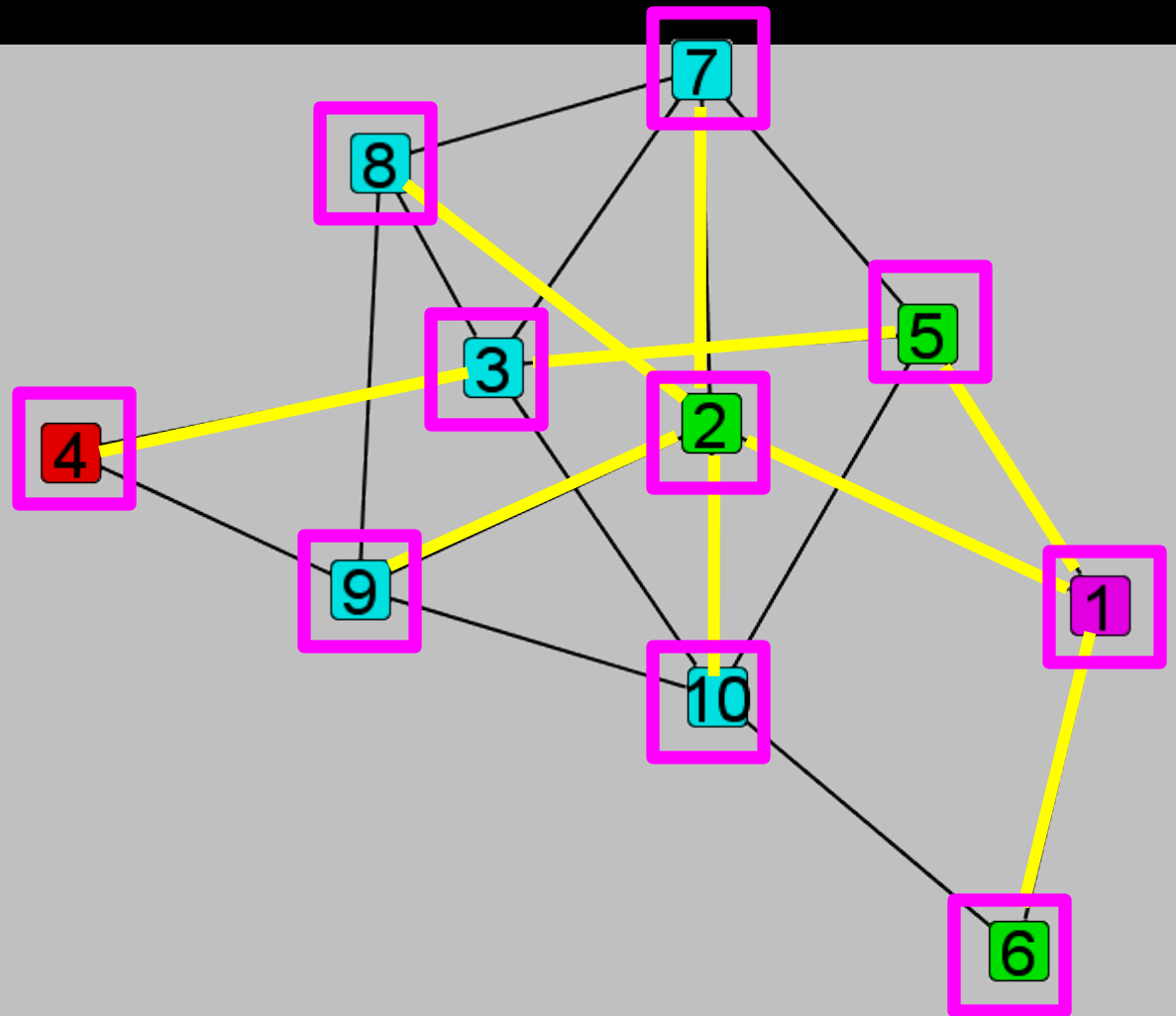
Epidemics in networks



Epidemics in networks

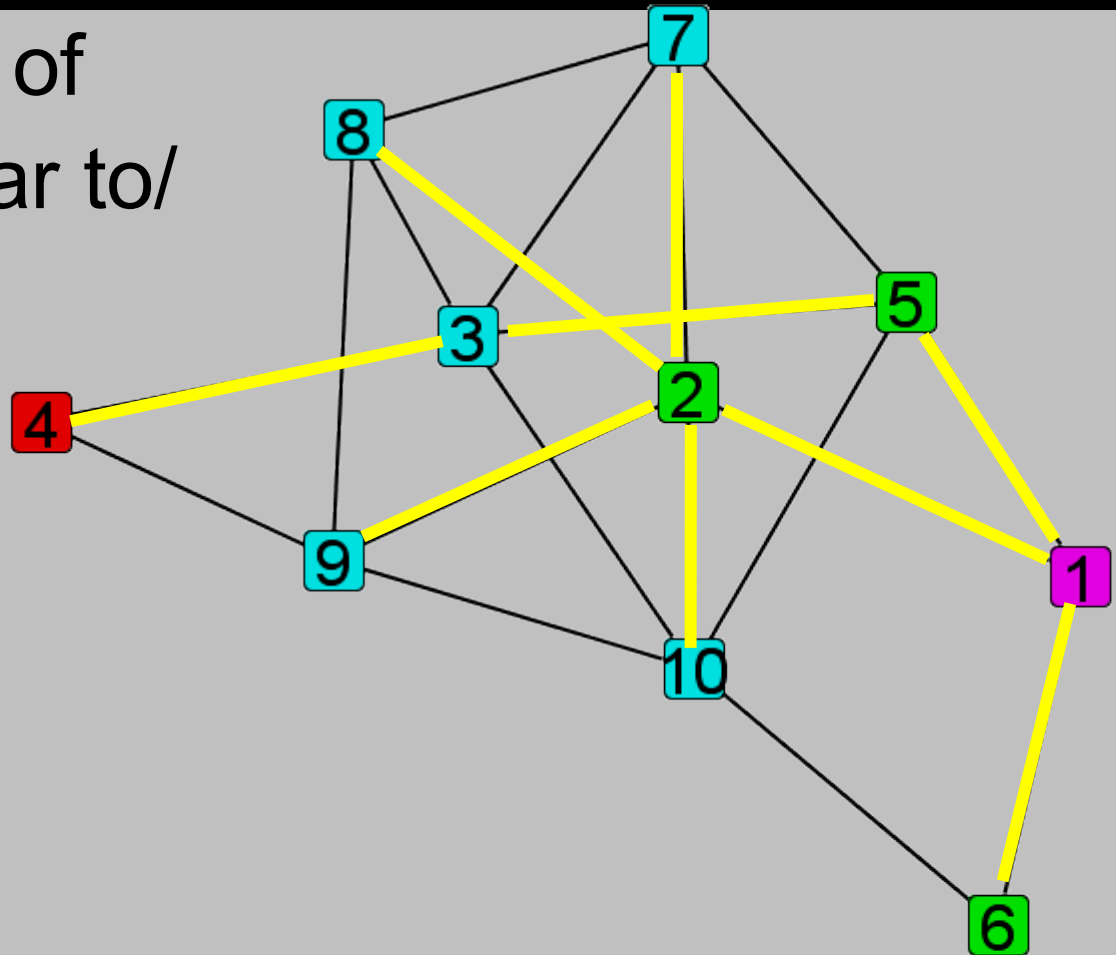


Epidemics in networks



Epidemics and Broadcast Search

How is spread of epidemic similar to/different from broadcast search?



Different network structures

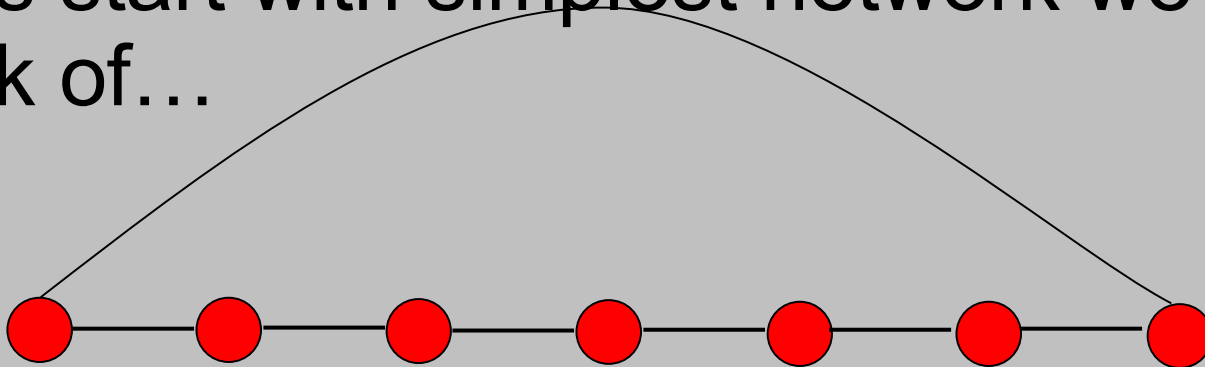
- How will different network structures influence spread of epidemic?

Different network structures

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- Let's start with simplest network we can think of....

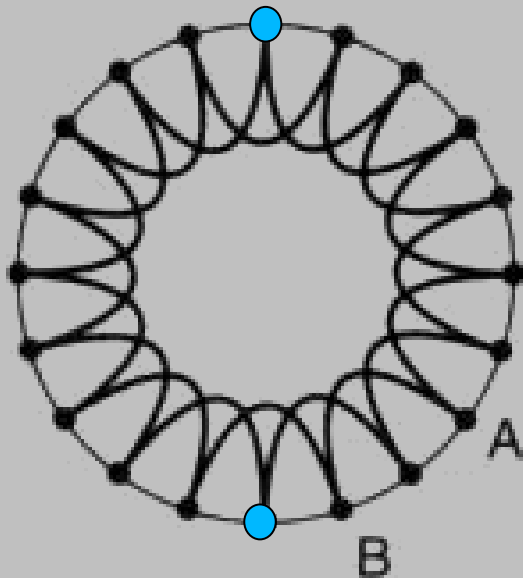
Different network structures

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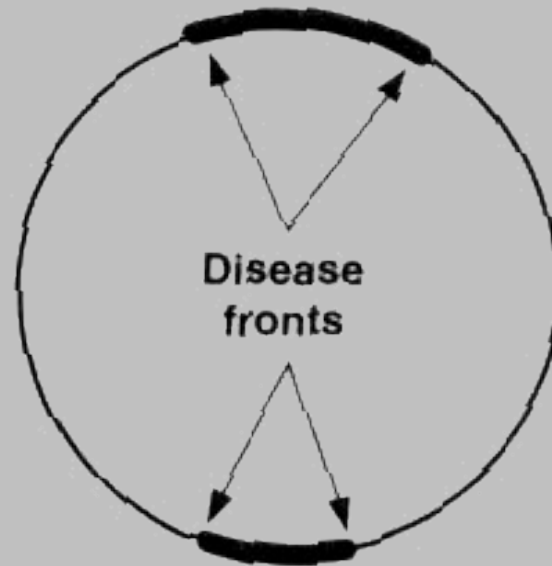
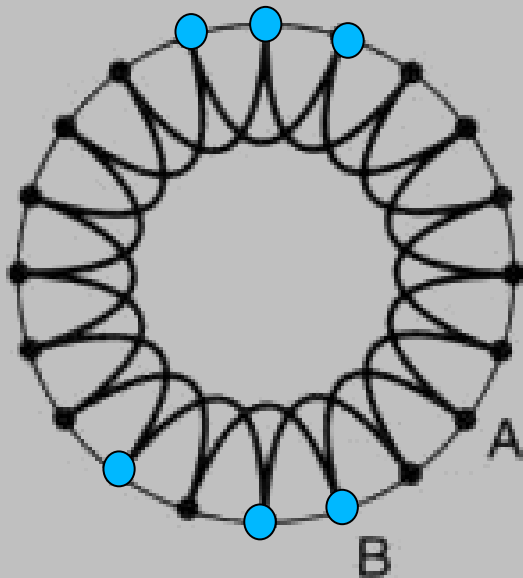
Periodic Lattice

- How will epidemic spread in this network?



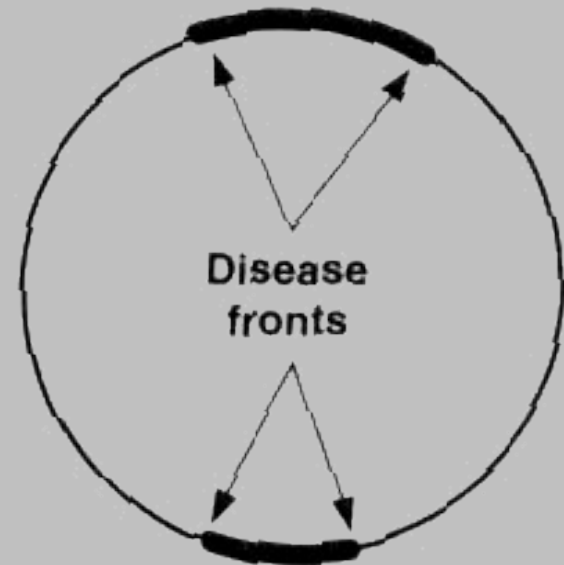
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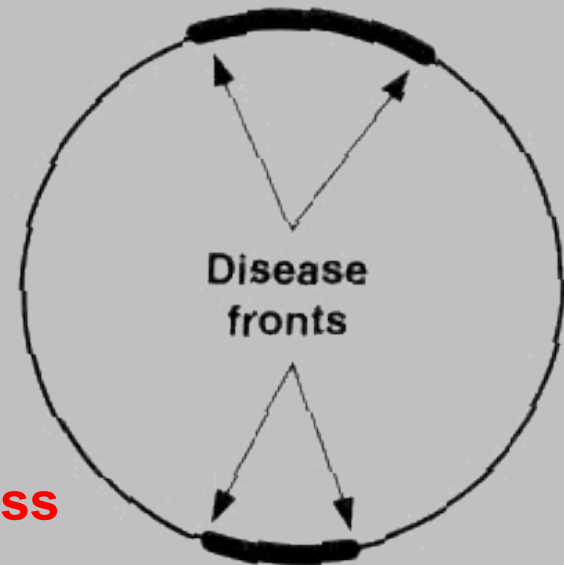
Reproductive Rate

- Reproductive rate = Avg # new infections caused by current infectives
- How does reproductive rate behave in our periodic lattice?
 - # current infectives grows
 - # possible new infectives remains constant
 - Reproductive Rate can only decrease

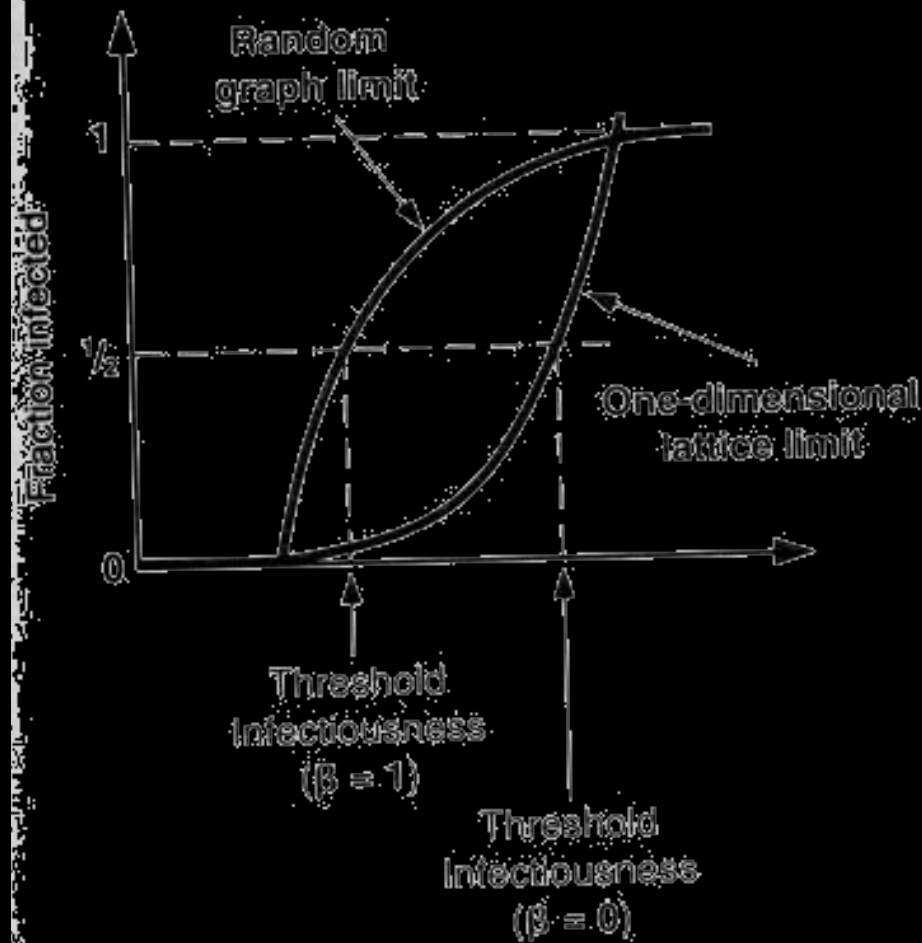


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 - **We need new metric: Infectiousness**



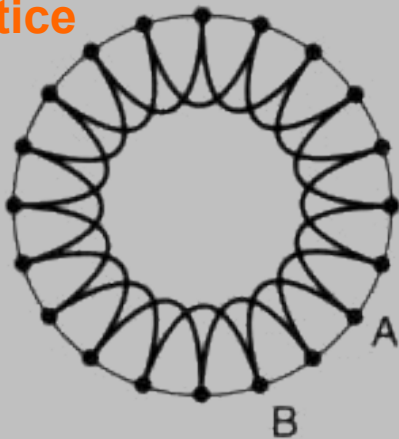
Threshold infectiousness



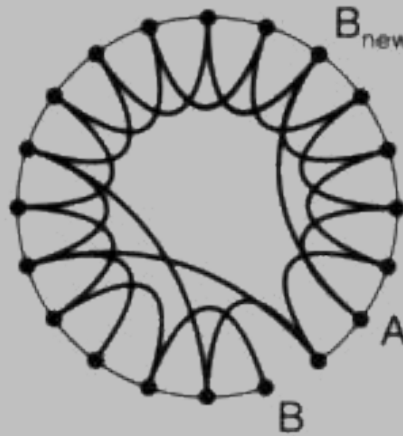
Beta model (review)

Beta = probability of rewiring each edge

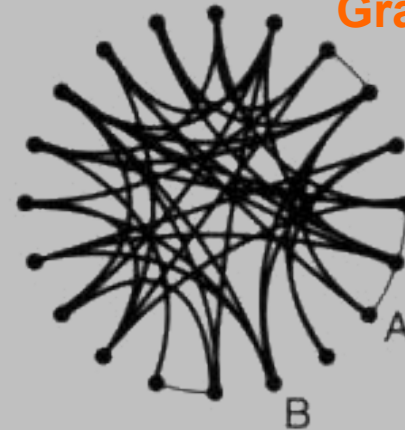
Periodic
Lattice



$\beta = 0$



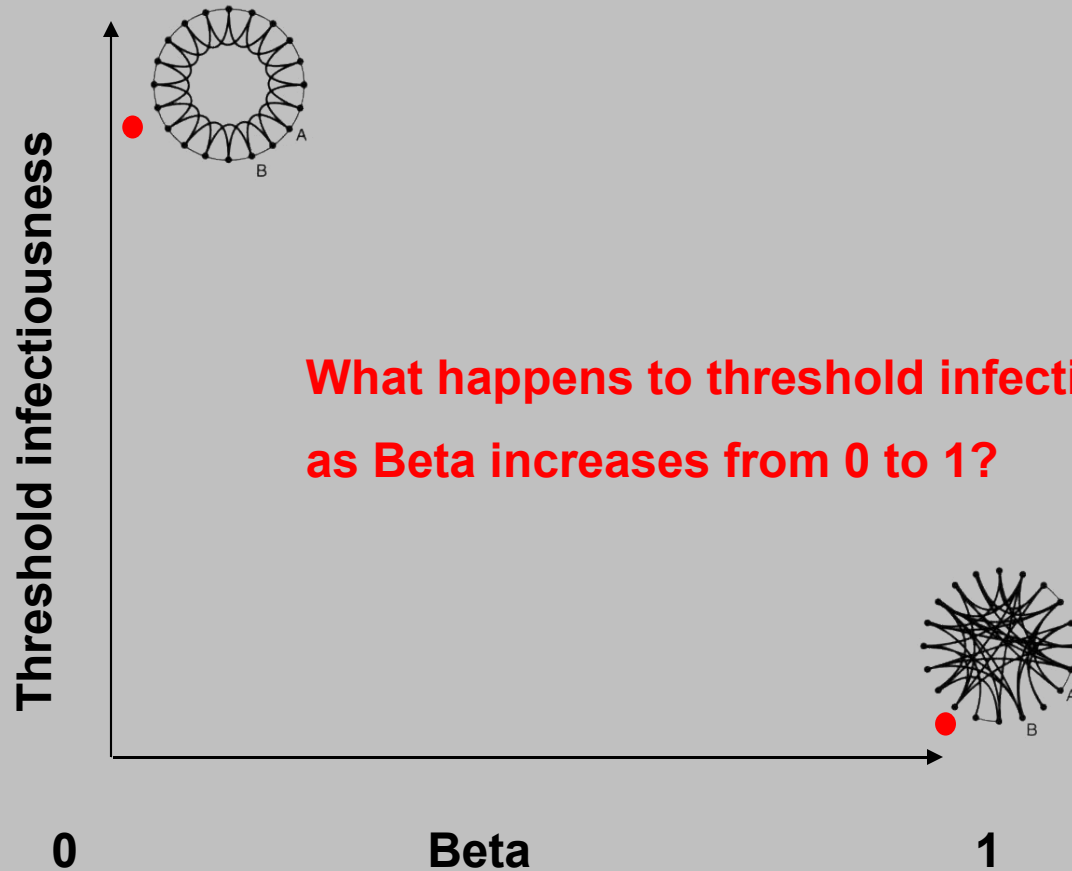
Random
Graph



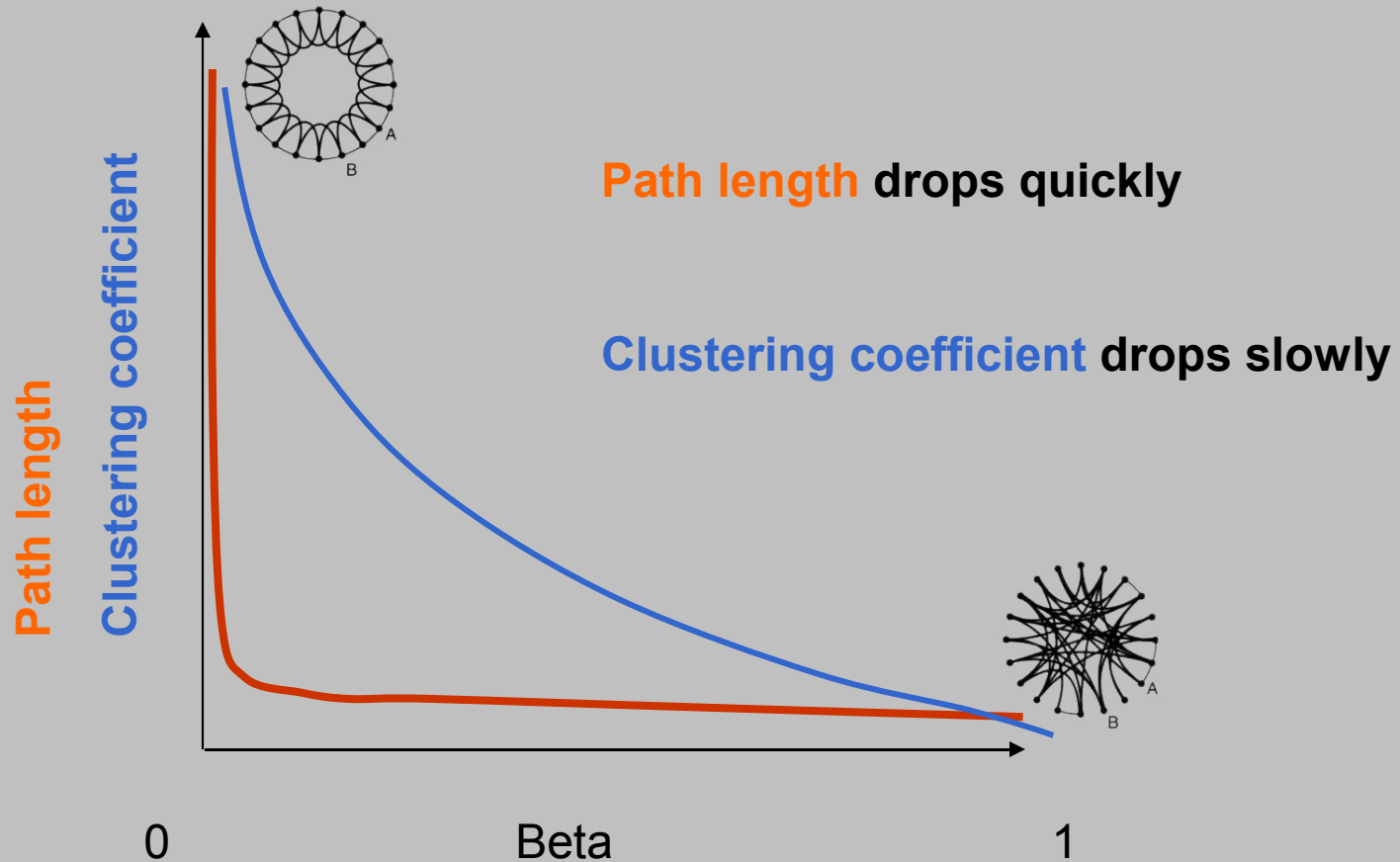
$\beta = 1$

Increasing randomness

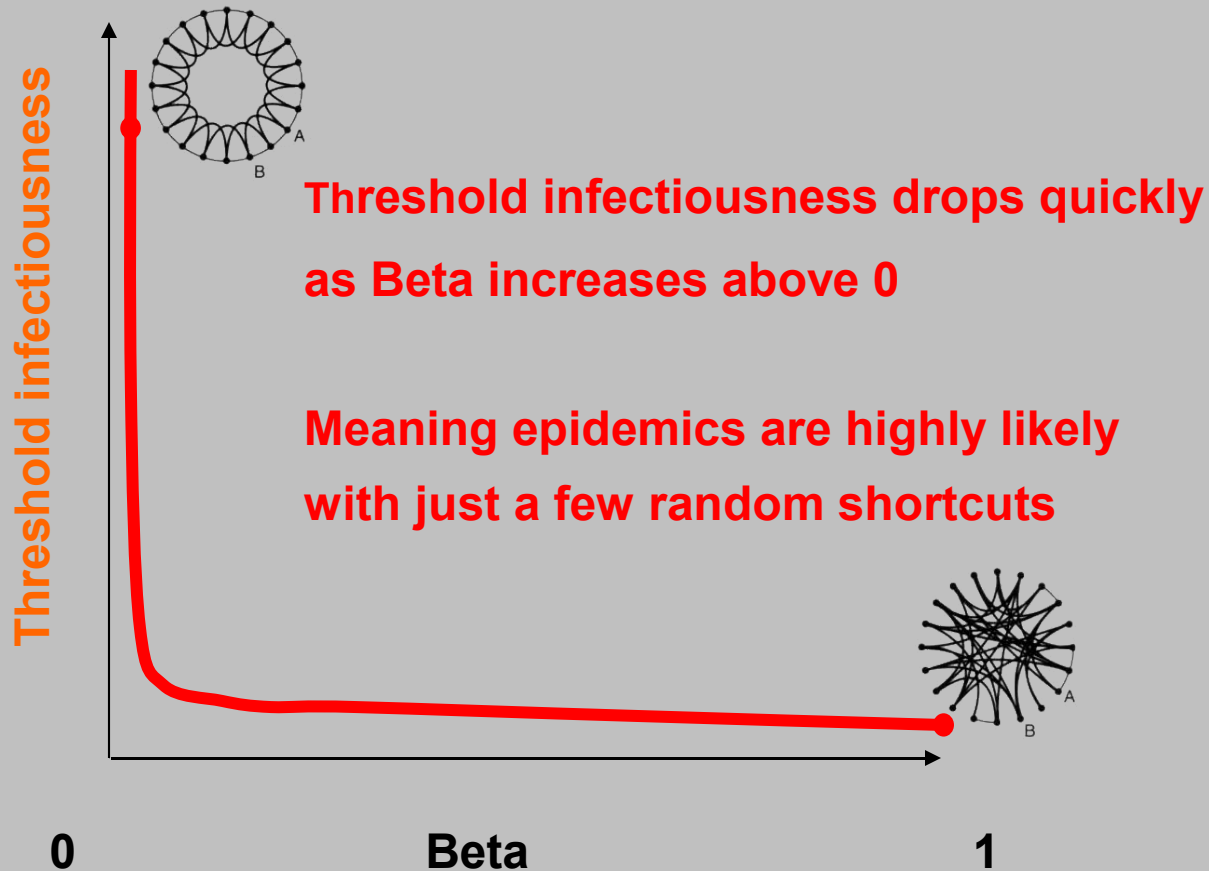
Beta model and threshold infectiousness



Recall Beta and small worlds



Beta model and threshold infectiousness



Implications to disease control?

- Enhancements to SIR model that we brought up in class...
 - **Structure of relationships**
 - **Countermeasures against infection**

Next time

- Inherent resistance to infection
- Percolation models
- Failures & robustness