

# Lecture 4: Understanding the small world phenomena

Sociology 204: Social Networks, Spring 2021

Matthew J. Salganik

1/2: Small world models



Review:

- ▶ empirical vs modeling approaches

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Today we will see a different network model

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- ▶ social network evolve
- ▶ not all relationships are equally likely
- ▶ occasionally we do things that are not determined by existing network structure

3.1

Likelihood  
that  
A meets B

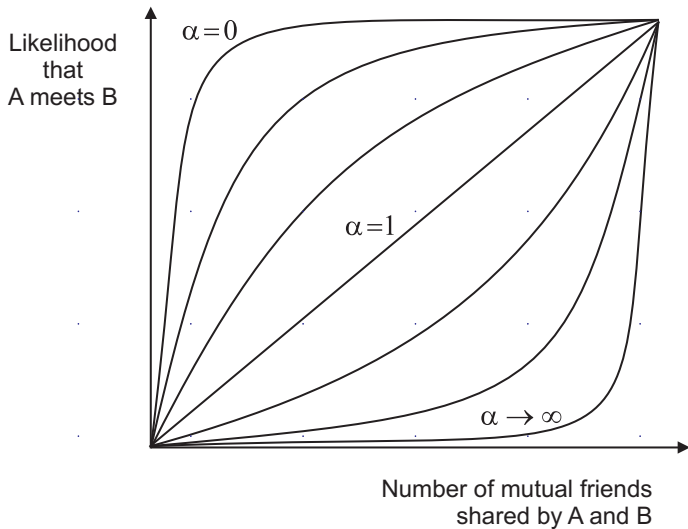
Caveman World

Solaria World

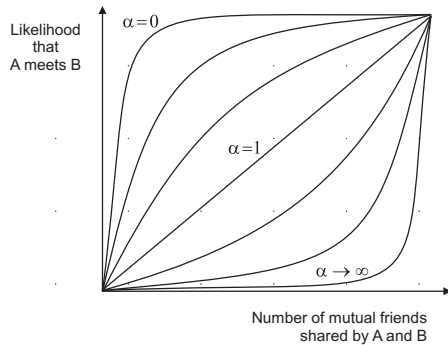
Number of mutual friends  
shared by A and B

The graph features a vertical y-axis and a horizontal x-axis, both ending in arrows. A curve labeled 'Caveman World' starts at the origin (0,0) and rises steeply, following a concave-down path that levels off towards the top of the y-axis. A second curve labeled 'Solaria World' also starts at the origin (0,0) but remains very close to the x-axis for a long distance before rising steeply in a concave-up fashion. The two curves intersect at a single point. The area above the intersection is labeled 'Caveman World' and the area below is labeled 'Solaria World'.

3.2



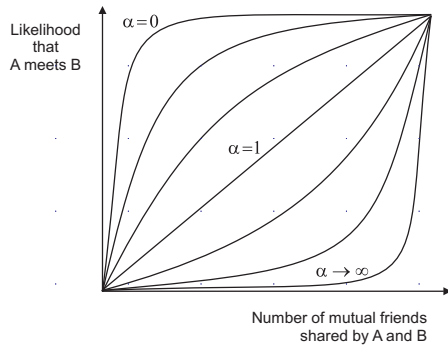
3.2



As technology changes do you think we are moving more toward:

1. caveman world ( $\alpha = 0$ )
2. solaria world ( $\alpha \rightarrow \infty$ )

3.2



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First metric:

Characteristics path length  $L$ : number of edges in shortest path, averaged over all paths

$L$  is defined as the number of edges in the shortest path between two vertices



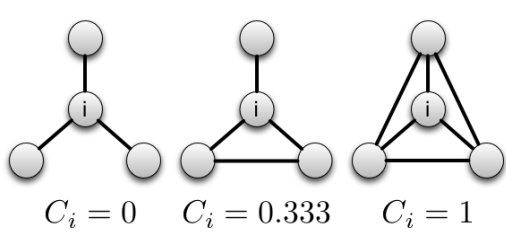
*shortest path  
is 1 edge*



*shortest path  
is 3 edges*

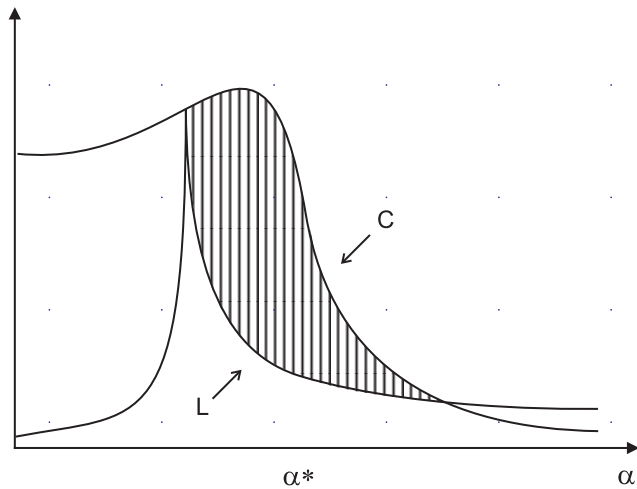
Second metric:

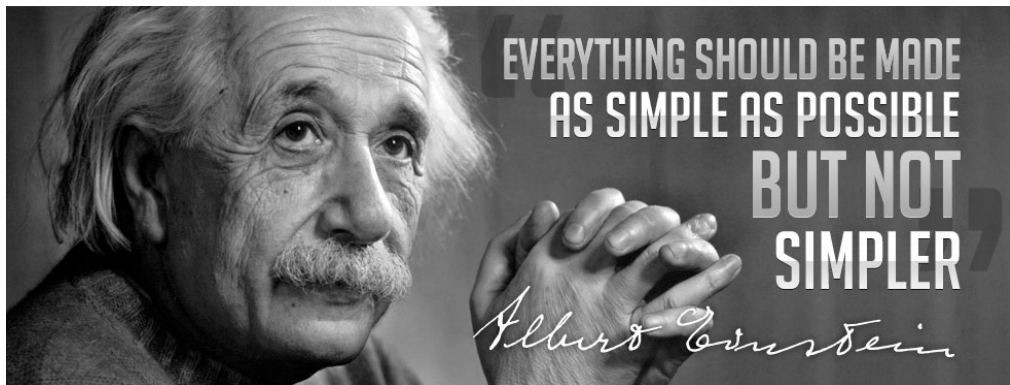
Clustering coefficient  $C$ : probability that a two friends of a randomly chosen person are friends





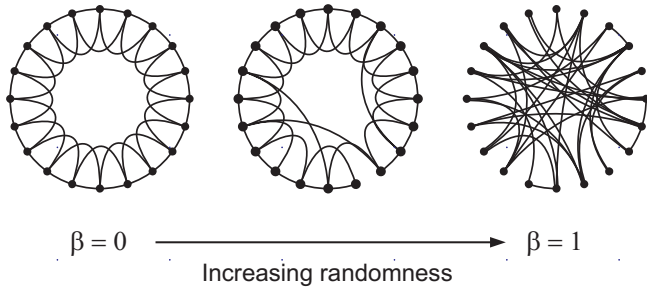
3.4



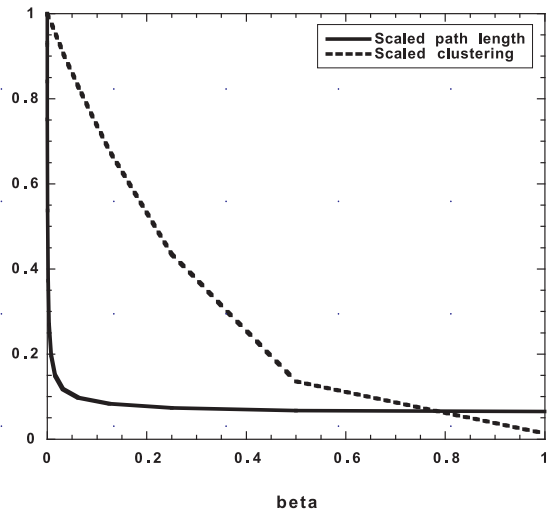


<http://vireomd.net/blog/dhc/einstein-kiss.html>

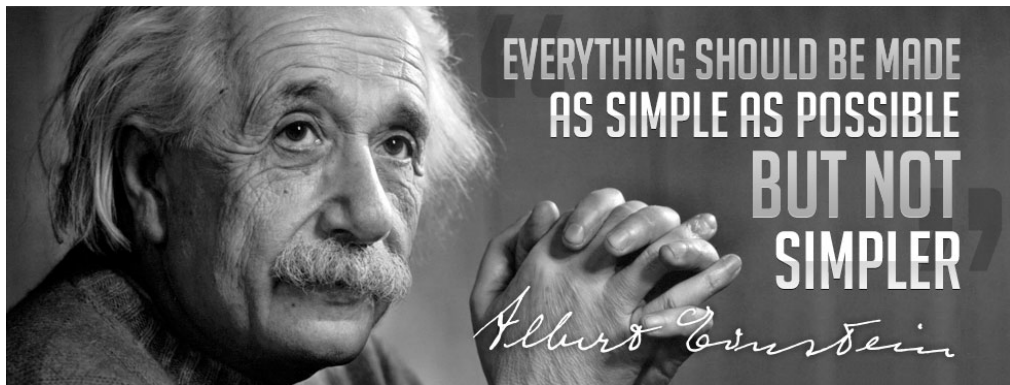
3.6



3.7



Demo: [http://mathinsight.org/small\\_world\\_network](http://mathinsight.org/small_world_network)



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# Are real networks small world networks?

