

# Lecture 4: Understanding the small world phenomena

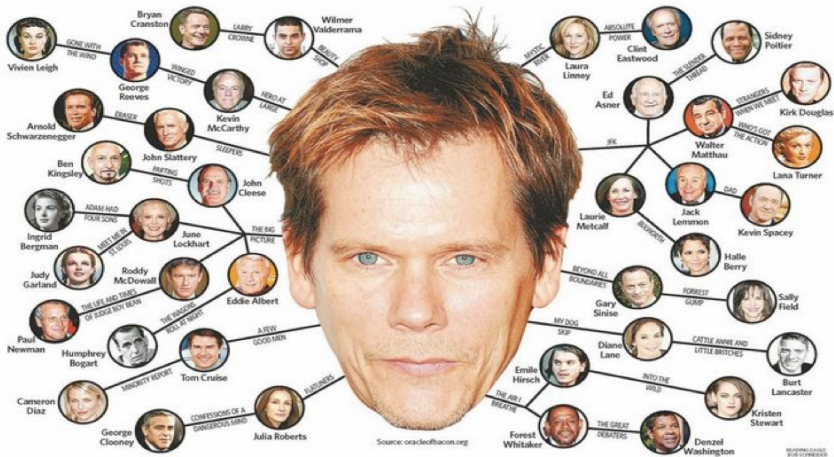
Sociology 204: Social Networks, Spring 2021

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2/2: Small world data



# Are real networks small world networks?



Small world means:

▶  $L_{actual} \approx L_{random}$

▶  $C_{actual} \gg C_{random}$

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$L_{actual}$	$L_{random}$	$C_{actual}$	$C_{random}$
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Movie actors	3.65	2.99	0.79	0.00027

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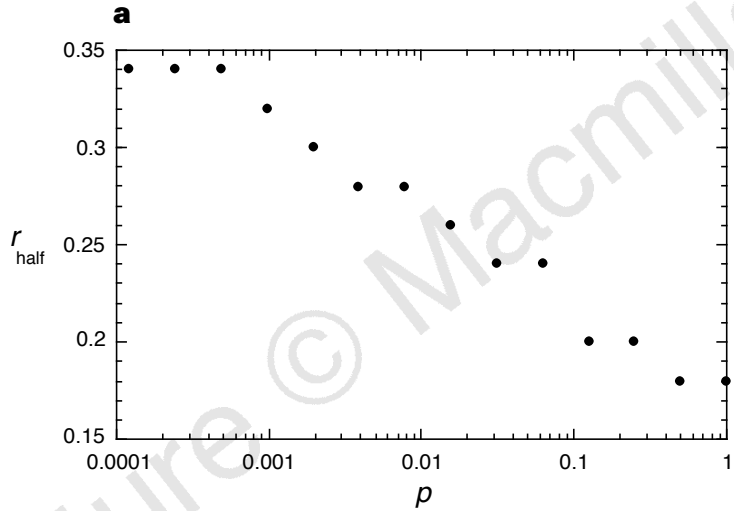
	$L_{actual}$	$L_{random}$	$C_{actual}$	$C_{random}$
Movie actors	3.65	2.99	0.79	0.00027
Power Grid	18.7	12.4	0.080	0.005

Small world means:

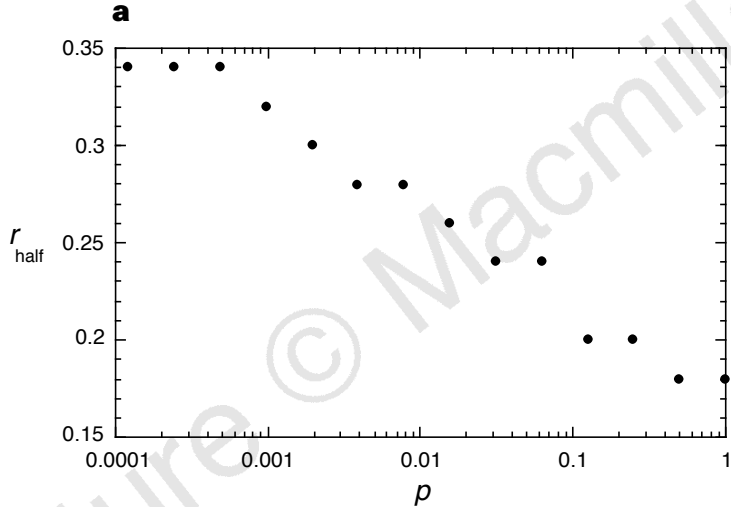
- ▶  $L_{actual} \approx L_{random}$
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	$L_{actual}$	$L_{random}$	$C_{actual}$	$C_{random}$
Movie actors	3.65	2.99	0.79	0.00027
Power Grid	18.7	12.4	0.080	0.005
C. Elegans	2.65	2.25	0.28	0.05

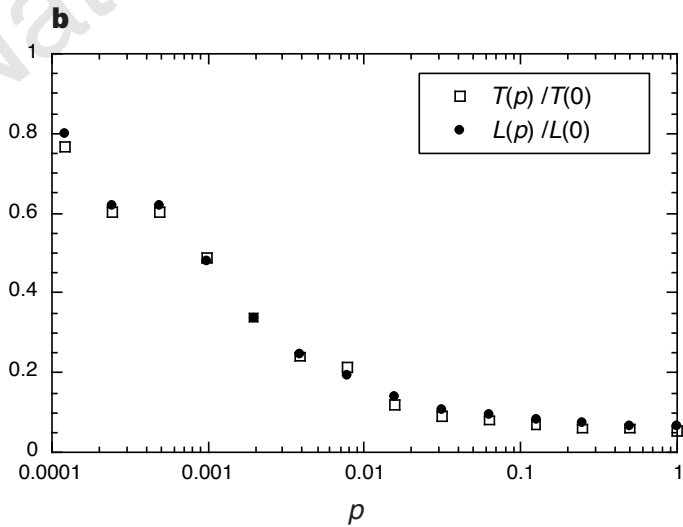
Who cares?

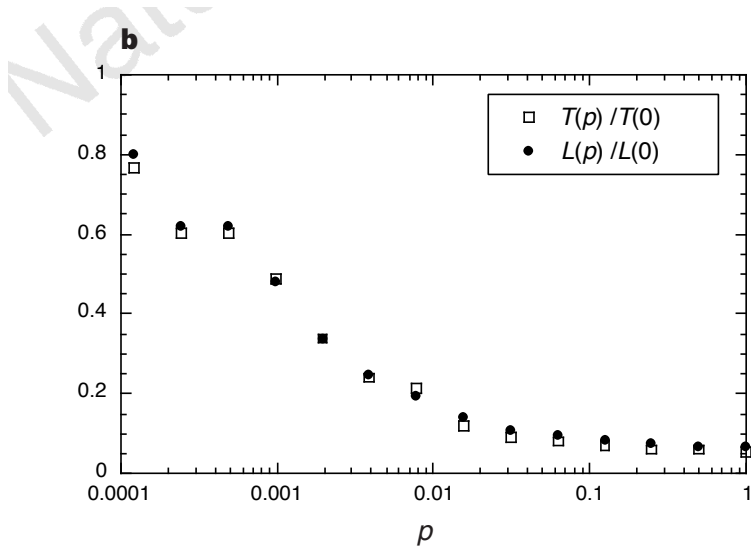






The more shortcuts the less infectious ( $r$ ) a disease needs to be to spread





The more shortcuts the faster a disease spreads

Making length contractions concrete . . . .

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- ▶ shortcuts are key the small world property (characteristic path length changes fast, clustering changes slow)
- ▶ small local changes can have global impacts
- ▶ similarity across networks of different types
- ▶ network structure impacts dynamics

Next class:

- ▶ Watts, Chapter 4, 101-114.
- ▶ Barabasi, A.L. and Bonabeau, E. (2003) Scale-free networks. *Scientific American*, 50-59. (Available from Canvas)
- ▶ Barabasi, A.L. and Albert, R. (1999) The emergence of scaling in random networks. *Science*, 286:509-512.
- ▶ Liljeros, F. et al. (2001). The web of human sexual contacts. *Nature*, 411:907-908 with comment and rejoinder.

Please fill out the after lecture feedback survey to me improve the lectures