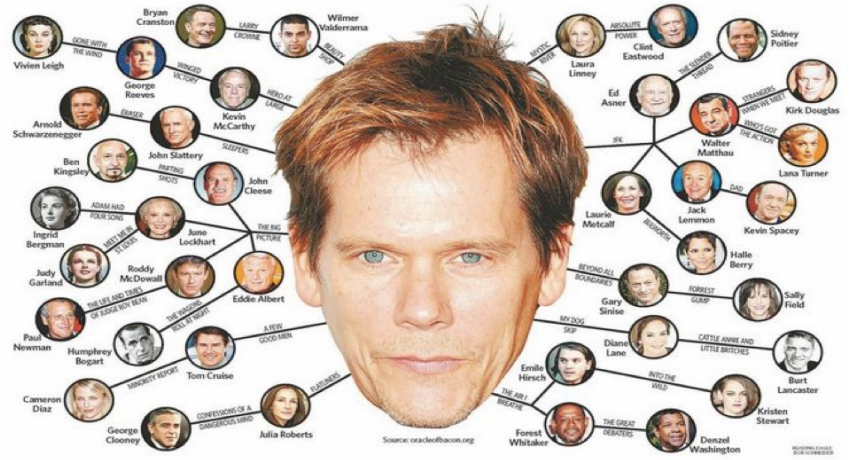
Lecture 4: Understanding the small world phenomena

Sociology 204: Social Networks, Spring 2021

Matthew J. Salganik

2/2: Small world data and impact

Are real networks small world networks?



Small world means:

- $L_{actual} \approx L_{random}$
- $C_{actual} >> C_{random}$

	L_{actual}	L_{random}	C_{actual}	C_{random}

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Power Grid	18.7	12.4	0.080	0.005

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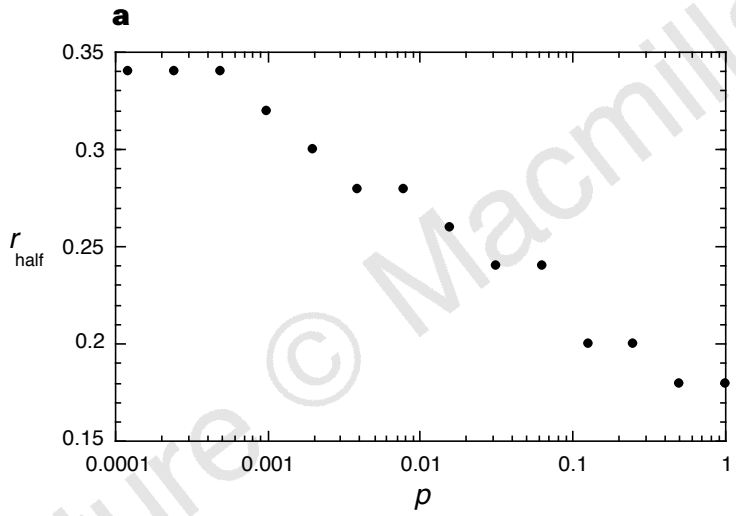
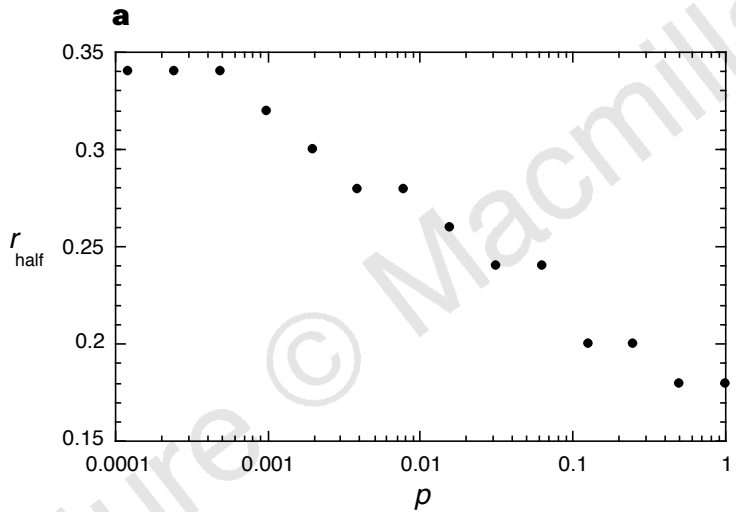
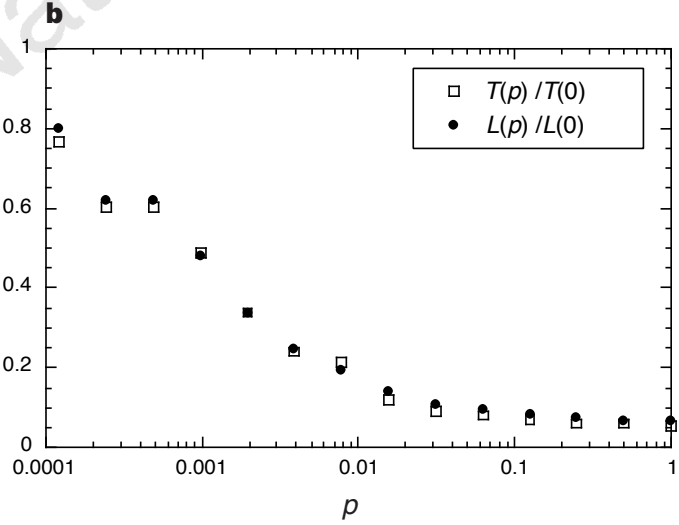
Power Grid	18.7	12.4	0.080	0.005
C. Elegans	2.65	2.25	0.28	0.05

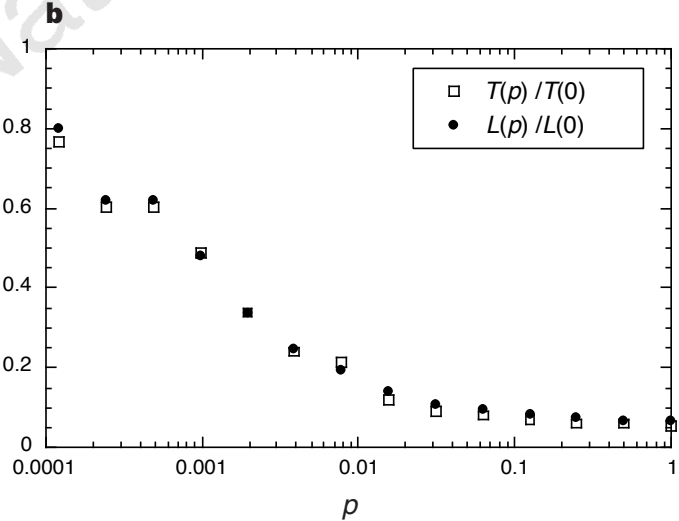
Who cares?





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


b
1
0.8
0.6
0.4
0.2
0
0.0001
0.001
0.01
0.1
1
p
T(p) /T(0)
L(p) /L(0)



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