
Diversity Dynamics in Online Networks

Based on :

J. Kunegis, S. Sizov, F. Schwagereit, D. Fay. Diversity Dynamics in Online Networks. Proc. Conf. on Hypertext and Social Media, 2012.
[<https://dl.acm.org/citation.cfm?id=2310039>]

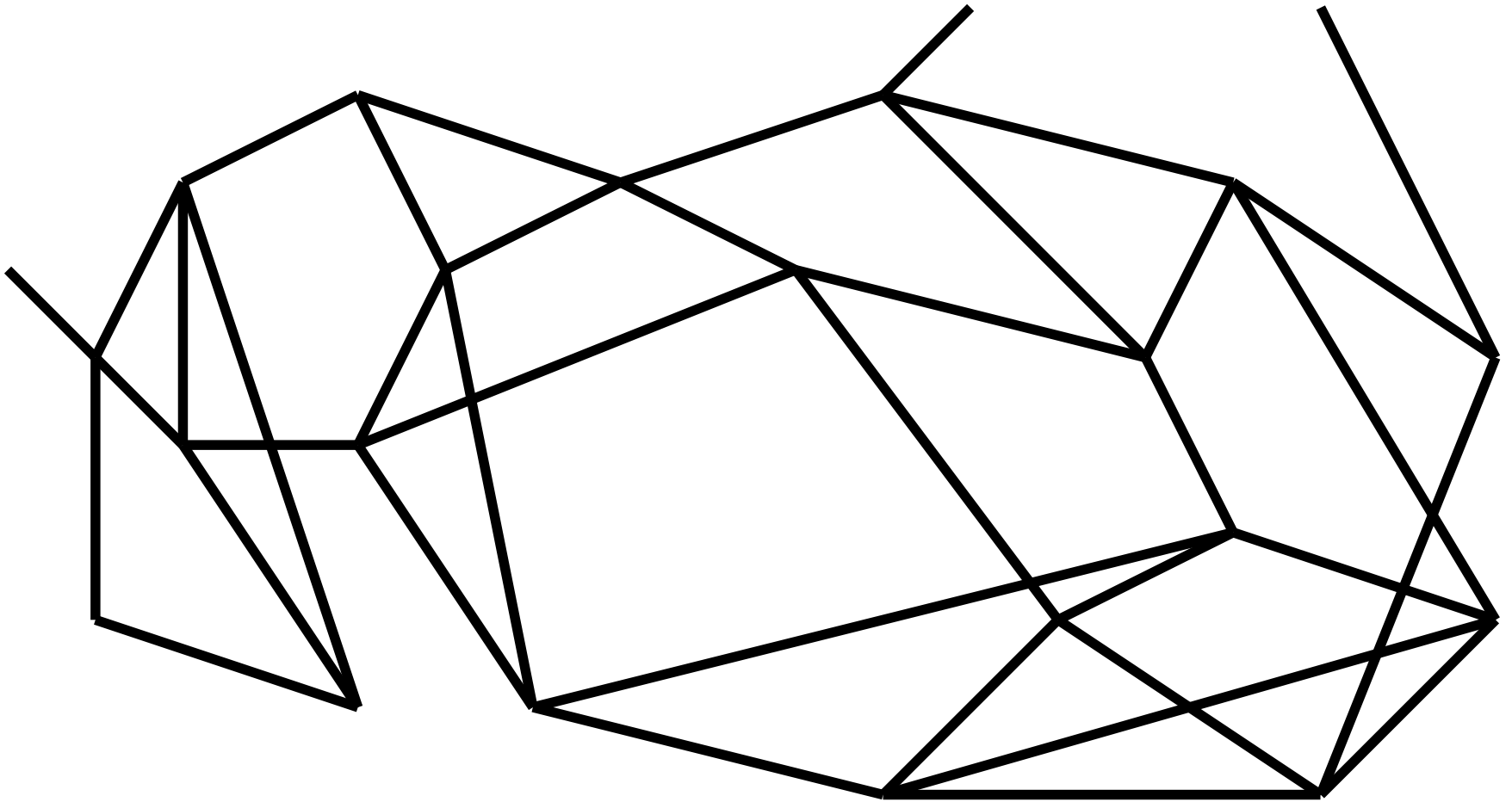
Everyone likes good things:



Or even better: Diversity!

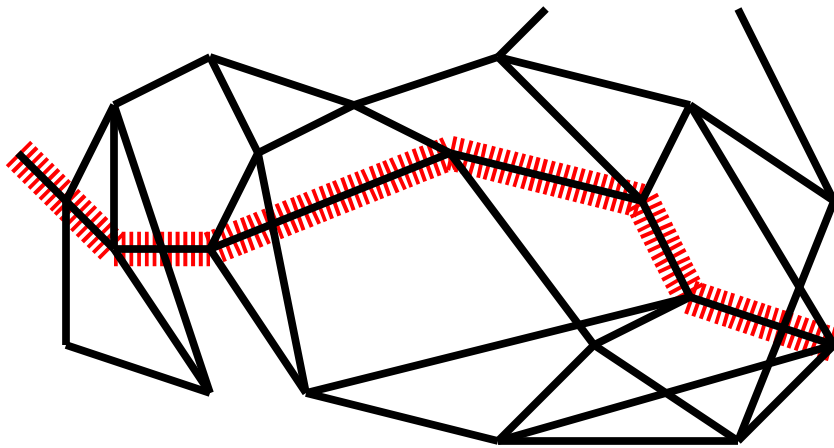


Structural Diversity



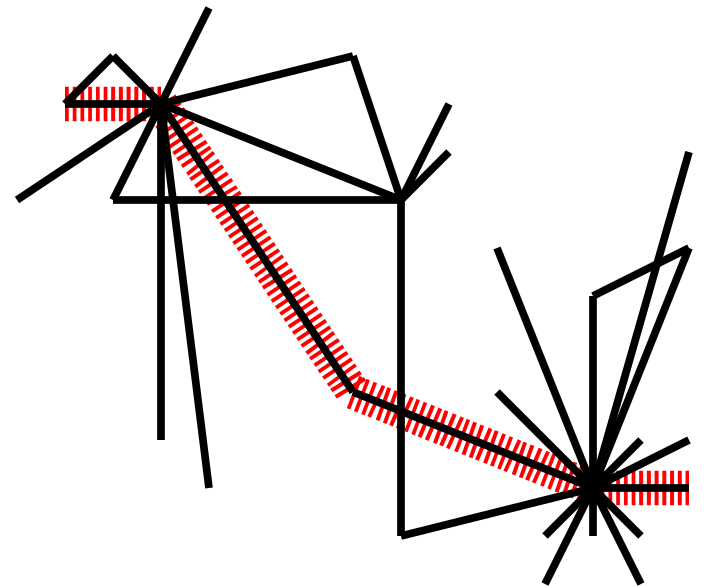
(1) Length of paths

Diversity



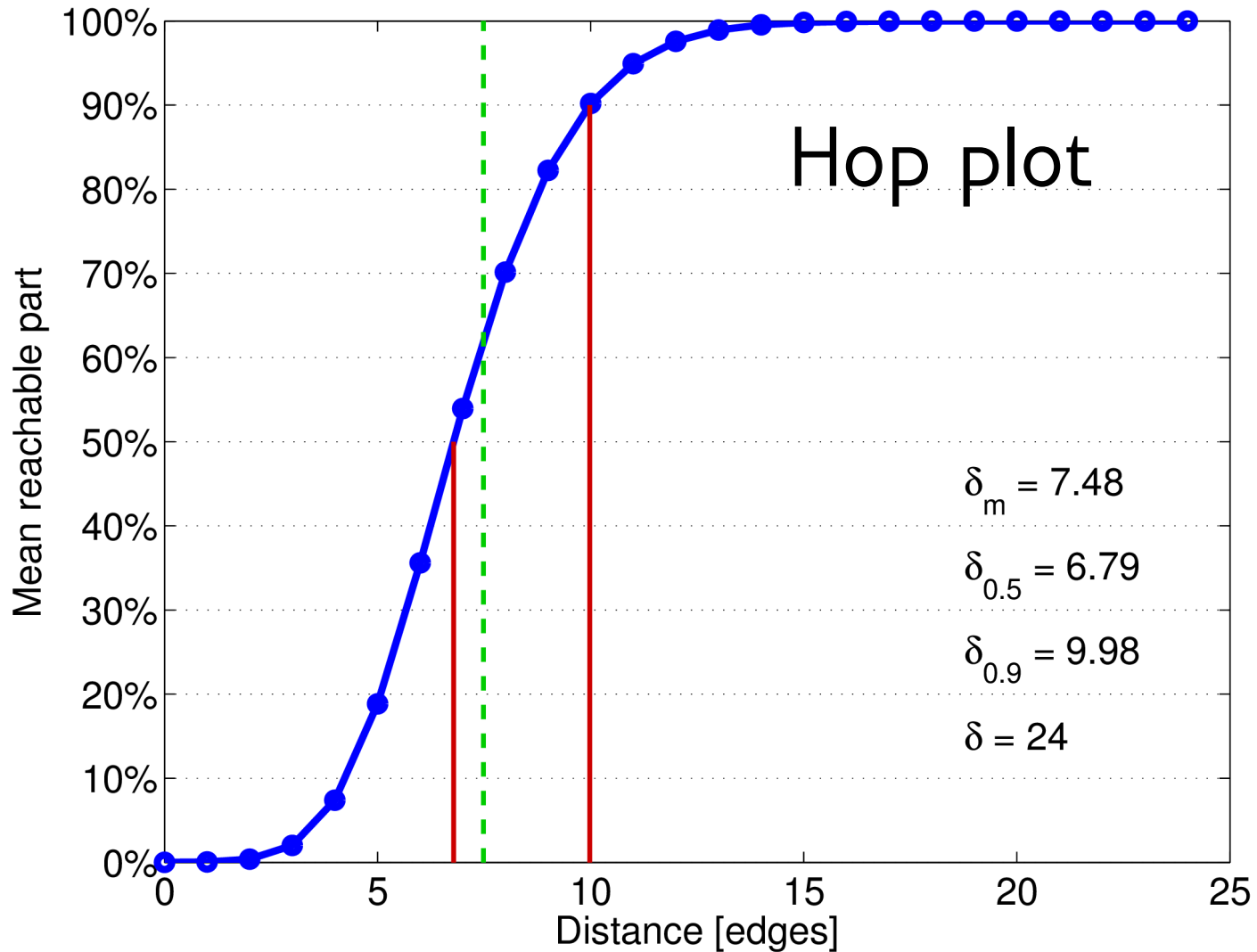
“Large” world

No diversity

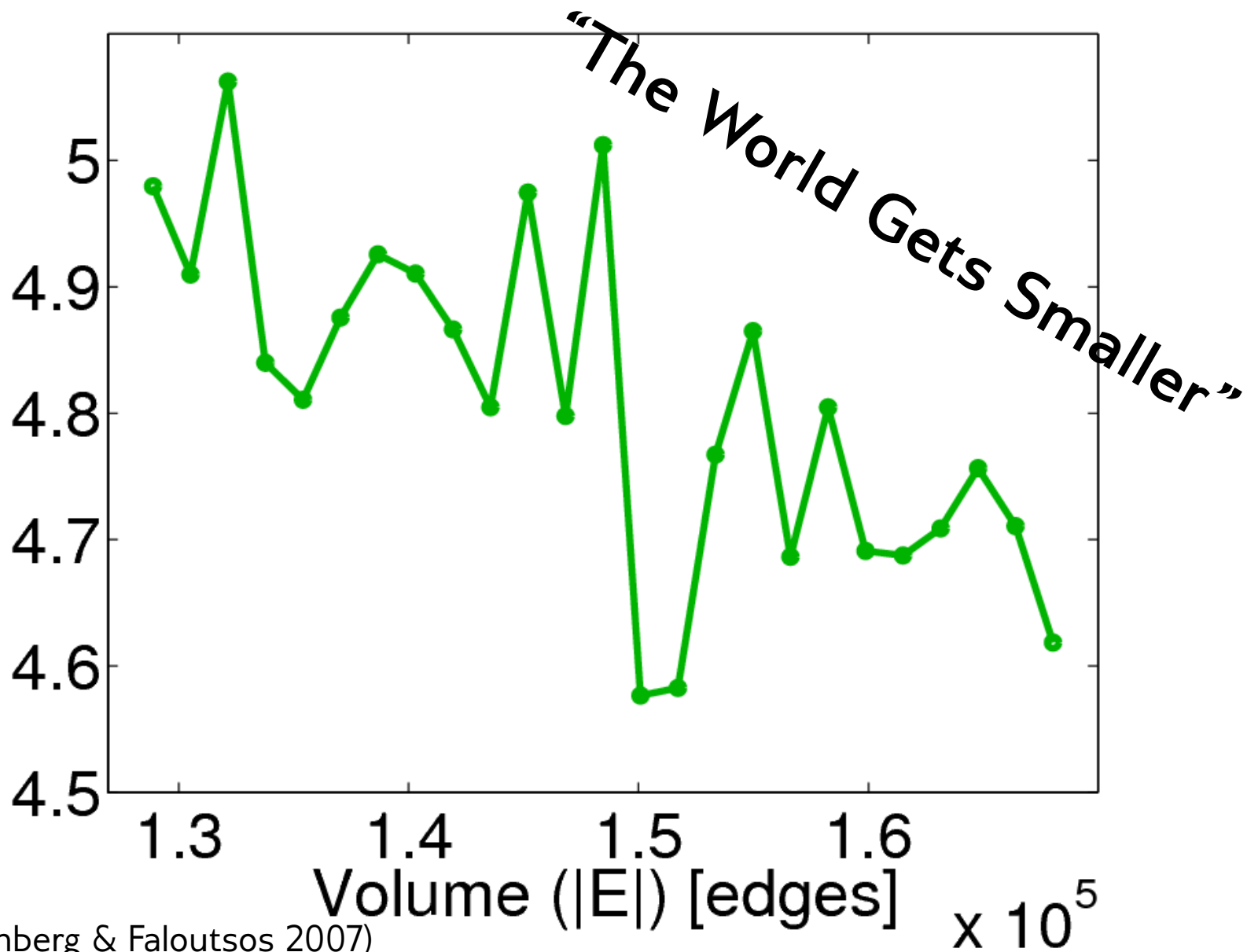


Small world

90-percentile effective diameter $\delta_{0.9}$



Effective diameter ($\delta_{0.9}$) [edges]



(Leskovec, Kleinberg & Faloutsos 2007)

Research

- (A) How can structural diversity be measured?
- (B) How does diversity change?

(A) How to Measure Diversity in a Network?

- (1) Length of paths
- (2) Numbers of neighbors
- (3) Size of communities
- (4) Random walks
- (5) Controllability

Mann–Kendall test

Let x_i and y_i be two statistics for network $1 \leq i \leq n$

Apply t-test to all pairwise differences $(x_i - y_i)$

(B) Experiments

27 networks from KONECT.cc

	Measure	Observed trends		Predicted trends	Monotonicity CONNECTED
		FULL	CONNECTED		
	d	(24) Up	(27) Up		Up
Pref. att.	G	(24) Up	(17) —	Up	
	J	(23) Up	(20) Up	Down	
	γ	(21) Down	(25) Down	Down	
	H_{er}	(19) Down	(12) —	Down	
Connect.	$\delta_{0.9}$	(18) Down	(26) Down	Down	Down
	$\vartheta_r(n)$	(10) —	(22) Down	Down	
	C_r	(12) —	(22) Down	Down	Down
	a	(15) —	(27) Up	Up	Up
L. pred.	c	(7) — ^a	(10) Up ^a	Up	
	rank_F	(13) —	(19) Down	Down	
	α	(19) Up	(23) Up	Up	

^a For the clustering coefficient, the total number of networks is 13, since bipartite networks are excluded.

References

J. Kunegis, S. Sizov, F. Schwagereit, D. Fay. Diversity Dynamics in Online Networks. Proc. Conf. on Hypertext and Social Media, 2012.

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Y.-Y. Liu, J.-J. Slotine, A.-L. Barabási. Controllability of Complex Networks. Nature, 473:167–173, May 2011.

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A.-L. Barabási, R. Albert. Emergence of Scaling in Random Networks. Science, 286(5439):509–512, 1999.

Credits

<http://www.shewearsshortshorts.com/2012/01/downside.html>

<https://twitter.com/#!/justinbieber>

<http://www.iconspedia.com/icon/nerd-4255.html>

<http://hk.digikey.com/1/3/index1227.html>