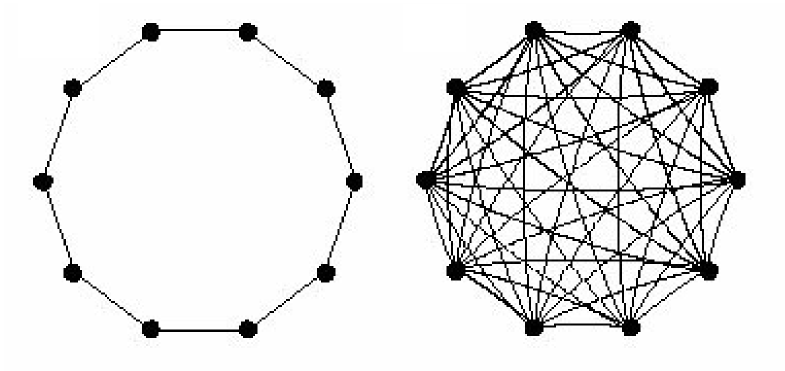
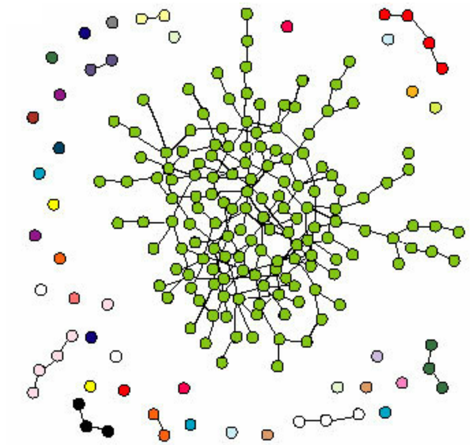


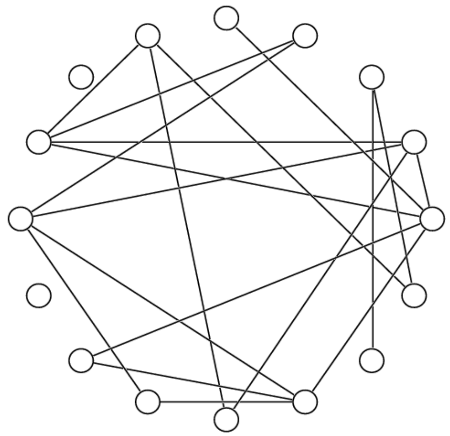
- clustering coefficient $\mathcal{C}$
- characteristic path length $\mathcal{L}$
- proximity ratio $\mu = (\mathcal{C}/\mathcal{L})/(\mathcal{C}_r/\mathcal{L}_r)$
- connectivity length $\mathcal{D}$
- number of relevant cycles (longer than three)
- degree distribution
- efficiency
- approximate entropy

Network	$\mathcal{C}_n$	$\mathcal{L}_n$	μ	$\mathcal{D}_{\text{global}}$	$\mathcal{D}_{\text{local}}$	$\mathcal{E}_{\text{global}}$	$\mathcal{E}_{\text{local}}$	γ
IMDB	2925	1.22	2398	1.12	0.001			2.3 ± 0.1
WSPG	16.00	1.51	10.60					exp
CE	5.60	1.18	4.75	1.01	0.17	0.46	0.47	
MBTS				0.14	0.10	0.63	0.03	
WWW	0.18					0.28	0.36	≈ 2.1
Internet					0.29	0.26		2.48

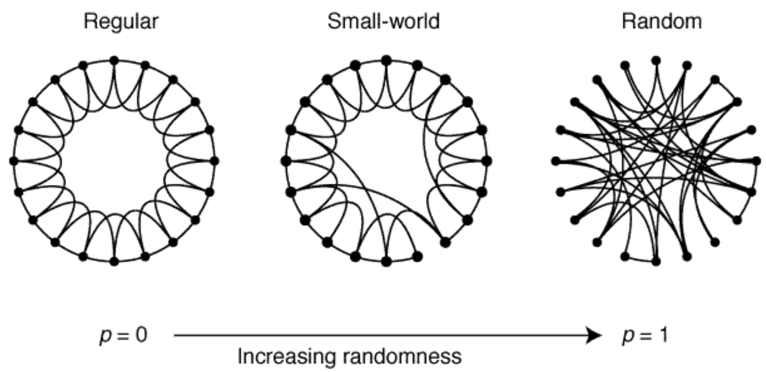
$G_{n,m}$-model with $n = 200$, $m = 193$



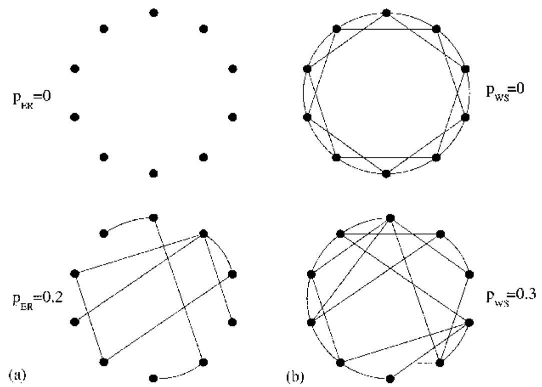
$G_{n,p}$-model with $n = 16$, $p = \frac{1}{7}$



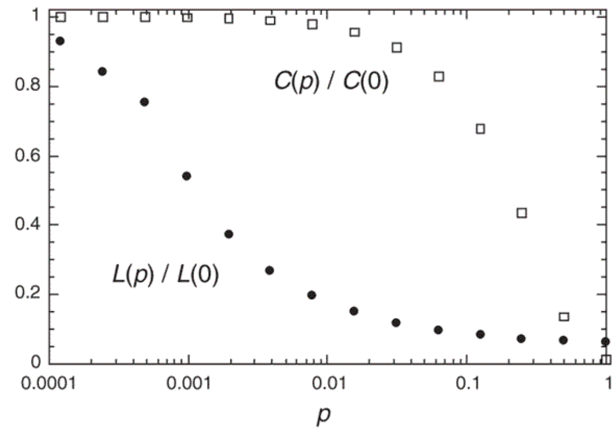
Small-world networks: random rewiring (WS-model)



ER-model ($G_{n,p}$) vs. WS-model



$\mathcal{C}$ and $\mathcal{L}$ for the WS-model



Morphing

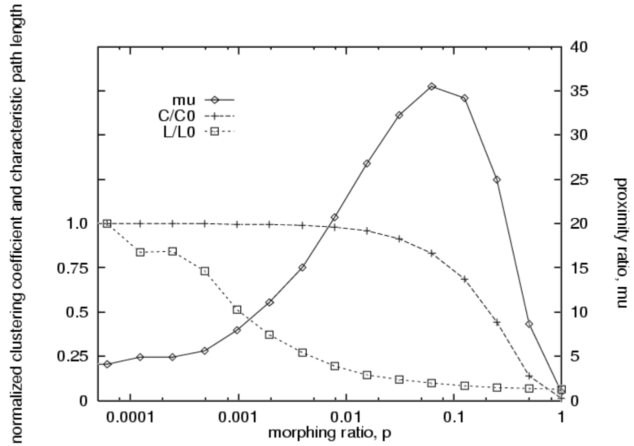
A non-uniform structure S is generated by *morphing* a regular structure S_1 and random structure S_2

(a) substructures for S are taken from S_1 with probability $(1-p)$ and from S_2 with probability p (*e.g.* SAT)

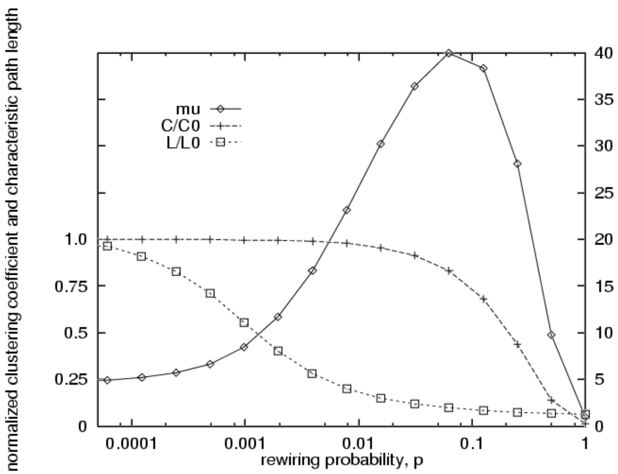
(b) a fraction $1-p$ of the substructures of S are taken from S_1, fraction p from S_2 (*e.g.* graphs)

(c) operations exist such that $S = (1-p) \cdot S_1 + p \cdot S_2$ can be calculated directly (*e.g.* matrices)

$\mathcal{C}$ and $\mathcal{L}$ for the morphing model



$\mathcal{C}$ and $\mathcal{L}$ for WS-model revisited

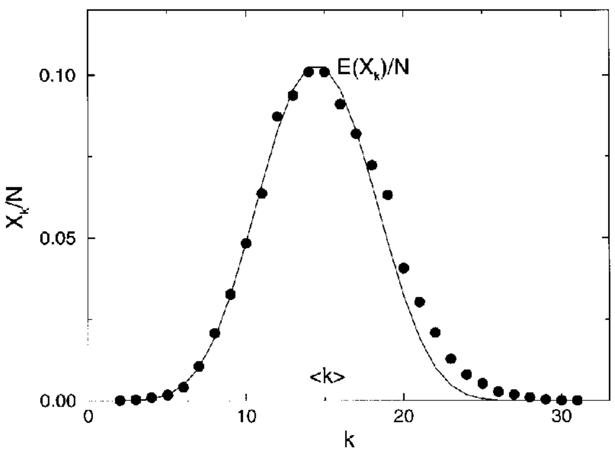


Metrical networks

WS-model requires connectivity and does not handle edge-weights; a more general definition of *connectivity length* $\mathcal{D}$ is suggested to "replace" $\mathcal{L}$ and $1/\mathcal{C}$:

$$\mathcal{D}(G) = H(\{d_{i,j}\}_{i,j \in G}) = \frac{n(n-1)}{\sum_{i,j \in G} 1/d_{i,j}}$$

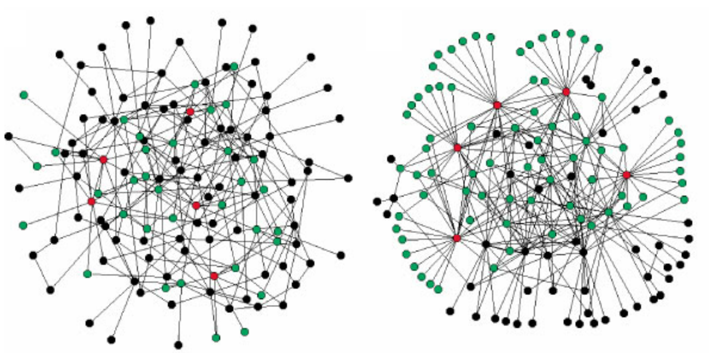
Degree distribution for $G_{n,p}$ (ER-model)



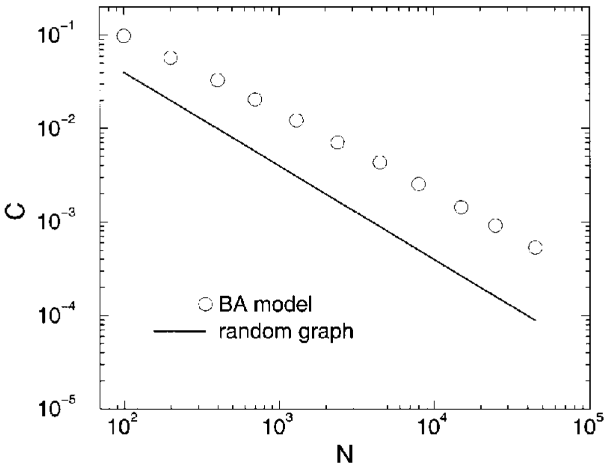
Growth and preferential attachment (BA-model)

- in natural small-world networks, the degree distribution appears to be of type $P(k) \approx k^{-\gamma}$
- ER-model obeys Poisson, WS even narrower
- Hogg's *ultrametric distance* produces more vertices of high and low egrees, but not the small-world property
- BA-model: initial set of vertices, addition of new vertices one by one, edges by preferential attachment

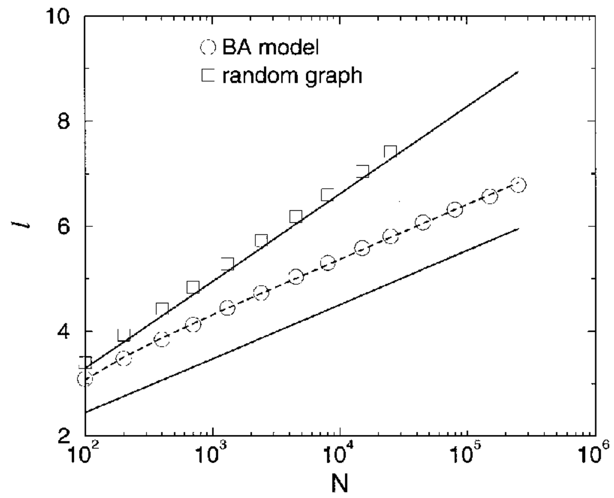
ER vs. BA ($n = 130$, $m = 215$, $\bar{k} = 3.3$)



$\mathcal{C}$ for ER and BA



$\mathcal{L}$ for ER and BA



Nr of cycles (> 3) for ER, WS, and BA