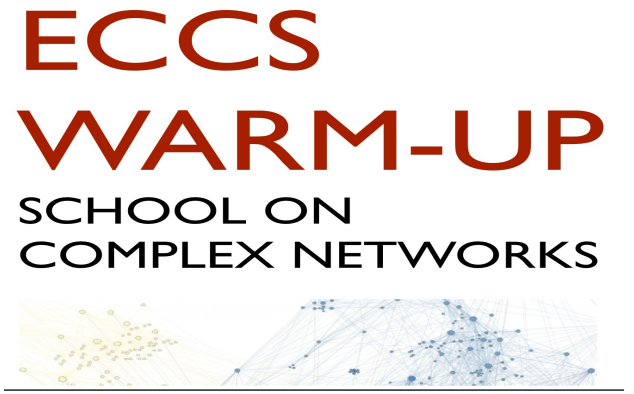
Clustering of real complex networks

Pol Colomer



Complex Networks

- Heterogeneous
- Small world
- High presence of triangles

A. Barabasi. A. Réka, ”*Emergence of scaling in random networks*”,Science 1999

Complex Networks

- Heterogeneous
- Small world
- High presence of triangles = **Clustering**

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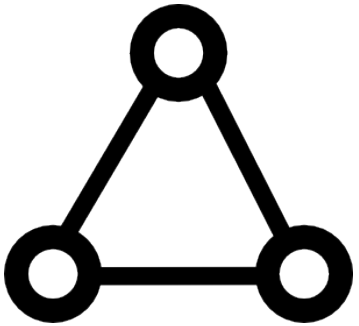
Clustering

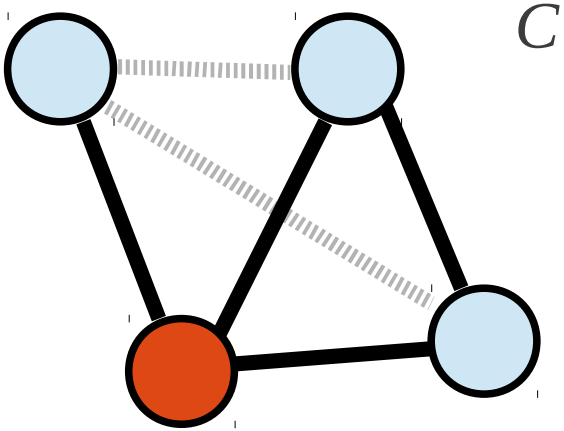
- Real networks have a high presence of triangles
- Not generated by random models
- Effect on structural and dynamical properties



Local clustering coefficient

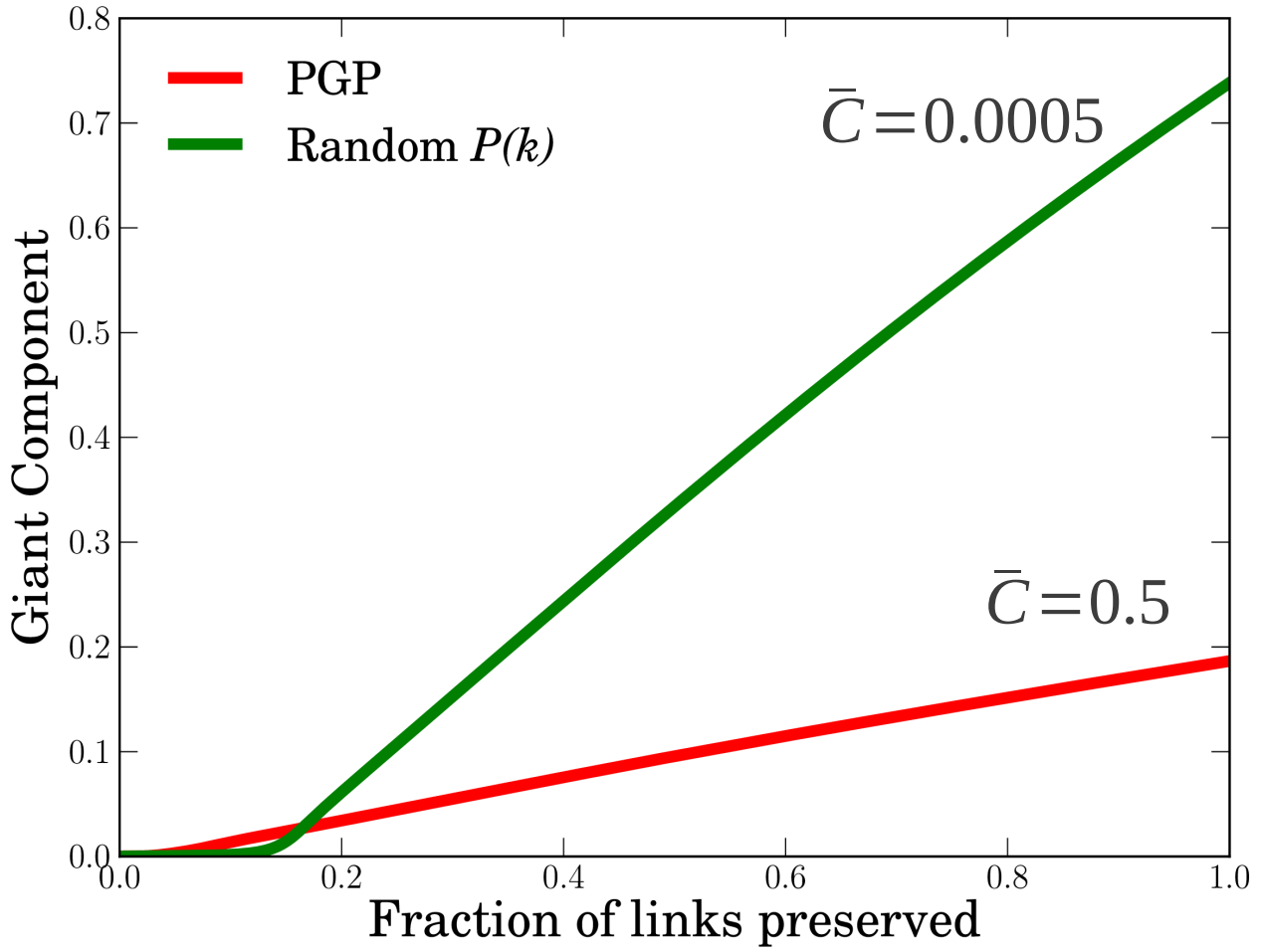
$$C_i = \frac{triangles}{possible\, triangles} = \frac{e_i}{1/2\, k_i (k_i - 1)}$$

$$\bar{C} = \frac{1}{N} \sum_i C_i$$

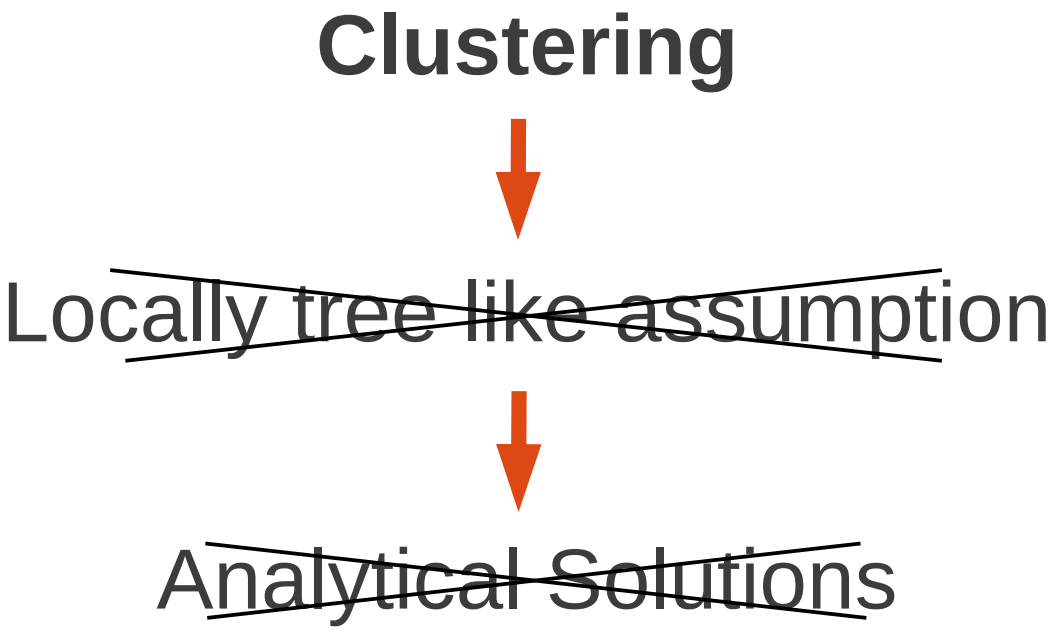


$$C = \frac{1}{3}$$

Percolation



Clustering


Clustering
Locally tree like assumption
Analytical Solutions

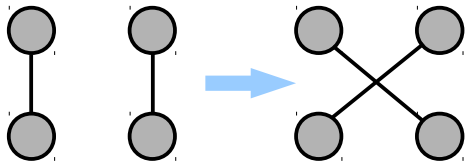
Maximally random model

- Fix *P(k)*
- Fix *C(k)*
- Maximally random

- Exponential graph

$$H = \sum_{k=k_0}^{k_c} \left| \bar{c}^{\star}(k) - \bar{c}(k) \right|$$

- Rewiring



- Annealed Metropolis-Hastings


THANK YOU