

Complex Systems- Exercises 5

1. Consider a network with some arbitrary degree distribution $\{k_i\}$ for $i = 1, \dots, N$.

(i) Show that for a given node i , the clustering coefficient C_i (i.e., the fraction of neighbours of i that are connected to each other) is given by:

$$C_i = \frac{2E_i}{k_i(k_i - 1)},$$

where E_i is the total number of edges that exist between the k_i neighbours of i .

(ii) Using (i) above, check the average clustering coefficient for a random graph.

2. Show that the average clustering coefficient C of a network with a given degree distribution is given by:

$$C = \frac{1}{N\langle k \rangle} \left(\frac{\langle k^2 \rangle - \langle k \rangle}{\langle k \rangle} \right)^2.$$