Networks in Economics and Social Science
2019/2020
Homework 3

Roberto Casarin

Abstract

Prepare a report studying the small-world properties of Watts-Strogatz random network model. Your report should provide a reply to the questions given in this document. You can use the LaTeXsource file of this document to generate your report. Your Homework is due by 13th of April by e-mail (`r.casarin@unive.it`).

1 The Watts and Strogatz's model

Consider the WS random network model $G_{WS}(n, K, p)$ where n is the number of nodes, $2K$ the number of neighbours of a given node in the ring lattice regular graph, and p is the re-wiring probability (see Lecture Notes).

1. What is the definition and the interpretation of local clustering coefficient statistics provided in *D. J. Watts, S. H. Strogatz (1998) Collective dynamics of small-world networks, Nature, 393(6684).*

2. Assume $n = 400$ nodes $K = 10$, and the regular grid $\{q = 0.01 + 0.01j,\ j = 1, \ldots, 99\}$ for the parameter q. Write a MATLAB code which evaluates for each q the average clustering coefficient (denote it $CC(q)$) and the average path length (denote it $APL(q)$) and provide two figures reporting the $CC(q)$ and $APL(q)$ as a function of q (provide your code in the report).

3. Provide a comment on the behaviour of the two network statistics, as a function of q.

(Hint: use the function `clustering_coef_bu.m` in the BCT folder available in the course material, and the MATLAB function `distances`).