MO412 – Network Science University of Campinas

Homework 11

Assigned on 2020-12-19 **Due on 2020-12-28**

1. (Communities on a Circle) Consider a one dimensional lattice with N nodes that form a circle, where each node connects to its two neighbors. Partition the line into n_c consecutive clusters of size $N_c = N/n_c$.

   (a) Calculate the modularity of the obtained partition.

   (b) According to the Maximum Modularity Hypothesis (SECTION 9.4), the maximum of M_c corresponds to the best partition. Obtain the community size n_c corresponding to the best partition.

2. (Modularity Maximum) This question refers to the value M of modularity defined in Equation 9.12.

   (a) Show that M cannot exceed one.

   (b) Is there a network with a partition into clusters that achieves $M = 1$? Explain.