Homework 07

Assigned on 2020-11-14   **Due on 2020-11-20**

1. (Directed Barabasi-Albert Model) The book explains in detail the process of obtaining the degree distribution for the *undirected* Barabasi-Albert model. In this exercise we will uncover the distributions for the in- and out-degrees of a *directed* Barabasi-Albert model.

   The rules are very similar: growth and preferential attachment. At each step in time, a new node is added to the network with m links, each being incoming or outgoing with probability 0.5. The probability that a node i already in the network is the other extremity of one of these new links depends on its in-degree k_i^{in} and is given by

   $$\Pi(k_i^{in}) = \frac{k_i^{in}}{\sum_j k_j^{in}},$$

   that is, the probability is proportional to the node's in-degree.

   (a) Obtain the degree distribution for the **out-degrees** in such a network. Does it follow a power law?

   (b) Obtain the degree distribution for the **in-degrees** in such a network. Does it follow a power law?