


Lec121 Implementing Rich getting Richer Phenomena (Barbasi Albert Model) - I

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Rich-get-richer phenomenon (i.e. Barabasi-Albert Model)- The Main Idea


- 1 We start with m_0 nodes, the links between which are chosen arbitrarily, as long as each node has at least one link.
- 2 The network develops following two steps:
 - 1 **Growth:** At each timestep we add a new node with m ($\leq m_0$) links that connect the new node to m nodes already in the network.
 - 2 **Preferential attachment:** The probability that a link of the new node connects to node i depends on the degree of node i .



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Steps for Implementation

- Take n , i.e. total number of nodes, from the user.
- Either take m , i.e. the number of edges to be connected to the new node, from the user, or decide it yourself based on n . In our implementation we will decide it ourselves as follows:
 - (m_0 is the initial number of nodes that should have atleast one link. m should be less than or equal to m_0).
 - We will take m_0 to be any random number between 2 to $n/5$. (You can use any measure.)
 - We will take m to be one less than m_0 .
- Add the rest $n-m_0$ nodes. Add edges to these $n-m_0$ nodes based on 'preferential attachment'.



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Steps to be followed for Preferential Attachment

For all $n - m_0$ nodes, repeat the following:

- Add the node.
- To add the edges, do the following:
 - Preprocessing:
 - Get a dictionary of degrees (since preferential attachment will happen based on degrees).
 - Maintain a dictionary of probabilities. (The probabilities have to be assigned based on degrees. More the degree, more the probability. Precisely, $\text{probability}[i] = \text{Degree}[i] / \text{Sum}(\text{degrees of all the nodes})$).
 - Maintain a list of lists for maintaining cumulative node probabilities. (This is for choosing a node based on probabilities)
 - For Example,
Probabilities = [0.2, 0.3, 0.5]
— > Cumulative Probabilities = [0.2, 0.5, 1.0].
- While *edges_added* are not equal to m :
 - Choose a random number from 0 to 1.
 - Whichever node has cumulative probability more than this random number, the edge will be connected to that node, if not already added.
If $r = 0.4$
— > Node 2 will be chose out nodes 1, 2 and 3.

