Vertex Copying Models.

23 May 2023 09:44

Growth and Preferential Attachment

No. of nodes cannot be static

→ A new node gets connected to an existing node in the N/w that has high no. of nbrs.

Barabasi_Albert Model

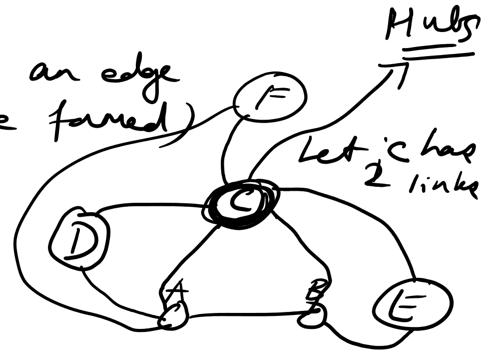
The type of N/w that evolves follows power-law distribu^n.

Scale-free N/w

frac^n of nodes having K degree → P_K

K → degree of nodes

$PA(u, v) = N(u) * N(v)$ → (To check if an edge can be formed)



PA model Algo.

i/p : No. of links for a new node (m)

1) At time t_0, a single edge.
2) At time $t+1$, add m edges from a new node v_{t+1} to the existing nodes.

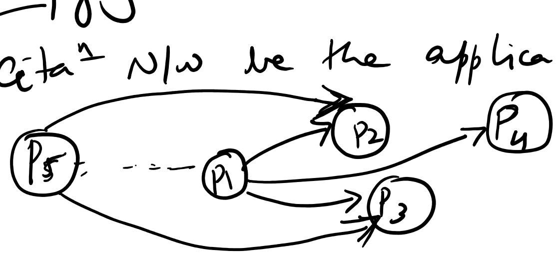
Let v_s be existing node

The edge $v_{t+1} v_s$ is added w' prob.

$$\left\{\frac{deg(v_s)}{2(mt+1)}\right\}$$

Vertex Copying.

Let Cita^n N/w be the applica^n



Basic Idea:

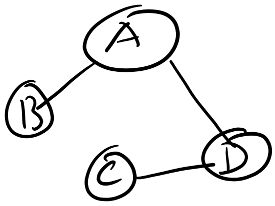
→ A new node v_t comes in to get added to the exiting N/w

→ we select an existing node v_s at random in the exiting N/w

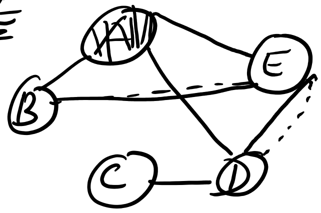
→ we copy the nbs/connec^n of v_s and create edges for v_t.

→ We copy the nbs./connec of v_s and create edges for v_t.

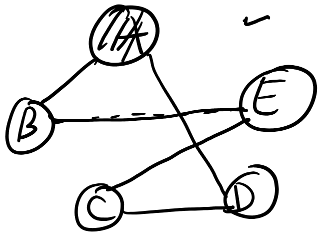
→ v_t may or may not connect to v_s.



A new node $\underline{E}$ enters w/ m links



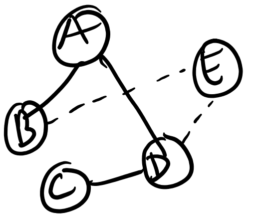
if not connected to A



F → w/ 4 links

What is the prob. that a new node v_t will copy its links from existing node v_i.

There are $\underline{n}$ nodes in existing N/W.



→ what is the prob. node A will be chosen?

1/4

In general $1/n$ is the prob.

If v_i is chosen, ~~that~~ let the degree of $v_i = q_i$

Now the prob. of choosing the nbrs of v_i

$$q_i * \frac{1}{n} \Rightarrow \text{Prob.}\ \cancel{\gamma} \Rightarrow \frac{\gamma \cdot q_i}{n}.$$

The avg. ~~of~~ no. of random links that new vertex v_s makes — ones not copied from a previous vertex is $\underline{(1-\gamma)}$

v_s has $\underline{c}$ edges to get connected to existing N/w

$$(1-\gamma)\frac{c}{n}.$$

Total prob. vertex i gets a new link

$$\frac{\gamma q_i}{n} + (1-\gamma)\frac{c}{n}$$

$$\left(\underbrace{\frac{r q_i}{n} + (1-r)}\frac{c}{n}\right)$$