Assignment 1 of cs6301   asj170430

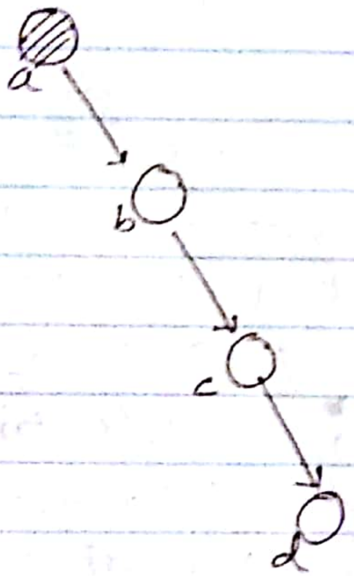
Q1 show by counterexample that the influence spread in positive influence model is nonsubmodular.

f is submodular iff

$A \subseteq B \subseteq V \quad \exists\, e \in V - B$

then

$f(A \cup \{e\}) - f(A) \geq f(B \cup \{e\}) - f(B)$.



Q2 Describe the general cascade model equivalent to positive influence model.

Positive influence model

At each iteration, every inactive node u evaluate how many active incoming neighbours that it has. If this number is atleast a 1/2 of total # of incoming neighbors, u becomes active

My general cascade model

We generalize cascade model to allow the probability that u succeeds in activating a neighbor v to depend on set of v's neighbors that have already tried ∴

∴ We define incremental function $f_v(u,S) \in [0,1]$ where S and $\{u\}$ are disjoint subsets of v's neighbors

for instance consider instance of threshold function f:

$$\cancel{\sum f_v(u,S) \geq \theta_v}$$

~~incremental fun^n^~~

~~summation of atleast half way of total numbers of disjoint v's neighbors.~~

~~threshold value of node v activation.~~

then v will be an active node
iff

$$p_v(u,s) \geq 2\theta_v$$

i.e. incremental function at ~~p~~ node v is twice greater than threshold function.

but $p_v(u,s) \in [0,1]$

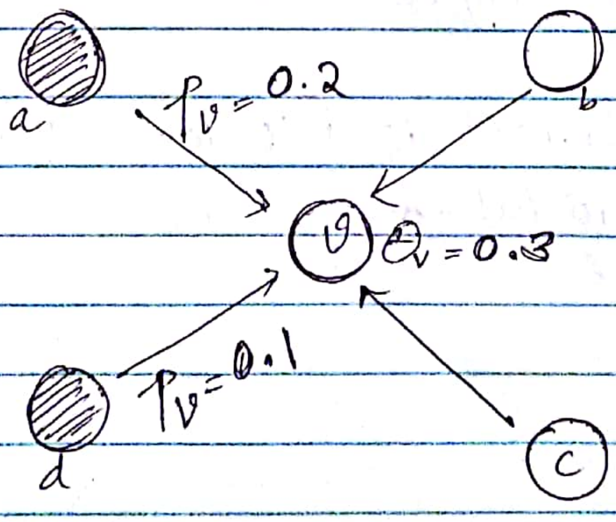
& $\theta_v \in [0,1]$.

∴ that puts restriction on θ_v.

∴ $\theta_v \in [0, 0.5]$

Q3

Counterexample



v is supposed to be active as influe. spread $\sigma_m = 0.2 + 0.1 > \theta$ but doesn't do so as none of $p_v \geq 2\theta_v$

Q4. $\theta_v \in [0, 1/2]$.

In order to become an active node v.

$$\sum_{w \text{ active neighbor of } v} b_{v,w} \geq \theta_v.$$

Also $$\sum_{w \text{ active neigh. of } v} b_{v,w} \leq 1.$$

According to definition of submodularity.
for $S \subseteq T$

$$f(S \cup \{v\}) - f(S) \geq f(T \cup \{v\}) - f(T).$$

$$f(T \cup \{v\}) - f(T) = 0$$

$$\therefore \underline{f(S \cup \{v\}) - f(S) \geq 0}$$

~~could be~~
is monotonic

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Q5

$$f_v(s) = \begin{cases} 0 & , \sum_{u \in s} b_{u,v} < 1/2 \\ \sum_{u \in s} b_{u,v} & \text{otherwise} \end{cases}$$

for $f_v()$ func

if $S \subseteq T$

$f_v(S \cup \{x\}) - f(S) < f(v(T \cup \{x\}) - f(T)$

if $\cancel{\Sigma} \, \theta_v < 1/2$

$f_v(S \cup \{x\}) - f(S) = 0$

and if $\theta_v > 1/2$

means right $= b \times v$

$\therefore$ we cannot decide if influence spread is submodular.