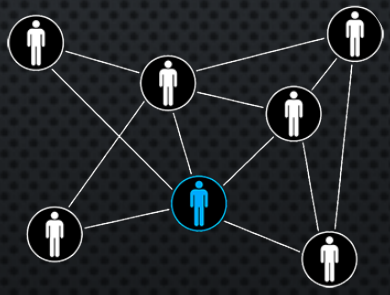
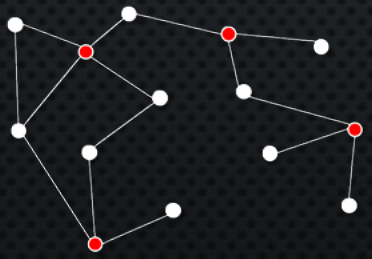
Pricing Game of Celebrities in Sponsored Online Viral Marketing

Pricing Game

Celebrity Selection



Information Diffusion



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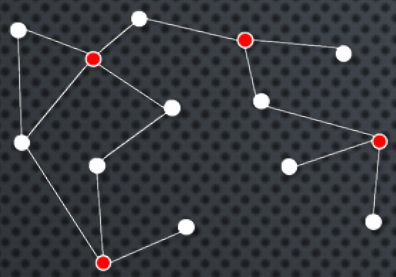
Cascade with Varying Activation Probability model

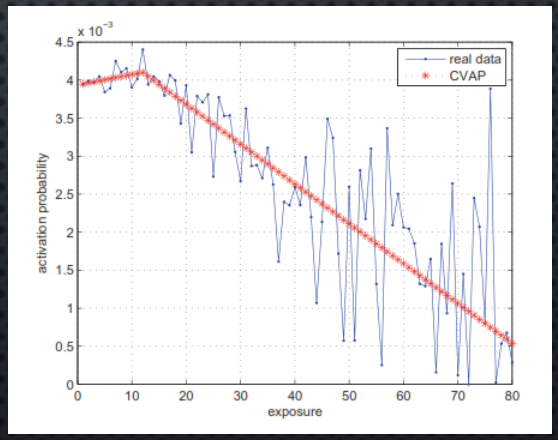


ICM

For a node u, after getting active, it has a single chance to activate each of its inactive son v, success with probability p

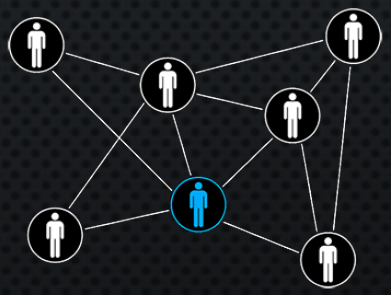
Activation probability p varies

$$p(s) = \begin{cases} \dfrac{p_m}{1 + ce^{-r_1 s}}, & s \le tp \\ -r_2(s - tp) + p', & otherwise \end{cases}$$



CVAP model

Influence function σ is submodular



Celebrity Selection

- Greedy algorithm provides $1 - \frac{1}{e}$ optimaility

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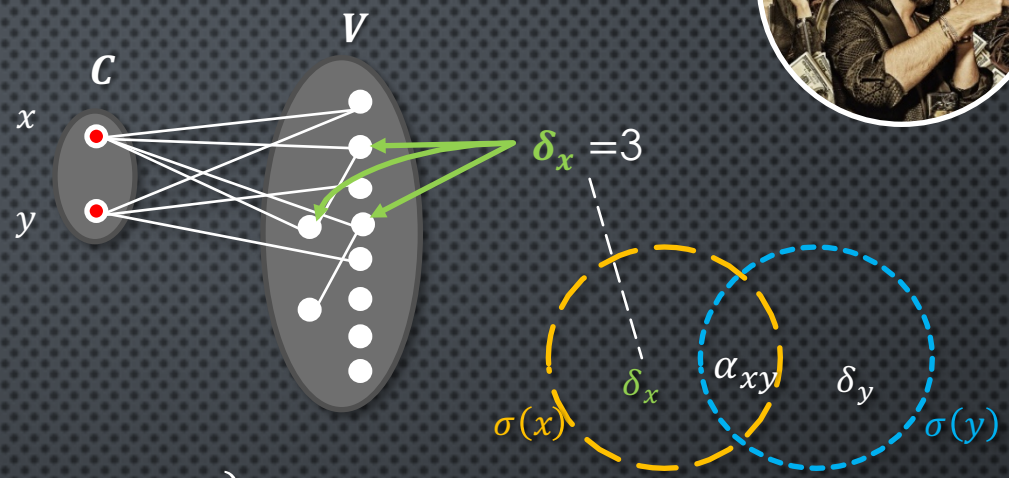
Pricing Game of Celebrities

The settings:

- Graph $G = (C, V, E)$
- $\boldsymbol{\sigma}$ is provided as an oracle
- Information complete
- No cost, no budget limit



The focus:

$$NASH = \left\{ \boldsymbol{p} \in \mathbb{R}_+^{|C|} \mid u_i(p_i, \boldsymbol{p}_{-i}) \geq u_i(p_i', \boldsymbol{p}_{-i}), \ \forall p_i' \in \mathbb{R}_+ \right\}$$

The simple greedy algorithm	The double greedy algorithm
Theorem 1. $NASH = \{\boldsymbol{\delta}\}$, if $\lvert C\rvert = 2$	Theorem 4. $NASH = \{\boldsymbol{\varphi}\}$
Theorem 2. $\lvert NASH\rvert = 1$, if $\lvert C\rvert = 3$	Theorem 5. $u(X_2(\boldsymbol{\varphi})) \in \left[\frac{1}{2}u(S^*), \frac{1}{2}\sigma(C)\right]$
Theorem 3. Those cannot be guaranteed, if $\lvert C\rvert \geq 4$: • $NASH \neq \emptyset$ (existence) • $NASH = \emptyset$ (non-existence) • If $NASH \neq \emptyset$, $\lvert NASH\rvert = 1$ (uniqueness)	

$$\varphi_i = \frac{\delta_i + \sigma(c_i | S_{i-1})}{2}$$

$$S_i = \{c_1, c_2, \ldots, c_i\}$$

$$X_2 \colon \mathbb{R}_+^{|C|} \to 2^C$$

$$S^* = \max_{S \subseteq C} u(S)$$

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