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Abstract

Abstract text describing the paper's content.

Index Terms

Index terms for the paper.



1 INTRODUCTION

Introduction text containing mathematical symbols and definitions.

- List of authors and their affiliations.

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2 "FOLLOWING" LINK CASCADE MODEL

neighbor-

ing links

(. . .)

$$G = (V, E, t),$$

$$v \in V$$

$$e_{uv} \in E$$

$$u, v.$$

$B,$

A

$$t : E \rightarrow \cup \{\perp\}$$

$$t(e_{uv}) = n \in$$

$$e_{uv}$$

$$n,$$

$$t(e_{uv}) = \perp$$

$t(e_{uv})$

$t_e.$

e'

A 1. Diffusion effect between links decays over time.

discovery proba-

bility $g_{e'e}$

A

C

diffusion probability $h_{e'e}$

B

C

"following" link cascade model.

$$t' + \delta,$$

$$e'$$

$$e$$

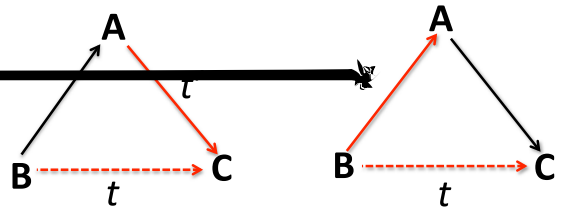
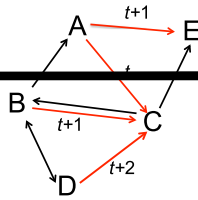
$$\lambda$$

$$t' + \lambda$$

$$e'$$

$$\delta$$

Organization.



(a) Follower diffusion

2.

(. . . , $\delta = 7$),

e, e'

(A, B, C)

$t' - 1$

$t' - 1, B$

A, C

B

Follower diffusion.

t'

$t' \leq t \leq t' + \delta$

$(t' - 1)$

e_{BA}

e_{BC}

follower diffusion.

e_{AC}

$t + 1$

e_{AC}

e_{BC}

$t + 1$

e_{DC}

A

e_{AE}

$t + 1$

e_{AC}

e_{AE}

$()$

Follower diffusion.

t'

$t' \leq t \leq t' + \delta$

$t' - 1$

e_{AC}

e_{BC}

follower diffusion.

A

C

B

A'

C

e_{AC}

e_{CB}

3 DATA AND OBSERVATIONS

.

3.1 Data Collection

0,000

0/ / 0 0 / / 0 0.

0

0/ / 0 0 / / 0 0.

(

3.2 Observations

1 12

13 24

()

()

t'

t

$0 \leq t - t' \leq \delta$

C_{Δ}

B C

C_{Δ}^{+}

$[t', t' + \delta]$ $|C_{\Delta}|$

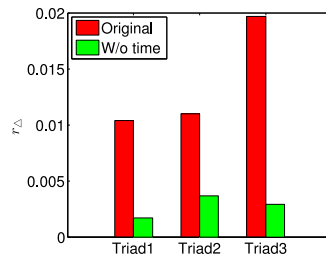
r_{Δ}

•

•

Pattern significance.

$$r_{\Delta} = \frac{|C_{\Delta}^{+}|}{|C_{\Delta}|}. \quad (1)$$



(

$\delta \leq 0.05,$
 $\delta = 0,000$
 $\delta = 0.0$
 Triad1, Triad2, Triad3
 Other observations.
 r_{Δ}
 Diffusion decay.
 $\delta = 1, 2, 3, 5, 7, 10$
 r_{Δ}
 δ
 r_{Δ}
 Summary.
 r_{Δ}

$$\begin{pmatrix} + & - \\ \xi & \xi \end{pmatrix} \begin{matrix} A & C \\ C & B \end{matrix} \begin{matrix} \xi \\ \xi \end{matrix} \quad C(+ - 0 \dots)$$

4 MODEL LEARNING

$$\begin{matrix} \xi & \xi \\ \xi & \xi \end{matrix}$$

Likelihood function.

$$\theta = \{h_{e'e}, g_{e'e}\}$$

(e', e) .

$$\begin{matrix} \xi & \xi & h_{e'e} \\ \xi & \xi & \xi \end{matrix} \begin{matrix} (e', e) \\ \dots \end{matrix} \begin{matrix} \xi \\ \xi \end{matrix} \quad 0.0 \quad \dots \quad 0.0 \quad \dots$$

$$y_{e'e} = \prod_{t=t'}^{t_e} (1 - g_{\Delta})^{t-t'} + (1 - h_{\Delta}) \prod_{t=t'}^{t_e} (1 - g_{\Delta})^{t-t'}$$

$$y_{e'e} = 1 - h_{\Delta} g_{\Delta} \sum_{t=t'}^{t_e} (1 - g_{\Delta})^{t-t'} \quad (6)$$

$$= h_{\Delta} (1 - g_{\Delta})^{t_e - t' + 1} + (1 - h_{\Delta}).$$

$$\log \mathcal{L} = \sum_{e \in \mathcal{E}} \left\{ \log \sum_{\vec{\alpha}_{S_e}} \prod_{e' \in S_e} x_{e'e}^{\alpha_{e'}} y_{e'e}^{1 - \alpha_{e'}} + \sum_{e' \in R_e} \log y_{e'e} \right\}.$$

EM algorithm.

$$q(e|\vec{\alpha}_{S_e}) = \frac{p(e|\vec{\alpha}_{S_e})}{\sum_{e' \in S_e} p(e'|\vec{\alpha}_{S_e})}$$

$$\log \mathcal{L} = \sum_{e \in \mathcal{E}} \left\{ \log \sum_{\vec{\alpha}_{S_e}} \hat{q}(e|\vec{\alpha}_{S_e}) \frac{p(e|\vec{\alpha}_{S_e})}{\hat{q}(e|\vec{\alpha}_{S_e})} + \sum_{e' \in R_e} \log y_{e'e} \right\}$$

$$\geq \sum_{e \in \mathcal{E}} \left\{ \sum_{\vec{\alpha}_{S_e}} \hat{q}(e|\vec{\alpha}_{S_e}) \log \frac{p(e|\vec{\alpha}_{S_e})}{\hat{q}(e|\vec{\alpha}_{S_e})} + \sum_{e' \in R_e} \log y_{e'e} \right\},$$

$$Q(\theta, \hat{\theta})$$

$$Q(\theta, \hat{\theta}) = \sum_{e \in \mathcal{E}} \left\{ \sum_{\vec{\alpha}_S}$$

$$h_{\Delta} = \frac{\sum_{(e',e) \in C_{\Delta}^+} \hat{D}_{e'e} + \sum_{(e',e) \in C_{\Delta}^-} \hat{B}_{e'e}}{|C_{\Delta}|}, \quad (12)$$

$$g_{\Delta} = \frac{\sum_{(e',e) \in C_{\Delta}^+} \hat{A}_{e'e}}{\sum_{(e',e) \in C_{\Delta}^-} \hat{B}_{e'e}(\delta + 1) + \sum_{(e',e) \in C_{\Delta}^+} \hat{D}_{e'e}(t_e - t_{e'} + 1)}. \quad (13)$$

$$D_{e'e} = B_{e'e} + A_{e'e} - A_{e'e}B_{e'e}. \quad (14)$$

A 1.

$G = (V, E, t)$

$\theta = \{h_{\Delta}, g_{\Delta}\}$

$h_{\Delta} \quad g_{\Delta} \quad (0,)$

E-

$e \in \mathcal{E}$

$e' \in S_e$

$x_{e'e} \quad y_{e'e}$

$e' \in S_e$

$A_{e'e} \quad B_{e'e} \quad D_{e'e}$

$e' \in R_e$

$B_{e'e}$

$\Delta = 1 \dots 24$

$h_{\Delta} \quad g_{\Delta}$

Convergence

5 APPLICATIONS

Followee maximization.

S

$(S \cup \{u\})$

S

e

S

S

$(S) R$

Followee maximization.

v

k

v

A 2.

$G = (V, E), \quad v, \quad k$

$S = \emptyset \quad R = 0,000$

$i = 1 \text{ to } k$

$u \in V \setminus S$

$s_u = 0$

$r = 1 \text{ to } R$

$s_{u+} = |FCM(S \cup \{u\})|$

$s_u = s_u / R$

$S = S \cup \{argmax_{u \in V \setminus S} s_u\}$

6 EXPERIMENTS

6.1 Experimental Setup

S

v

k

S

v

i

$u \notin S$

$(S \cup \{u\})$

t

S

v

e

S

Evaluation metrics. (text describing metrics)

$$CF_score(u, v) = \sum_w I(w, v) sim(w, u),$$

$$sim(w, u) = \frac{I(w, u)}{I(w, v)}$$

$$CF_score(u, v).$$

SimRank.

$$0$$

Katz.

$$\{h_\Delta\} \quad \{g_\Delta\}$$

$$p(e|S_e)$$

$$p(e|S_e) > \tau.$$

$$\tau \quad 0$$

$$\tau.$$

Random-random model (RR).

$$RR_score(u, v) = \frac{1}{|F(u)|} \sum_w I(u, w) I(w, v) \frac{1}{|F(w)|}$$

$$\frac{|F(u)|}{I(u, w)}$$

RR_score(u, v).

Preferential attachment with communities (PAC).

Comparison methods.

Basic.

SVM.

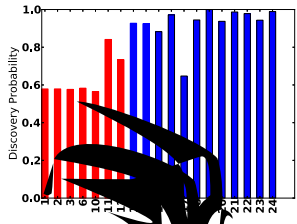
LRC.

$$PAC_score(u, v) = \beta \left(\alpha \frac{|N(v)|}{\sum_{v \in C(u)} |N(v)|} + (1 - \alpha) \frac{1}{|C(u)|} \right) + (1 - \beta) \left(\alpha \frac{|N(v)|}{\sum_{v \in V} |N(v)|} + (1 - \alpha) \frac{1}{|V|} \right)$$

Collaborative filtering (CF):

$$|N(v)|$$

ξ	$u,$				$\xi\xi$	
		$0.V$				ξ
ξ	$u,$			ξ		ξ
	$u.$					ξ
ξ		$\xi\alpha$	$\beta\xi$	0	$0.$	ξ
						$-$



(a) Discoverability



(a) Follower maximization

(b) Follower maximization



11

r_{Δ}

Delay analysis.

Convergence analysis.

Model parameter analysis.

6.3 Application Improvement

k

v

v

ξv

ξ / ξ

ξ / ξ

$(- \xi / \xi$

0.0

$k \xi / \xi$

ξ / ξ

$(+ - 0)$

ξ

ξ / ξ ξ .
 $\xi\xi$ $\xi\xi$ $\xi\xi$ $\xi\xi$ -
 $\xi\xi$ ξ ξ / ξ
 $\xi\xi$ ξ .

7 RELATED WORK

Diffusion model and influence maximization.

ξ
 $\xi\xi$, $\xi\xi$, -

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