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E-commerce business model mining and prediction

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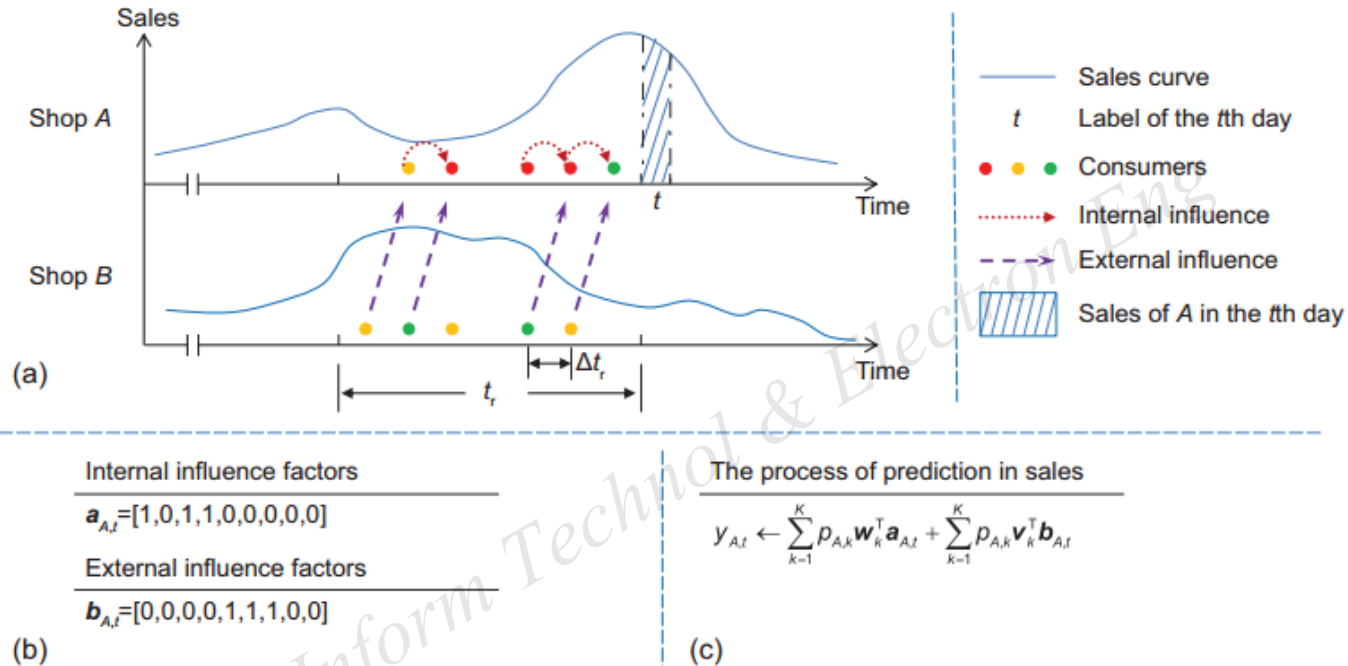
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Introduction

- We study the problem of business model mining and prediction in the e-commerce context.
- Compared with traditional methods, we consider the potential relationships both among the consumers (consumer influence) and among the shops (competitions or collaborations).
- We propose a new method for e-commerce business model mining and prediction, called EBMM, which combines regression with community analysis.
- Extensive evaluations using Alibaba Group e-commerce data demonstrate the promise and superiority of EBMM.

Design method



The definitions of internal influence factor and external influence factor

$$\mathbf{a}_{n,t}((i-1)M + j) = \begin{cases} 1, & \tau(i, n), \tau(j, n) \in [t - t_r, t], \\ & \tau(j, n) - \tau(i, n) \in (0, \Delta t], \\ 0, & \text{otherwise,} \end{cases}$$

$$\mathbf{b}_{n,t}((i-1)M + j) = \begin{cases} 1, & \tau(i, n'), \tau(j, n) \in [t - t_r, t], \\ & \tau(j, n) - \tau(i, n') \in (0, \Delta t], \\ 0, & \text{otherwise.} \end{cases}$$

Optimization

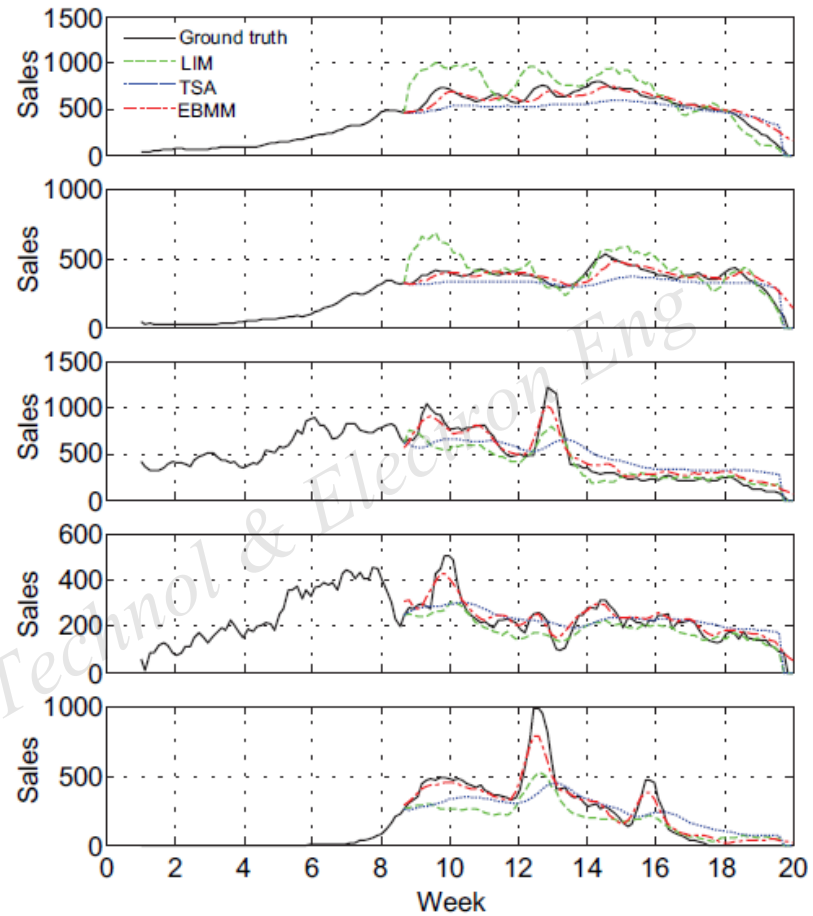
The objective function of EBMM:

$$\begin{aligned} \min \quad & \sum_{n=1}^N \left\{ \sum_{t=1}^T \text{loss}(x_{n,t}, \mathbf{a}_{n,t}, \{\mathbf{w}_k\}) \right. \\ & + \sum_{t=1}^T \text{loss}(z_{n,t}, \mathbf{b}_{n,t}, \{\mathbf{v}_k\}) \\ & \left. + \lambda_1 \sum_{t=2}^T |x_{n,t} - x_{n,t-1}| + \lambda_2 \sum_{t=1}^T |z_{n,t}| \right\} \\ \text{s.t.} \quad & y_{n,t} = x_{n,t} + z_{n,t}, \end{aligned}$$

We split the sales volume of a shop into two parts: $x(\cdot)$ is the true part of the shop's sales and $z(\cdot)$ is the noise part of the shop's sales.

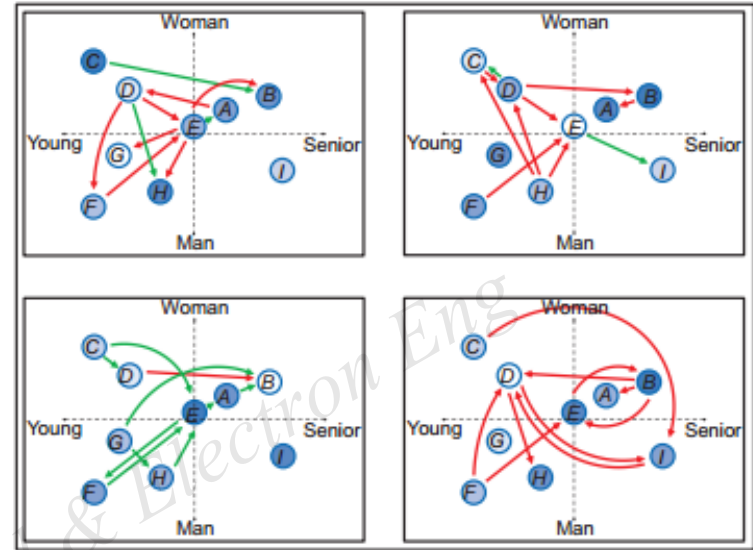
We solve the problem using an ADMM (alternating directions method of multipliers) algorithm (Boyd *et al.*, 2011).

Experimental results

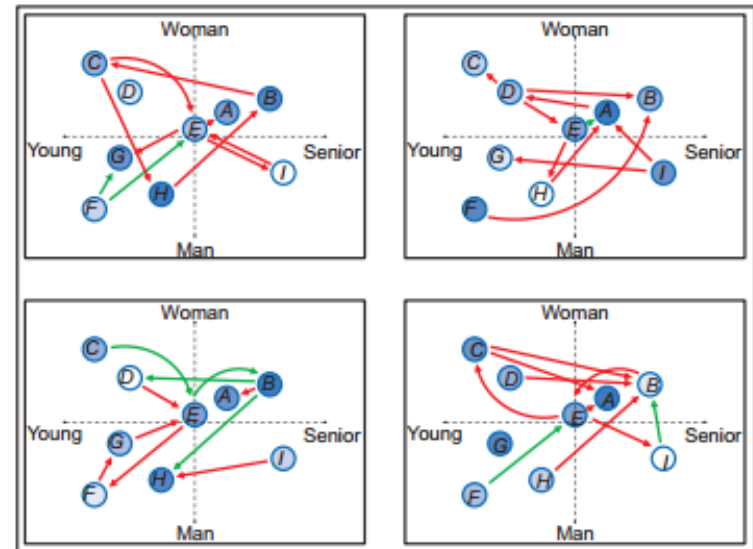


Examples of the individual sales prediction for five different shops

Experimental results (Con'd)



(a)



(b)

Influence power mining among the consumer communities in blouse (a) and sleeveless shirt (b) datasets.

Conclusions

- This is the first effort on e-commerce business model mining and prediction with the unobserved potential relationships among the consumers and among the shops in the market.
- We develop an effective optimal solution, EBMM, to business model mining and prediction combining information diffusion theory with community analysis.
- We demonstrate the effectiveness and promise of EBMM in the real-world business model prediction application.