Corporate Leaders Analytics and Network System (CLANS): Constructing and Mining Social Networks among Corporations and Business Elites in China

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The Chinese University of Hong Kong

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Outline

1. Introduction
2. CLANS System
3. Website Illustration

Background

- Social networks are essential for business.

[1] Brian Uzzi. "Embeddedness in the making of financial capital: How social relations and networks benefit firms seeking financing". In: *American sociological review* (1999), pp. 481–505.

[2] David F Larcker, Eric C So, and Charles CY Wang. *Boardroom centrality and stock returns*. Citeseer, 2010.

[3] David Larcker et al. "Back door links between directors and executive compensation". In: *Back Door Links Between Directors and Executive Compensation (February 2005)* (2005).

Image source: http://blog.beacontechnologies.com/wp-content/uploads/2013/08/social_media_for_companies.jpg

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- In US, social networks among firms benefit the debt financing, firm performance, and corporate governance[1][2][3].

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- Especially, relationship plays a crucial role in Chinese business model.
- To the best of our knowledge, few studies focus on the social network of corporations and elites in China

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- Researchers
  - Help them conduct deep research

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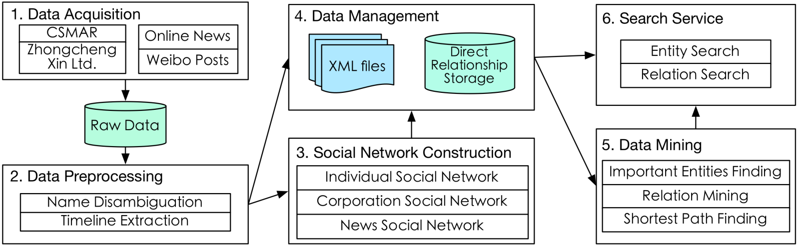
  - Construct a business social network and formulate similarity relations among individuals and corporations
  - Conduct data mining to discover more implicit information

System Overview



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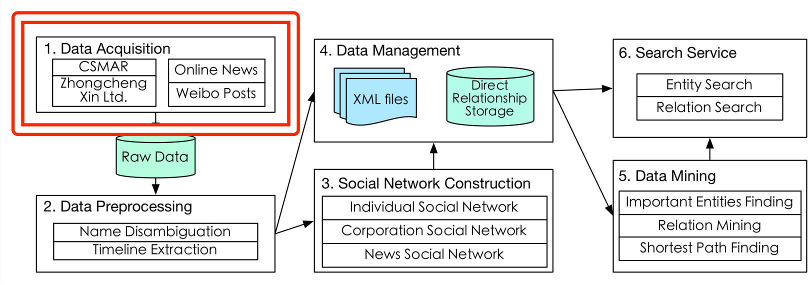

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Sources	People	Company
Online news	16,374,279	1,126,299
Sina Weibo	19,445,929	2,367,619

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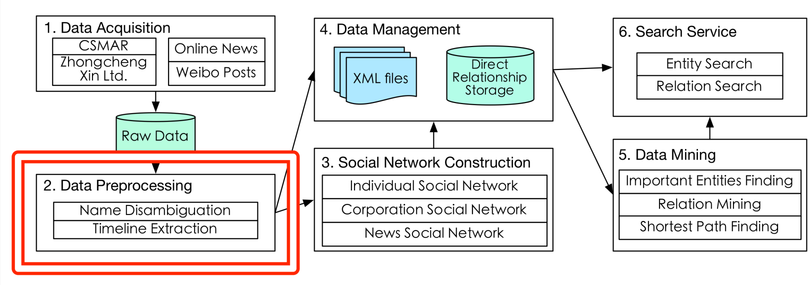

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- Result
  - Identify 87,458 individual entities in CSMAR and find the common 46,130 people in two datasets

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    - The first two rounds are the same.
    - Third round, apply the Latent Semantic Allocation to the labeled result from the second round, map all the documents to vectors in the lower dimensional latent semantic space, calculate document similarities, set the threshold and label the rest.

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- Result
  - Select random sample of 1000 posts and news, Weibo posts is 98% and online news is 86% by precision rate.

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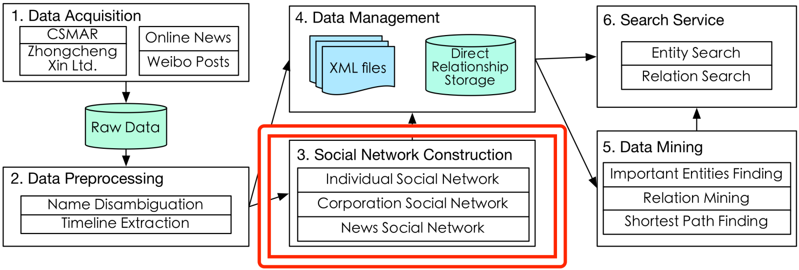
  - 95.1% precision rate for education timeline, 83.1% for working timeline.

System Overview



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Social Network Construction
Colleague Social Network

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- Let colleague relationship denoted as a combination of value relation and close relation.

- The colleague weight between person p_i and p_j is defined as

$$\omega_{p_i,p_j} = \sum_{t \in L(p_i,p_j)} \frac{PS_{t,p_i} + PS_{t,p_j}}{2} , \tag{1}$$

where $L(p_i, p_j)$ denotes a collection of the intersection years that person p_i and p_j used to work with each other, and PS_{t,p_i} denotes the position rank of person p_i in the year t. At the end, all the weights are normalized, which is also applied in the following weight calculation.

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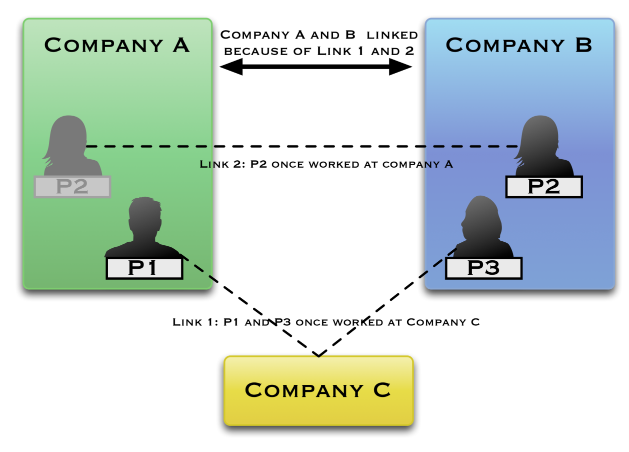
where $\omega^{al}_{i,j}$ is a weight for alumni relationship, $\omega^{co}_{i,j}$ for colleague relationship; α and β denotes the corresponding percentage.

Definition

We define the corporation social network as an directed graph $\hat{G}(\hat{V},\hat{E})$. In $\hat{G}(\hat{V},\hat{E})$, every vertex (corporation) has feature set $P_i = \{p_i^1, p_i^2, \cdots, p_i^n\}$ and every direct edge (relationship) has weighted value $W_{i,j} = (\omega_{i,j}^{gp}, \omega_{i,j}^{nk})$. n is the size of the set (total number of staffs); $\omega_{i,j}^{gp}$ is a weight for group membership, $\omega_{i,j}^{nk}$ for network relationship.

Example



Company A
Company A and B linked because of Link 1 and 2
Company B
P2
Link 2: P2 once worked at company A
P2
P1
P3
Link 1: P1 and P3 once worked at Company C
Company C

- $\omega^{gp}_{i,j}$, $\omega^{nk}_{i,j}$ are defined as follows:

$$\omega^{gp}_{i,j} = \sum_{p^k_i \in P_i \cap P_j} PS_{p^k_i} * \omega^{gp}_{p^k_i} , \tag{3}$$

$$\omega^{nk}_{i,j} = \sum_{(p^k_i, p^r_j) \in L_2(P_i, P_j)} PS_{p^k_i} * \omega^{nk}_{p^k_i, p^r_j} . \tag{4}$$

  $PS_{p^k_i}$ denotes the position rank of person p^k_i in corporation i; $\omega^{gp}_{p^k_i}$ is a weight for p^k_i connecting P_i with P_j; $L_2(P_i, P_j)$ denotes a collection of connections between $(P_i - P_i \cap P_j)$ and $(P_j - P_i \cap P_j)$; $\omega^{nk}_{p^k_i, p^r_j}$ denotes a weight between p^k_i and p^r_j calculated in the previous equation.
- Corporation weight from corporation i to j is defined as $W_{i,j} = \alpha\omega^{gp}_{i,j} + \beta\omega^{nk}_{i,j}$

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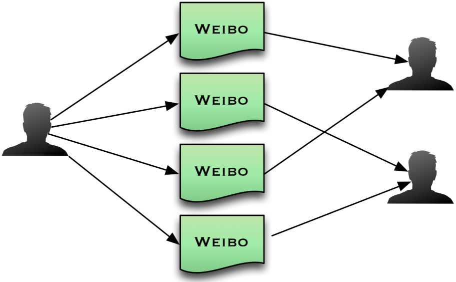

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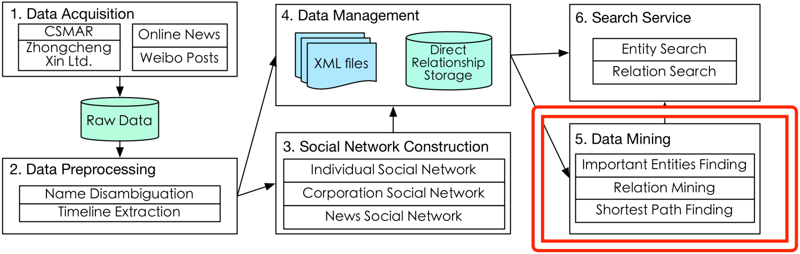

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- For corporation social network
  - Use PageRank algorithm

Data Mining

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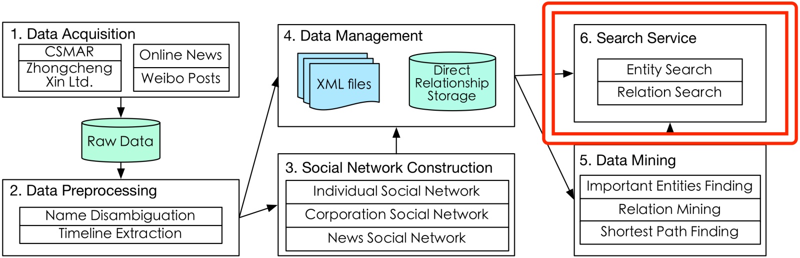

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  - Given any two keywords, the system returns shortest path between them and the corresponding intermediate nodes and link information.

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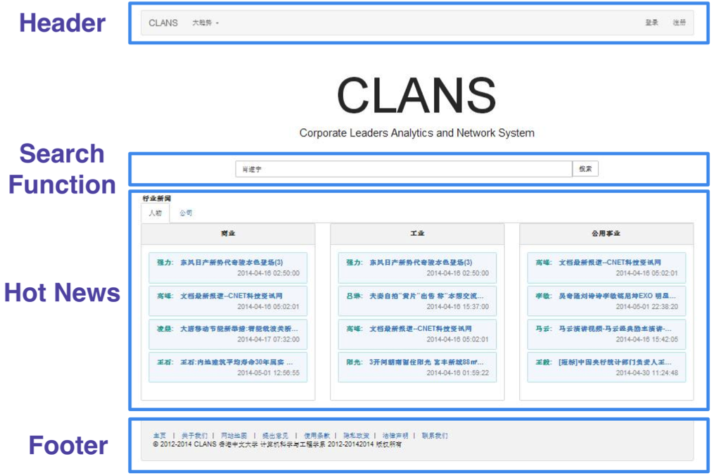
3 Website Illustration

Website Illustration

Homepage



Website Illustration

Person Page

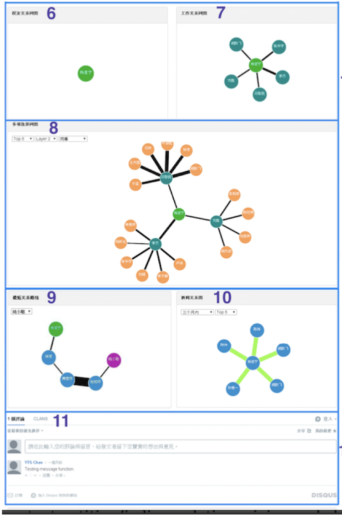
1. Basic Information

2. Timeline

3. Recent News

4. Positive News

5. Negative News



6. Alumni Social Network
7. Colleague Social Network

8. Integrated Individual Social Network

9. Shortest Path with Another Person
10. News Social Network

11. Comments

Website Illustration

Company Page

1. Basic Information

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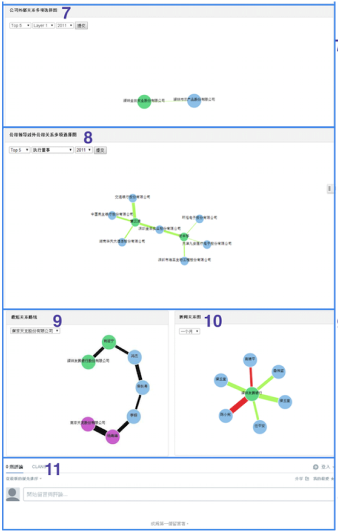
6. Stock Value Trend

Website Illustration

Company Page



7. Corporation Social Network

8. Corporate Leaders Social Network

9. Shortest Path with Another Firm

10. News Social Network

11. Comments

Q&A