A Social Network Study of Evliyâ Çelebi's *The Book of Travels-Seyahatnâme*

Ceyhun Karbeyaz[1], Ethem F. Can[1], Fazli Can[1], Mehmet Kalpakli[2]
karbeyaz.c@husky.neu.edu, efcan@cs.umass.edu, canf@cs.bilkent.edu.tr, kalpakli@bilkent.edu.tr
1-Department of Computer Engineering, 2-Department of History Bilkent University, Ankara, 06800, Turkey

Abstract

We present two methods for constructing social networks by using textual data and apply it to *Seyahatnâme-Bitlis Section* from book IV and check if the constructed networks hold social network properties. The first social network construction method is based on proximity of co-occurence of names. The second method is based on 2-pair associations obtained by association rule mining by using sliding text blocks as transactions. The social networks obtained by these two methods are validated using a Monte Carlo approach by comparing them with the social network created by a scholar-historian.

Aim of the Study

- We present two different methods for constructing social networks from textual data and apply them to *Seyahatnâme-Bitlis Section* to obtain a social network that represent relationships among people.
- We use the social network created by a human expert as the ground truth and assess the effectiveness of the methods by comparing the generated network structure with that of the ground truth.
- We analyze the manually and automatically generated networks to see if they contain the social network properties.

Methods: ProxiBM and RuleBM

- ProxiBM: text proximity-based method.
  - Manual identification of the paragraphs.
- RuleBM: association rule-based method.
  - Sliding text window for blocking.

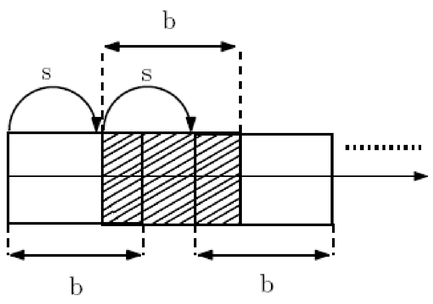

Figure 2: Sliding window-based blocking: l: total text length, b: block size (0 < b ≤ l), s: step size, nb: number blocks, nb = 1+⌈(l-b)/s ⌉ for 0 < s ≤ b, nb = 1 + ⌊(l-b)/ s ⌋ for s > b

Background

- Evliyâ Çelebi, an Ottoman writer, scholar and world traveler, visited most of the territories and also some of the neighboring countries of the Ottoman Empire in the 17th century. He took notes about his trips and wrote a 10-volume book called *Seyahatnâme (The Book of Travels)*.

- Brin et al. [1] use association rule mining to find frequent itemsets over market data. Chawla [2] applied association rules over construction and analysis of a social network from market basket data.

Data Set

- Manual character corpus with sultans, rulers, scholars etc.
- Our history expert manually constructed the social network.

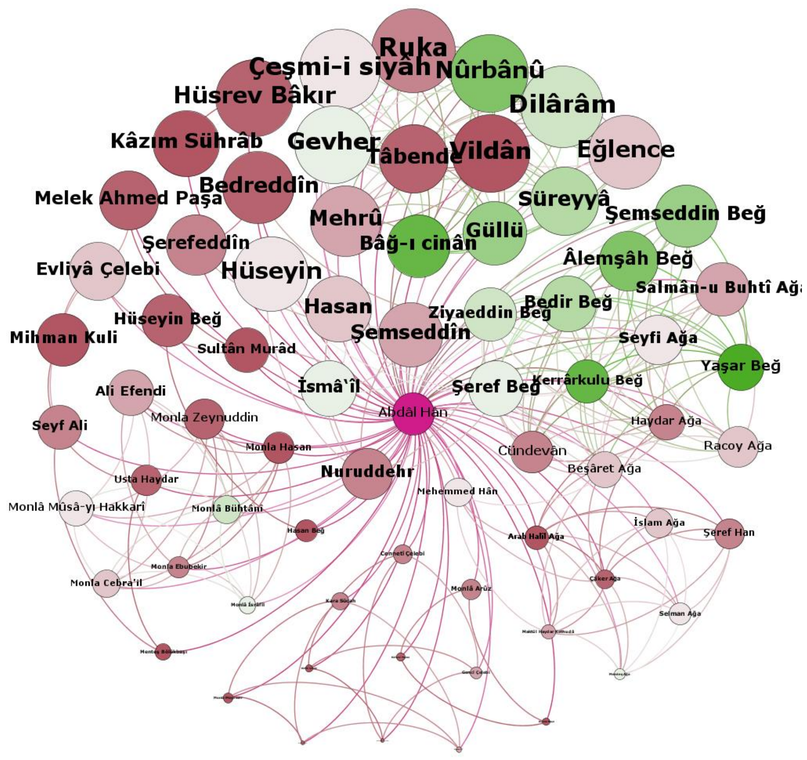

Figure 1: Ground truth: Manually constructed social network for *Bitlis Section*.

Measuring Effectiveness

$$Precision = \frac{No.\ of\ matching\ edges}{No.\ of\ edges\ obtained\ by\ method} \quad (1)$$

$$Recall = \frac{No.\ of\ matching\ edges}{No.\ of\ edges\ of\ manually\ constructed\ network} \quad (2)$$

$$F = \frac{2 * Precision * Recall}{Precision + Recall} \quad (3)$$

Experimental Results

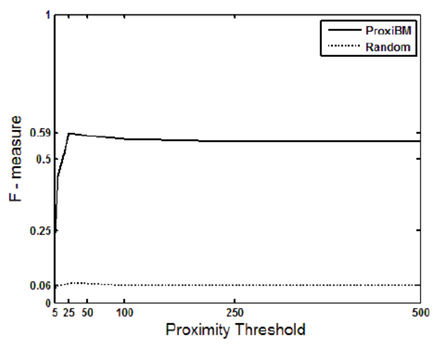

Figure 3: ProxiBM results vs. Random (Monte Carlo) results for different proximity threshold values.

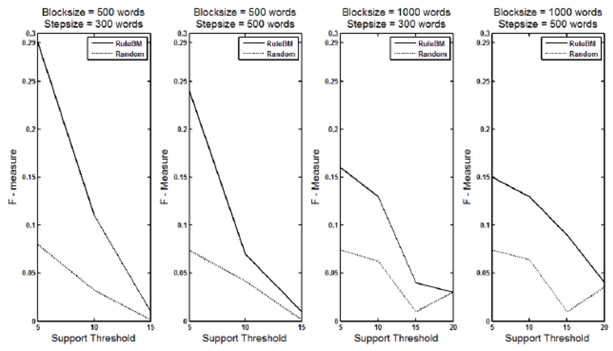

Figure 4: RuleBM results vs. Random (Monte Carlo) results for different blocksize, stepsize and support threshold values.

Network	*Size*	*No.of Edges*	*<k>*	*l*	*C*	C_{rand}
Ground Truth	71	321	9.04	1.90	0.93	0.15
ProxiBM	88	395	8.98	3.34	0.83	0.11
RuleBM	82	515	12.56	2.32	0.86	0.14

Table 1: Characteristics of social networks for both methods with the best configuration and ground truth compared to random networks that have the same average degrees *<k> and size (no. of nodes in* network) values.

Actual Network		ProxiBM		RuleBM	
Character	Degree	Character	Degree	Character	Degree
Abdâl Hân	69	Ziyâeddin Beğ	20	Abdâl Hân	66
Ziyâeddin Beğ	20	Selmân	20	Beşaret Ağa	40
Şeref Beğ	18	Beşaret Ağa	19	Şeref Beğ	32
Beşaret Ağa	17	Şemseddin	16	Hüsrev Paşa	30
Haydar Ağa	15	Hasan Beğ	16	Haydar Ağa	27
Cündevân	13	Haydar Ağa	14	Zâl Paşa	27
Salmân-u Buhtî Ağa	13	Şeref Beğ	13	Salmân-u Buhtî Ağa	27
Racoy Ağa	13	Maktûl Haydar Kethudâ	13	Ziyâeddin Beğ	26
Bedir Beğ	13	Racoy Ağa	13	Şeref Beğ	23
Şemseddin Beğ	13	Seyfi Ağa	13	Âlemşâh Beğ	23
Âlemşâh Beğ	13	Bedir Beğ	13	Yaşar Beğ	23
Kerrârkulu Beğ	13	Siyâvuş	13	Cündevân	23
Yaşar Beğ	13	Kâzım Sührâb	13	Racoy Ağa	23
Seyfi Ağa	13	Salmân-u Buhtî Ağa	12	Seyfi Ağa	23
Vildân	12	Kevkeban	12	Süleymân Hân	23

Table 2: Degree distribution of characters with the highest degrees for best configurations of ProxiBM and RuleBM along with actual social network for *Seyahatnâme-Bitlis Section*.

Conclusion

- We hope the social networks obtained by our social network construction methods would open new research avenues by identifying forgotten but important historical characters as well as their relationships.
- Proposed ProxiBM and RuleBM methods generate meaningful social networks which are significantly different from random and substantially similar to the social network manually constructed by a scholar-historian.
- The experimental results show that the networks created by ProxiBM show a higher similarity to the manually created social network than those of RuleBM.

References

[1] S. Brin, R. Motwani, J. D. Ullman, and S. Tsur. Dynamic itemset counting and implication rules for market basket data. *SIGMOD Rec., 26:255–264, June* 1997.
[2] T. Raeder and N. V. Chawla. Modeling a store's product space as a social network. ASONAM'09*, pages 164–169,* Washington, DC, USA, 2009. IEEE Computer Society.

To appear in the Proceedings of Exploration, Navigation and Retrieval of Information in Cultural Heritage Workshop *(ENRICH 2013), Dublin, 1 August 2013.*