

Social Networks Meet Social Science

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Abstract

Computer science research community devoted a special attention to the studies of online social networks. In the meantime, we observed that algorithms and data processing techniques are often not enough to fully exploit research potential of social data available. One needs a set of models and methods explaining social interaction to pose meaningful questions on the wealth of data. This is a moment when social sciences come into a picture providing the necessary tools and knowledge. Here we review some research papers on online social networks, which have been published in the fields of economics, sociology, psychology and political science. We hope, such an interdisciplinary view on the social network research might help to eliminate existing gap between information management experts and scholars from social sciences.

1 Introduction

Recent boom of online social networks provided computer scientists with a lot of new research directions and inspired numerous efficient algorithms for scalable network analysis. In addition, it motivated scholars from social sciences like economics, sociology, psychology and political science, to catch up with modern data processing techniques. The massive datasets of digitized social data attracted social scientists, who rarely worked with terabytes of information or used scalable data analysis algorithms. Their usual toolbox is tailored to hundreds and thousands of data points, which are rather trustworthy and verifiable. In contrast, contemporary social graphs are built from millions of nodes and billions of edges, the data is highly dynamic, incomplete, unreliable and difficult to interpret.

It is reasonable to assume that online analytical tools from computer science will be widely adopted by social scientists in a short term prospective and current technological gap will be eliminated. On the other hand, the social disciplines will stay superior in posing right questions on social data, which is a key skill in

understanding characteristics and mechanisms of a modern society. Such division of competencies creates a need for the interdisciplinary research teams and a number of highly visible research papers were produced by consortia of social and data processing experts.

To provide an overview of problems and challenges addressed by the social sciences using online networking data, we selected a set of publications from four aforementioned branches of social sciences. Each study is summarized into a key research question, a method used and a general outcome. We grouped these works by the field of study, while some papers might be attributed to two or more disciplines. We also made an attempt to mention some national papers where applicable. Finally, some relevant studies completed with support from the Center for the Study of New Media and Society were added to the picture.

2 Psychology

An interesting compilation of papers on online addiction is prepared by Kuss and Griffiths [19]. One of the most comprehensive reviews of psychologically oriented research using Facebook was done by Wilson, Gosling, and Graham in 2012 [32]. A large volume of more than 400 articles has been split into five categories including: into 5 categories: descriptive analysis of users, motivations for using Facebook, identity presentation, the role of Facebook in social interactions, and privacy and information disclosure. Descriptive analysis focuses on Facebook users and their typical online behaviour. Motivations part is about why people use Facebook and identity presentation is about how they want to look for the outside world. Social interaction category studies relationships between individuals and groups. Finally, privacy and information disclosure papers target various trade-offs between personal information sharing and associated risks.

Following the proposed categories, we pick few representative papers from each. For example, in-house Facebook research lab published in 2011 one of the largest studies describing inhabitants of the biggest social network [2, 3, 27]. For the motivation study we take an example addressing psychological well-being and increased social capital of the users [23]. A case study of identity representation from [29] confirms old wisdom that attractive photos are more likely to help in getting new friends than unattractive ones. One recent work which caught quite some attention in press is devoted to social interactions, in particular, Backstrom and Kleinberg [4] studied possibility of identifying romantic relationship between two people based on

their network neighborhood alone. The results are promising and might lead to finding structurally significant people in various online applications.

3 Sociology

The methods of sociological research could be considered as the most demanded from the computer science community. Several basic notions in social network analysis have deep roots in sociology, starting from the famous works by Granovetter [25] or by Travers and Milgram [25]. A good introduction into a sociological perspective on modern social network analysis include work by Marin and Wellman [20] or by Hansen, Shneiderman and Smith [16], while a standard textbook in this area belongs to Faust and Wasserman [30]. Among research topics addressed by modern sociologists we observe a popular theme of geo-dependencies of social ties, which has already produced several crossdisciplinary teams [22, 24, 28]. Another hot topic is a cascade-behavior prediction [7, 13], which promises numerous potential benefits for the information diffusion applications. A more specific task in the same direction is measuring the influence on information sharing of each particular node [5].

4 Economics

Thanks to the excellent textbooks by Matthew Jackson [18] and by Easley and Kleinberg [9], we currently have a good overview of the role of social networks in economics. For a short intro in this area one is advised to look at a brief summary [17]. However, economics research is often focused on small-scale networks from offline world, rather than on massive online datasets. Situation is changing nowadays and more and more papers address online networks in the economics science, for an up-to-date review one might look into a work by Ravasan, Rouhani and Asgary [21]. A lot of available studies concentrate on applied questions, for example, work by Acquisti and Fong [1] shows how online information could be used for discrimination during in a hiring process. Another interesting topic is connected to online fundraising potential [6]. Some early studies in political economy show dependencies between online activity and offline movements [10].

5 Political Science

Modern political science is a lot more about proper math and heavy computing as it was ever before. Researcher perform complex data analysis on millions of tweets and online texts to better understand current political issues and verify classic models and theories of the field. A recent outburst of civil movements supported by visible online activity was recently studied in Egypt [26], Spain [14], USA [8] and Russia [15]. Other interesting topics include debates around political economy of privacy on Facebook [11] and Internet surveillance [12]. Regarding applications, some interesting visualizations around political activities are developed in [31].

6 Conclusions

This survey is a minor step towards better cooperation between computer science and social sciences communities. A set of research problems listed above is not exhaustive by any means, but rather a basic selection for future development. We hope, interested readers will follow the way of diving into alien, but interesting research disciplines, and will find necessary bits of knowledge, which are invisible within their native research circle.

References

- [1] Acquisti, A., and Fong, C.M. An Experiment in Hiring Discrimination Via Online Social Networks. Social Science Research Network Working Paper Series (Apr. 2012).
- [2] Backstrom, L. Anatomy of Facebook. <https://www.facebook.com/notes/facebookdata-team/anatomy-offacebook/10150388519243859>, 2011. [Online; accessed 25-May-2014].
- [3] Backstrom, L., Boldi, P., Rosa, M., Ugander, J., and Vigna, S. Four degrees of separation. CoRR abs/1111.4570 (2011).
- [4] Backstrom, L., and Kleinberg, J.M. Romantic partnerships and the dispersion of social ties: a network analysis of relationship status on facebook. In CSCW (2014), S. R. Fussell, W. G. Lutters, M. R. Morris, and M. Reddy, Eds., ACM, pp. 831–841.
- [5] Bakshy, E., Hofman, J.M., Mason, W.A., and Watts, D.J. Everyone’s an influencer: Quantifying influence on twitter. In Proceedings of the Fourth ACM International Conference on Web Search and Data Mining (New York, NY, USA, 2011), WSDM’11, ACM, pp. 65–74.
- [6] Castillo, M., Petrie, R., and Wardell, C. Fundraising through online social networks: A field experiment on peer-to-peer solicitation. *Journal of Public Economics* (2014).
- [7] Cheng, J., Adamic, L.A., Dow, P.A., Kleinberg, J. M., and Leskovec, J. Can cascades be predicted? In WWW (2014), C.-W. Chung, A.Z. Broder, K. Shim, and T. Suel, Eds., ACM, pp. 925–936.
- [8] Conover, M.D., Davis, C., Ferrara, E., McKelvey, K., Menczer, F., and Flammini, A. The geospatial characteristics of a social movement communication network. *PloS one* 8, 3 (2013), e55957.
- [9] David, E., and Foray, D. *Networks, Crowds, and Markets: Reasoning About a Highly Connected World*. Cambridge University Press, New York, NY, USA, 2010.
- [10] Enikolopov, R., Makarin, A., Petrova, M., and Polishchuk, L. Social media and protest participation: Cross-city evidence from Russia.
- [11] Fuchs, C. The political economy of privacy on facebook. *Television & New Media* 13, 2 (2012), 139–159.

- [12] Fuchs, C., Boersma, K., Albrechtslund, A., and Sandoval, M. *Internet and Surveillance: The Challenges of Web 2.0 and Social Media*, 1st ed. Routledge, New York, NY, 10001, 2011.
- [13] Goel, S., Watts, D.J., and Goldstein, D.G. The structure of online diffusion networks. In *Proceedings of the 13th ACM Conference on Electronic Commerce (New York, NY, USA, 2012)*, EC'12, ACM, pp. 623–638.
- [14] González-Bailón, S., Borge-Holthoefer, J., Rivero, A., and Moreno, Y. The dynamics of protest recruitment through an online network. *Scientific reports* 1 (2011).
- [15] Greene, S.A. Beyond bolotnaia. *Problems of Post-Communism* 60, 2 (2013), 40–52.
- [16] Hansen, D.L., Shneiderman, B., and Smith, M.A. Social Network Analysis: Measuring, Mapping, and Modeling Collections of Connections. In *Analyzing Social Media Networks with NodeXL*, D.L. Hansen, B. Shneiderman, and M. A. Smith, Eds. Elsevier, 2011, ch. 3, pp. 31–50.
- [17] Jackson, M.O. The economics of social networks. In *Proceedings of the 9th world congress of the econometric society* (2005).
- [18] Jackson, M.O. *Social and Economic Networks*. Princeton University Press, Princeton, NJ, USA, 2008.
- [19] Kuss, D.J., and Griffiths, M.D. Online social networking and addiction – a review of the psychological literature. *International journal of environmental research and public health* 8, 9 (2011), 3528–3552.
- [20] Marin, A., and Wellman, B. Social network analysis: An introduction. Scott J, Carrington PJ, editors. *The SAGE Handbook of Social Network Analysis*. Thousand Oaks, CA: SAGE Publications (2011), 11–25.
- [21] Ravasan, A.Z., Rouhani, S., and Asgary, S. A review for the online social networks literature (2005–2011). *European Journal of Business and Management* 6, 4 (2014), 22–37.
- [22] Sadilek, A., Kautz, H., and Bigham, J. P. Finding your friends and following them to where you are. In *Proceedings of the Fifth ACM International Conference on Web Search and Data Mining (New York, NY, USA, 2012)*, WSDM'12, ACM, pp. 723–732.
- [23] Steinfield, C., Ellison, N.B., and Lampe, C. Social capital, self-esteem, and use of online social network sites: A longitudinal analysis. *Journal of Applied Developmental Psychology* 29, 6 (2008), 434–445. *Social Networking on the Internet – Developmental Implications*.
- [24] Takhteyev, Y., Gruzd, A., and Wellman, B. Geography of Twitter networks. *Social Networks* 34, 1 (Jan. 2012), 73–81.
- [25] Travers, J., and Milgram, S. An experimental study of the small world problem. *Sociometry* 32, 4 (Dec. 1969), 425–443.
- [26] Tufekci, Z., and Wilson, C. Social media and the decision to participate in political protest: Observations from tahrir square. *Journal of Communication* 62, 2 (2012), 363–379.
- [27] Ugander, J., Karrer, B., Backstrom, L., and Marlow, C. The anatomy of the facebook social graph. *CoRR* abs/1111.4503 (2011).
- [28] Volkovich, Y., Scellato, S., Laniado, D., Mascolo, C., and Kaltenbrunner, A. The length of bridge ties: Structural and geographic properties of online social interactions. In *ICWSM (2012)*, J.G. Breslin, N.B. Ellison, J.G. Shanahan, and Z. Tufekci, Eds., The AAAI Press.
- [29] Wang, S.S., Moon, S.-I., Kwon, K.H., Evans, C.A., and Stefanone, M.A. Face off: Implications of visual cues on initiating friendship on Facebook. *Computers in Human Behavior* 26, 2 (Mar. 2010), 226–234.
- [30] Wasserman, S., and Faust, K. *Social network analysis: Methods and applications*, vol. 8. Cambridge university press, 1994.
- [31] Weber, I., Garimella, V.R.K., and Batayneh, A. Secular vs. islamist polarization in Egypt on twitter. In *Proceedings of the 2013 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (New York, NY, USA, 2013)*, ASONAM'13, ACM, pp. 290–297.
- [32] WILSON, R. E., GOSLING, S. D., AND GRAHAM, L. T. A review of Facebook research in the social sciences. *Perspectives on Psychological Science* 7, 3 (May 2012), 203–220.

Социальные сети в социальных науках

Сергей Чернов

Стремительный рост социальных сетей придал дополнительный импульс исследованиям для ученых-информатиков в этой области. В то же время, мы наблюдаем, что владение алгоритмами и методами обработки информации не гарантирует максимального раскрытия научного потенциала данных из социальных сетей. Помимо этого, требуется инструментарий моделей и методов для понимания социальных взаимодействий, чтобы иметь возможность формулировать интересные вопросы к многообразию современных данных. В этот момент социальные науки могут помочь процессу исследования, предоставив необходимые инструменты и знания. В данном тьюториале мы представляем избранные исследования онлайн-социальных сетей, опубликованные в научных сообществах экономистов, социологов, психологов и политологов. Надеемся, что подобный междисциплинарный взгляд на исследования социальных сетей поможет сократить существующее разделение между экспертами в обработке информации и учеными из общественных наук.