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Behavior analysis in social networks: Challenges, technologies, and trends

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Editorial

Behavior analysis in social networks: Challenges, technologies, and trends

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The research on social networks has advanced significantly, which can be attributed to the prevalence of the online social websites and instant messaging systems as well as the popularity of mobile apps that support easy access to online social networks. These social networks are usually characterized by the complex network structures and rich contextual information. They now become the key platforms for, among others, content dissemination, professional networking, recommendation, alerting, and political campaigns. As online social network users perform activities on the social networks, they leave data traces of human behavior which allow the latter to be studied at scale. There are however a wide range of challenges in analyzing human behavior in social networks. Behavior analysis in online social networks spans a number of disciplines, across numerous fields in and beyond computer science. For example, one would have to involve social network analysis, an area in social science, to analyze social relationships, how they evolve and mature over time. The results of behavior analysis have important implications on community discovery, anomaly detection, and trend prediction, and they can enhance applications in multiple domains such as information retrieval, recommendation systems, and trust and security. Research in behavior analysis is a fertile ground also for businesses and IT industry, as they develop innovative ideas fostering the design of the new generation of social network platforms and their services.

This special issue is organized with the purpose of introducing novel research work on behavior analysis in social networks. Submissions have come from an open call for paper. With the assistance of professional referees, 27 papers are selected after at least two rounds of rigorous reviews. These papers cover widely topics related to behavior analysis in social network, including social network structure analysis, social topic analysis and behavior understanding, social user analysis, social recommendation, and social media analysis. We divide the whole special issue into the above five parts according to the themes of the papers.

The first part contains 5 papers that are related to social network structure analysis. In the first paper "Highly Efficient Epidemic Spreading Model Based LPA Threshold Community Detection Method", Deng et al. introduce an epidemic-spreading-based label propagation process for community detection. The second paper, "Multi-objective Community Detection Method by Integrating Users' behavior attributes", proposes a method that simultaneously accomplishes structure clustering of social network and attribute categorization for user behaviors. The third paper, "Uncovering Fuzzy Communities in Networks with Structural Similarity", proposes a fuzzy community detection method, which detects fuzzy community structures without any prior knowledge. In the fourth paper, "Identification of Influential Nodes in Social Networks with Community Structure based on Label Propagation", Zhao et al. propose a

method that identifies a set of influential nodes by exploring the community structure of social network. The fifth paper, “Discovering top-k Non-Redundant Clusterings in Attributed Graphs”, introduces a novel algorithm to discover the top-k non-redundant clustering solutions in attributed graphs, i.e., a ranking of clusterings that share the least amount of information, in the information theoretic perspective.

The second part contains 3 papers on social topic analysis and behavior understanding. In the first paper “Predicting the Popularity of Viral Topics Based on Time Series Forecasting”, Hu et al. demonstrate the high correlation of the short-term popularity of viral topics, and present a method to predict the short-term popularity of a given viral topic by using only data of historical popularity of the topic. The second paper, “Estimating Multilateral Trade Behaviors on the World Trade Web with limited information”, presents a novel approach to reconstructing the topological structure of directed weighted network for estimating multilateral trade behaviors. The third paper, “Protecting Private Geosocial Networks against Practical Hybrid Attacks with Heterogeneous Information”, addresses the problem of privacy preserving geosocial network data publishing and focuses on the anonymization to prevent identity disclosure.

In the third part of the special issue, we have 6 papers on social user analysis. The papers “Matching Entities across Online Social Networks” and “Identifying Users Across Social Networks Based on Dynamic Core Interests” both discuss user identification over multiple online social networks, one introduces a supervised learning method with features extracted from users’ profiles and the other introduces a dynamic core interests mapping method that jointly considers users’ social network structures and users’ generated content. The third paper, “FriendBurst: Ranking People Who Get Friends Fast in a Short Time”, investigates a problem of identifying the factors that are related to the burst of social users’ friends. It defines the friend increasing speed ranking problem in a semi-supervised framework, and then proposes a partially labeled ranking factor graph model to infer the ranking list of friends increasing speed of users. In the fourth paper, “TOSI: A Trust-Oriented Social Influence Evaluation Method in Contextual Social Networks”, Liu et al. propose a trust-oriented social influence evaluation method built on three social contexts, i.e., social trust, social relationship and preference similarity, between two participants to evaluate the social influence of each participant. In the fifth paper, “Identifying Social Influence in Complex Networks: A Novel Conductance Eigenvector Centrality Model”, Li et al. propose a conductance eigenvector centrality model to measure peer influence in the complex social network. The sixth paper, “PT-LDA: A Latent Variable Model to Predict Personality Traits of Social Network Users”, proposes a probabilistic topic model to predict the personality traits within the framework of Five Factor Model.

The fourth part of the special issue contains 6 papers on social recommendation. The first paper, “An Intelligent Movie Recommendation System through Group-level Sentiment Analysis in Microblogs”, introduces a movie recommendation approach that mines user preferences information embedded in microblogs for evaluating the similarity between online movies and TV episodes. The second paper, “Effective Successive POI Recommendation Inferred with Individual Behavior and Group”, introduces a point-of-interest recommendation method that combines the factors of successive behaviors, group preference, and spatial restriction. In the third paper, “Collaborative Filtering with Weighted Opinion Aspects”, Yang et al. propose a collaborative filtering method that incorporates both user opinions and preferences on different aspects. In the fourth paper, “SVM-TIA: A Shilling Attack Detection Method Based on SVM and Target Item Analysis in Recommender Systems”, Zhou et al. propose a method to detect shilling attacks based on SVM and target item analysis. The fifth paper, “Cluster-level Trust Prediction Based on Multi-modal Social Network”, introduces a trust prediction approach that incorporates user-item co-clustering method and the aggregation of multi-model similarity of users. The final paper of this part, entitled “Presenting New Collaborative Link Prediction Method for Activity

Recommendation in Facebook", introduces an approach that explores collaborative filtering methods for activity prediction and recommendation both for pairs of users without any interaction background and also for user pairs with the activity background.

The final and also the largest part contains 7 papers on social media analysis. The first two papers, "Sentiment Analysis for Chinese Microblog based on Deep Neural Networks with Convolutional Extension Features" and "Topic-Related Chinese Message Sentiment Analysis", discuss sentiment analysis, one introduces a novel deep learning approach and the other focuses on incorporating of topic information. The second two papers, "Multi-Label Maximum Entropy Model for Social Emotion Classification over Short Text" and "Detecting Influenza States based on Hybrid Model with Personal Emotional Factors from Social Networks", are related to social emotion. In the fifth paper, "On the Learning of Image Social Relevance from Heterogeneous Social Network", Zhu et al. propose to decompose the heterogeneous social network into several homogeneous networks, on which the global relevance between social entities can be learned efficiently using a random walk style approach. The sixth paper "Pornographic Image Detection Utilizing Deep Convolutional Neural Networks" introduces a pornographic image detection using a convolutional neural network. The seventh paper, "Dimensionality Reduction of Data Sequences for Human Activity Recognition", introduces a manifold elastic net that encodes the local geometry for finding an aligned coordinate system in data representation.

To conclude, the papers in this special issue cover different techniques related to social behavior analysis. We believe this special issue will benefit researchers and practitioners working in this area.

Acknowledgement

We thank the reviewers for their great efforts. Their professional evaluations and constructive comments are vital for securing the high quality of the special issue. Finally, we express our thanks to all the authors who have contributed to the special issue.