Behavior Informatics to Discover Behavior Insight for Active and Tailored Client Management

Longbing Cao
Advanced Analytics Institute, University of Technology Sydney, Australia
Longbing.Cao@gmail.com

ABSTRACT

Behavior is ubiquitous, and behavior intelligence and insight play an important role in data understanding and business problem-solving. *Behavior Informatics* [1, 2] emerges as an important tool for discovering behavior intelligence and behavior insight. As a computational concept, behavior captures the aspects of the demographics of behavioral subjects and objects; social relationships or norms governing the interactions between behaviors of an individual or a group; behavior sequences or networks and their dynamics; and the impact or effect generated by the behaviors undertaken by subjects on objects. Accordingly, a behavior model [2] captures the subject and the object of a behavior or behavior sequence, the activities conducted by its subject on objects, and the relationships between activities; behavior subject, object, activities and relationships are characterized by their respective attributes. As a result, a behavior is represented as a behavior attributes-based vector; and a subject's behaviors at a time period form a vector-based sequence, namely, represented as a behavior attribute vector-based matrix [3]. With such behavior modeling and from the informatics perspective, behavior informatics takes a top-down approach to systematically and deeply represent, model, reason about, and aggregate behaviors [4]; and a bottom-up approach to analyze and learn behavior occurrences, non-occurrences, dynamics, impact, and utility [2].

Accordingly, for a real-life problem, first, its data is converted to *behavioral data* according to the above behavior model, characterized by the relevant activities that form behavior sequences, and the properties of subjects, objects, activities, and relationships. Second, analytical tasks, such as behavior pattern analysis, abnormal behavior detection, coupled analysis of group behaviors, modeling of behavior impact and utility, discovery of high impact and high utility behaviors, analysis of non-occurring behaviors, and analysis of behavior evolution and dynamics, can be undertaken on such behavioral data. In this way, complex behaviors are quantifiable, computable [5], and manageable.

This talk introduces some of real-life applications of behavior informatics in core business, capital markets and government services. It involves complex individual and group behaviors in relevant business, the interactions between clients and service providers, and relevant behavior sequences and attributes. The examples demonstrate the personalized and early prediction, the prevention and intervention of abnormal behaviors, and the active and tailored management of suspicious clients. Examples include the detection of pool manipulation through analyzing coupled sequences [3] of trading behaviors from multiple associated accounts in stock markets, the intervention of high-impact [6] behaviors in social security for preventing overpayments, the quantification and identification of high-utility [7] behaviors, the identification of and tailored intervention on self-finalizing versus non-self-finalizing taxpaying behaviors [8, 9], and even the impact of non-occurring behaviors [10] in debt recovery and prevention. The real-life case studies show the value and potential of behavior informatics for handling complex and challenging risk management, fraud and non-compliance, and for active and tailored client management in business problems. The examples are associated with highly significant economic benefits and social impact as a result of applying the resultant behavior insight and behavior intelligence[1].

CCS CONCEPTS

• **Information systems applications** → Data Mining; •
Modeling and simulation → Simulation types and techniques

KEYWORDS

Behavior informatics, behavior computing, behavior intelligence, behavior insight, behavior modeling, user modeling, coupled behavior analysis, non-occurring behavior

REFERENCES

[1] Longbing Cao, et al. Behavior Informatics: A New Perspective. IEEE Intelligent Systems, 29(4): 62-80, 2014.

[2] Longbing Cao, In-depth Behavior Understanding and Use: the Behavior Informatics Approach, Information Science, 180(17); 3067-3085, 2010.

[3] Longbing Cao, Yuming Ou, Philip S Yu. Coupled Behavior Analysis with Applications, IEEE Trans. on Knowledge and Data Engineering, 24(8): 1378-1392, 2012.

[4] Can Wang, Longbing Cao, Chi-Hung Chi. Formalization and Verification of Group Behavior Interactions. IEEE T. Systems, Man, and Cybernetics: Systems 45(8): 1109-1124, 2015.

[5] Longbing Cao, Philip S Yu (Eds). Behavior Computing: Modeling, Analysis, Mining and Decision, Springer, 2012.

[6] Longbing Cao. Zhao Y., Zhang, C. Mining Impact-Targeted Activity Patterns in Imbalanced Data, IEEE Trans. on Knowledge and Data Engineering, 20(8): 1053-1066, 2008.

[7] Junfu Yin, Zhigang Zheng, Longbing Cao. USpan: An Efficient Algorithm for Mining High Utility Sequential Patterns, KDD 2012, 660-668.

[8] Zhigang Zheng, Wei Wei, Chunming Liu, Wei Cao, Longbing Cao, Maninder Bhatia. An effective contrast sequential pattern mining approach to taxpayer behavior analysis, World Wide Web 19(4): 633-651, 2016.

[9] Australian Taxation Office. Commissioner of Taxation Annual Report 2012-2013.

[10] Longbing Cao, Philip S. Yu, Vipin Kumar. Nonoccurring Behavior Analytics: A New Area. IEEE Intelligent Systems 30(6): 4-11, 2015.

[11] Yanchang Zhao, Huaifeng Zhang, Longbing Cao, Chengqi Zhang and Hans Bohlscheid. Mining Both Positive and Negative Impact-Oriented Sequential Rules From Transactional Data, PAKDD2009, pp.656-663.