

# Preface

The task of collective view prediction is to reason about the opinion of an individual to an item by calculating his or her relevant online community's attitudes. More than 20 years' explorations in this field have made progress in developing precise and robust models and related algorithms for predicting collective view in online community. The researchers also learned the current methods' advantage and understood their limitations. Our research presents a new perspective and ideas to address the low performance and robustness in collective view prediction tasks. The applications of the models, methods, and algorithms in this book will be promising and valuable for improving the quality of online information recommendation services, targeting advertisement delivery, word-of-mouth analysis and so on.

Investigating related theory and engineering practice can help us understand the pros and cons of conventional methods in completing the group opinion prediction task. Recommendation methods and sentiment analysis are closely related to the task. Collaborative filtering is such a typical approach. The advantage of this method can generate personalized predictions without additional text analysis. Those approaches have become mainstream models and methods for collective view prediction in recent years. Early study indicated that the feasibility of collaborative filtering is solely based on the reliability of information resources. However, in the real application environment, things are getting complicated. The misconduct behaviors in rating could decrease the information reliability. Those activities could make the prediction invalid and unreliable. To improve the prediction accuracy and reduce the impact of noise data, the theme of this book is to review the previous related theoretical foundation and propose a trust-based collective view prediction model and relevant algorithms. Our study shows that effective model for collective view prediction is attributed to users' trust relationships network.

Asking appropriate research questions could motivate us to pursue the right direction and address hard problems in the right way. From the theoretical perspective, this book re-examines the trust definition and quantitatively analyze the relationship between user's similarity and their trust network leads us to the right solutions. From algorithm design perspective, one of the key questions is what kinds of trust metrics strategies would impact the collective view prediction

accuracy. From the evaluation perspective, we establish a framework for assessing the model's robustness and to formally describe the attacks aimed at trust-based prediction algorithms.

This book studies on the linear correlation of trust and similarity, and the influence of spread distance to the correlation. To explore the trust network, we collect more than 300,000 users' data from the popular review websites. The study results indicate that users' similarity on opinions is positively correlated to their distance in trust network and negatively correlated to their trust value. We conclude two basic rules that are important to designing effective and efficient collective view prediction algorithms. In order to analyze how different trust metrics influence the prediction accuracy, we further elaborate on two well-known trust metrics, and based on the new metrics we design new collective view prediction algorithms. To further improve the accuracy of the trust-based prediction algorithms, we propose a Bayesian fusion model for combining trust and similarity. Moreover, a second-order Markov random walk model is proposed to alleviate the sparse data problem in similarity measurement. These new approaches are more accurate than the classical collaborative filtering algorithms in our experimental evaluations.

Trust-based collective view prediction demonstrates more capability to resist attacks over the traditional techniques. But there were few quantitative analysis of this issue in previous studies. We build a robustness analysis framework to measure the capability of trust-based prediction algorithms to resist attacks. Simulation results using this framework reveal the key factors which impact the robustness of trust-based algorithms, and confirm that the honest users' feedbacks can help algorithm recover from attacks. We also give two strategies to improve the algorithm robustness in real applications.

**Keywords** Collective view • Trust metrics • Trust network • Social network • Sentimental analysis • Recommendation • Collaborative filtering



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