



Título: CONSENSUS EVOLUTION NETWORKS AND ADJUSTMENT COST FOR GROUP DECISION MAKING: LARGE SCALE, TRUST SOCIAL NETWORKS AND GROUP RECOMMENDATION APPROACHES

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Resumen: Social commerce group recommendation (SCGR) is a recommended strategy based on users' social relationships [LWL13]. Social media breaks the limitations of interpersonal interaction such as space, distance, and time, making the community scale larger, which makes SCGR has the characteristics of a large-scale. SCGR also needs to consider the group's preference and give the recommendation item with high overall satisfaction. Hence, SCGR is essentially a large-scale group decision-making (LSGDM) problem [ZLHF19]. LSGDM is a new decision-making method based on traditional group decision making (GDM) to meet decision-making needs in the age of social media and big data [TL19]. In the process of LSGDM, there are many complex factors related to group behavior, such as communication, conflict, and collaboration among group members. Besides, different decision-making members differ in cultural and knowledge background, cognitive ability, information expression form and judgment level, etc., which leads to the high complexity and uncertainty of LSGDM [DPW+20]. LSGDM is becoming a new research hotspot in the field of decision-making due to the traditional GDM models are gradually unable to deal with it [Pal18].

This thesis starts from traditional GDM, takes SCGR as the research object, and makes social network analysis a tool to focus on clustering analysis, CRP, and other issues in LSGDM considering user behavior. Specifically, we mainly focus on the discussions about the following four aspects.



(1) To explore group consensus's composition and evolution, we introduce a new tool, consensus evolution networks (CENs). The CENs study CRP based on social network analysis techniques. We define CENs, determine the suitable agreed consensus thresholds based on the sensitive consensus threshold, introduce a new consensus index, and design a pairwise feedback adjustment method for improving consensus.

(2) To explore the effects of trust on the CRP of SNGDM, we mainly focus on the following two aspects. (a) We propose several minimum cost consensus models based on the implicit trust, which is obtained from opinions similarity. In this study, the moderator is regarded as a trustworthy coordinator to persuade individuals to reach a consensus he/she expects to pay the lowest cost. The implicit trust of individuals to the moderator is computed based on opinions similarity. Two minimum cost consensus models and the dual models are proposed based on implicit trust. (b) We explore group consensus based on multiplex network structures. Firstly, we construct the trust consensus evolution multiplex network combining trust relationships and consensus relations. The consensus and trust evolution is both investigated during the consensus adjustment. We then compute experts' influence based on their comprehensive importance in the layer of trust networks and CENs using PageRank centrality. Furthermore, we explore consensus evolution under both the positive and negative effects of trust based on experts' influence. Finally, we consider the development of trust relationships based on the negotiation between experts.

(3) To study the CRP in LSGDM, we balance the clustering analysis and CRP and consider the influence of clustering factors on CRP. (a) Firstly, we design a dynamic clustering analysis process based on CENs with different consensus thresholds based on community detection method. We then evaluate the clustering validity based on intra-cluster and inter-cluster consensus levels. Finally, we give a feedback adjustment algorithm based on the clustering analysis. This study balances the dynamic clustering and CRP based on CENs with higher consensus thresholds. (b) Firstly, we regard the preference information and adjustment cost as dual attributes of the clustering analysis. The former plays a significant role, and the latter represents a supporting role. We then compute the distance between individuals based on the dual attributes. The adjustment cost is attached to the clustering analysis with a parameter, which is determined by balancing the conflict between the intra-cluster total adjustment costs and intra-cluster consensus levels. Based on this parameter, we also define the initial clustering centers combining the consensus levels and adjustment cost.

(4) To deal with the large-scale characteristics of SCGR, we propose an LSGDM model based on the OWA operator considering users behavior and provide a corresponding SCGR model for an online shopping platform. Firstly, we compute the distance between users based on the weighted OWA operator to deal with the evaluation information's data sparsity. Then, we utilize the Louvain method, which considers the prior community partition with the concept of modularity, to find users with similar shopping preferences and behaviors. Moreover, we discuss the polarization effects to obtain collective preferences of clusters and manage minority opinions with the importance induced OWA operator. An LSGDM method is proposed based on the above techniques. Finally, we develop an SCGR model based on the LSGDM method and illustrate its effectiveness in Dianping.com.

This thesis mainly consists of two parts: the first one illustrates the existing problems, the basic concepts, and models, and the results obtained from the proposed models. The second part is a compilation of the main publications that are associated with this thesis.

The rest of the thesis is organized as follows: Section 2 introduces some related preliminaries. Section 3 justifies the development of the thesis through discussing the basic ideas and challenges of current researches. Section 4 presents the objectives of the thesis. Section 5 introduces the methodologies used in the thesis. Section 6



discusses the results of the proposals in the thesis. Section 7 presents a discussion of the results obtained in the thesis. Section 8 gives conclusions of the thesis. Finally, some future works are discussed in Section 9.