Trust networks in recommender systems

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Trust is not only essential in our daily lives, its importance in virtual networks should not be underestimated either. For example, we only use information found on the web when we trust the source, and we do not give our credit card details on sites we distrust. With the advent of the semantic web [2], intelligent web agents will be taking over more and more human tasks. Therefore, there is a growing need for computational models that can imitate the human notions of trust and distrust.

Efficient trust models already play an important role in many intelligent web applications, e.g. question answering systems [9], P2P networks [7] and recommender systems [8]. Recent publications [5] also show an emerging interest in modeling the notion of distrust, but models that take into account both trust and distrust are still scarce [3, 4, 6].

A trust network is a network in which the agents are connected by trust scores. Typically these networks are sparse. A fundamental problem in such networks is the determination of the scores of the agent pairs for which we did not receive an explicit score, i.e. propagation and aggregation of trust. The problem of trust propagation can informally be described as: if the trust value of agent a in agent b is p, and the trust value of b in agent c is q, what information can be derived about the trust value of a in c? Aggregation operators are needed to combine the trust values received from different trusted third parties (several propagation chains).

Most of the existing approaches only take into account trust, and cannot distinguish between complete distrust (trust=0, distrust=1) and ignorance (trust=distrust=0). Besides, they deal with trust in a binary way: they assume that an agent is to be trusted or not and calculate the probability or belief that the agent can be trusted. But in reality, people often say 'I trust this person very much' or 'I rather distrust this person'. So there also is a need for representing partial trust.

Therefore, we propose a model that represents both trust and distrust, as a matter of degree. To this aim, we draw (trust,distrust) couples from a bilattice-based square L^2 [1], where L is a complete bilattice. This representation allows to model partial validity as well as partial knowledge. In particular, this approach is powerful enough to model ignorance (no trust, but also no distrust) and inconsistency (trust and distrust at the same time).

A trust model can play an important role in recommender systems; we will show how a trust network among the users of such systems can improve the quality and the amount of the delivered recommendations. We will discuss the benefits of the bilattice approach and the new problems that arise when modeling distrust in addition to trust. More specifically, we will talk about the requisites for the new propagation and aggregation operators for (trust,distrust) couples and present some concrete examples.

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