

# The Effect of Behavior Change on Honesty Checking in Peer-to-Peer Systems

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## Abstract

*You have to write at maximum 3 pages stating the research topic that you want to explore. This assignment is done in groups of two. Write a concise and clear introduction followed by a problem statement section that clearly explains the problem under investigation. Here is an example for your reference. Good Luck.*

## 1 Introduction

Being part in a *peer-to-peer* (P2) system, a peer has the privilege of using pools of resources or services that would not be available to it otherwise. Unfortunately, the idea of having a virtual network framework is not attractive because of the risk associated with the notion of “sharing” resources or services [4, 6, 7, 8]. Because of the sensitivity and the vitality of data or information, such peers prefer to use their own “closed box” resources. This is not just costly and inefficient way to utilize resources, but also negates the advantages of P2P systems. As such, one of the fundamental challenges in the open and decentralized P2P environments is the ability to mitigate the risk of transacting with untrustworthy peers [4].

Many researchers have proposed reputation systems [1, 3, 4, 10] to assess the trustworthiness of a peer based on recommendations obtained from other peers. Recommenders play a vital role in the success of any reputation system because based on their recommendations, a derived reputation score will be computed and used to decide whether a transaction should take place. A false recommendation can result in committing a transaction with untrustworthy peers or avoiding a transaction with trustworthy peers. Recommenders with different motivations and malicious intentions can cause harm in such systems. Therefore, mechanisms to filter out undesirable recommenders are fundamental and are an integral part of the success of any online reputation-based community [2, 10]. Recommender filtering schemes are widely used in the literature [5, 14, 7, 11, 4] to minimize the effect of the undesirable recommenders in polluting the recommendation network.

Hence, the objective of a reputation system is to have recommenders that positively contribute to the computed reputation score. A positive contribution helps narrowing the gap between the derived reputation score and the actual trustworthiness of the peer in question. To positively contribute, a recommender should be willing, active, and honest. Unwilling recommenders will not reply nor forward a recommendation request. Contacting unwilling recommenders will not contribute at all to the derived reputation score but it will result in an inefficient bandwidth utilization. Incentive mechanisms are introduced to promote and encourage recommenders to participate in the recommendation network [9, 13]. Non-active recommenders will provide stale recommendation or a recommendation based on few transactions with target peer. Many researchers have investigated recommender activeness by considering the number of transactions, their values, and when these transactions were performed [12, 15].

Honesty checking has been also investigated by various researchers [5, 14, 7, 11, 4] but none has linked the behavior change of the peer in question to the honesty of recommenders. The primary goal of this paper is to shed light on the importance of this issue and its effect on recommenders’ honesty. To the best of our knowledge, no existing literature tackles this issue, which we believe it is a vital dimension that should be considered when performing honesty checking.

Throughout this paper, we refer to the peer that wants to assess a reputation as a *source peer* and the peer whose reputation is assessed as a *target peer*.

## 2 Honesty Checking

Relying on recommenders to estimate the reputation of the target peer, the source peer might be misinformed and form the wrong perception about the target peer. This is due to dishonest recommenders that try to pollute the environment by intentionally giving bogus reputation reports. Ideally, dishonest recommenders should be prevented from contributing to the target peer reputation. Measuring honesty is a difficult task because in order for a source peer to determine the honesty of a recommender, the source peer needs to know what the recommender believes in. Since, this is impossible in P2P systems, most of the existing honesty checking algorithms [11, 7, 14, 5] use the consistency of the recommendation with an expected value in measuring honesty. In these honesty checking schemes, a recommender is marked as dishonest if it provides a recommendation that contradicts the expected value.

In other words, existing honesty checking algorithms assume that if a recommendation is not in line with the expected value, then the recommender is the one to blame. On the contrary, the recommender might be honest and is reporting a behavior change of the target peer, while the expected value is reporting the old behavior of the target peer. Therefore, if there is an oscillating target peer that changes its behavior from trustworthy to untrustworthy, or vice versa, then such oscillating target peer will affect the recommenders' honesty.

A behavior change may be due to the target peer's attempt to gain profit by building up its reputation and using it to perform untrustworthy transactions without being noticed. On the other hand, a behavior change can happen if a trustworthy peer is compromised by an untrustworthy peer and used to launch attacks.

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