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# Trust based stock recommendation system - a social network analysis approach

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**Abstract**

We propose a novel system to recommend the leading investment option in stocks utilizing a methodology based on the transactions of trusted mutual funds and their corresponding stock holding portfolio. The network formed by the stock holding portfolio is the mutual funds are analysed by the tools of social network analysis. The analysis of the method using the Indian mutual funds data qualifying CRISIL-1 rating shows that it can effectively be used as a reliable portfolio recommendation system for non-professional investors looking for stock investment guidance and reveals the similarity between investment pattern of various Indian mutual funds.


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*Keywords:* Social network analysis, Decision support system, Portfolio recommendation system, Mutual Funds, Trust based recommendation

## 1. Introduction

Stock market investment is an area that has been gaining long-term traction and attention by financial institutions, individuals and multiple research communities. Judging a favourable investment decision on the plethora of available stocks in the market is a tiresome and challenging task. There is considerable amount of uncertainty about the nature of returns and hence poses difficulty in the decision-making process associated with selection of securities. There is a need to strike the right balance between expected return (maximize) and associated risk (minimize)[1]. There are multiple analytical methodologies employed for decision making in stock exchanges, which could be broadly categorised into two groups viz. Technical analysis and Fundamental analysis[2]. Fuzzy expert systems as well as artificial neural networks were employed to analyse the stock market and measure the attractiveness measure of the participating companies[2]. Luo et al.[3] have designed a decision support system for projecting buying or selling decisions utilising principles of fundamental analysis together with consideirng technical indicators. Primarily these systems were developed for novice investors to aid in making subjective judgements regarding stock selection as per their individual

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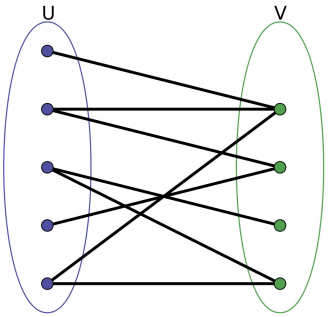


Fig. 1. Bi-Partite Graph representation mutual fund portfolio network

requirement. The opinion of an expert is derived out of his experience gained by analysing stock features over a period of time. The two key components of credibility of a recommendation identified the majority of researchers are trustworthiness and expertise in order to counter the uncertainty a fuzzy expert system was proposed by Fasanghari etal.[4]. Another way of getting insight into what investors and traders thinking about a particular stock is carry out a *sentiment analysis* of Twitter data (tweets) of investors. Investors also connect with one another to discuss, trade, invest, learn and share knowledge across the network. The analysis of the investors network thus formed could provide insight into the wisdom of the crowds to help one make smarter investment decisions. However in such networks the trust between individuals can not be fully depended and the relationships could be falsely built. If one knows that his tweets are followed then he can put fake tweets and false information to influence our investment decision, which is considered as the main problem of social network analysis. Discovering trust in relationships among entities of a social network which leads to a trust-based social network is a promising solution to this problem. This can be further improved by incorporating an expert opinion as the trusted expert advice will lead to better results. Attempts have been made to develop social network of financial experts based on their publicly listed portfolios for further analysis to recommend an appropriate portfolio to a novice investor[5]. However classifying the type of knowledge that different experts have is a challenging problem. Apart from this the type of knowledge, particularly tacit knowledge gained through experience and learning over time is hard to be coded and also people are not often aware of the knowledge they possess or its value for others. All these make the task of finding trustworthy experts for an investment decision more complicated and challenging. With the objective of developing a trust based investment relationship, we propose a social network approach making use of Mutual Fund Investment Portfolio. It is generally believed that pursuing an investment decision of a trustworthy mutual fund is less risky than seeking advice from an individual expert. We can also examine the credibility of investment behaviour and stock holding patterns of the mutual fund in real time and a stock recommendation system, namely, *trust based stock recommendation system,* showing the leading stocks appropriate for investment can be designed. Such system can also show the investment price range by analysing the mutual fund transaction in the stock market reducing the overall risk and increasing the profitability . In order to demonstrate the acceptability and reliability of the proposed methodology, we have carried out an detailed analysis of this model on CRISIL-1 rated Indian Mutual Funds. The results of this analysis strongly support the validity of the proposed portfolio recommendation model.

## 2. Stock portfolio recommendation system

Generally a recommendation system suggests personalized choices from a large set of possible options with the objective of reducing complexity decision making[6]. The last decade has witnessed the emergence of lots of e-commerce portals offering such services to their users. Generally a recommendation system works on information filtering technique and provides information which is of the interest of the concerned user. Typically, a recommendation engine, which employs a set of algorithms, compares the user's profile