International Journal of Information & Computation Technology.
ISSN 0974-2239 Volume 3, Number 2 (2013), pp. 49-54

http://www. irphouse.com

An Intelligent Agent Based Framework for an Efficient Portfolio Management Using Stock Clustering

Preeti N. Baser[1] and Dr. Jatinderkumar R. Saini[2]

[1]Preeti N. Baser, Assistant Professor, SJPIBMCA,
Gandhinagar, Gujarat, India – 382 007
Research Scholar, R. K. University, Rajkot
Email :priti_dalal007@yahoo.com
[2]Dr. Jatinderkumar R. Saini, Director (I/C) & Associate Professor,
Narmada College of Computer Application, Bharuch, Gujarat, India – 392 011.
Research Guide, R. K. University, Rajkot
Email :saini_expert@yahoo.com

ABSTRACT

Clustering is a process of assigning data sets into different groups so that, data sets in same group having similar behavior as compared to data sets in other groups. The main objective of cluster analysis is to minimize intra-group similarity and maximize inter-group dissimilarity. This research work proposes agent based framework for portfolio management using stock clustering. The clustering agents help in detecting the clusters automatically from stock market data. It also assists in viewing the mining results. An agent based framework is proposed by considering investors during mining process for achieving better decision investment in stock market. Investor can invest money in different securities instead of investing in single security so that he/she can get maximum return and minimum risk. This research work focuses on how the stock clustering is useful for generating efficient portfolio by the means of using agents.

Keywords: Agent based framework for stock clustering, Data Mining, Portfolio Management

INTRODUCTION

Data Mining is the process of automatically discovering knowledge from large databases which is used for further decision making process. It is the process of

analyzing the observational data sets to find unsuspected relationships and to summarize the data in novel ways those are both understandable and useful to the data user called as data mining. It is the achievement of relevant knowledge that can allow you to make strategic decisions which will allow you to proceed further. The large variety of DM techniques which have been developed over past decades includes similarity search, cluster analysis, classification, and mining of association rules. Clustering is one of the important data mining tasks. We can minimize further data mining task using clustering by selecting most compact cluster instead of applying task for entire data. Portfolio management is an important application in which clustering is used. An investor considering investment in securities is faced with the problem of choosing from among a large number of securities. His choice is depends upon the risk-return characteristics of individual securities. He would attempt to choose the most desirable securities and like to allocate his funds over this group of securities. Again, he is faced with the problem of deciding which securities to hold and how much to invest in each. The investor faces an infinite number of possible portfolio or group of securities. The risk return characteristics of portfolios differ from those of individual securities combining to form a portfolio. The investor tries to choose the optimal portfolio taking into consideration the risk and return characteristics of all possible portfolios. However, a single data-mining technique has not been proven appropriate for every domain and data set. A system which performs the process autonomously needs more user interaction by way of selecting the appropriate data mining techniques and appropriate attributes. An agent based data mining, minimizes this problem by selecting the attributes based on the user specified objective. It also chooses appropriate data mining technique for knowledge extraction [1]. The level of automation incorporated in this mining system is an important issue. Detecting the interesting patterns and finding out the appropriate knowledge is also an interesting issue in data mining. This research work addresses this issue with the help of agents [2]. The agents help in detecting the clusters automatically from stock market data. It also assists in viewing the mining results. An agent based framework is proposed by considering investors during mining process for better understanding, making better decision and better finding new patters in case of selecting suitable clustering techniques for better investment in stock market. Investor can invest money in different securities instead of investing in single security so that he/she can get maximum return and minimum risk. This research work focuses on how the stock clustering is useful for generating efficient portfolio by using agents.

REVIEW OF LITERATURE

The authors in [3] states that, the agent based studies can be implemented for clustering, classification, and summarization. Some of the reasons where agents are more flexibility, modularity and general applicability to a wide range of problems.

In [4] authors proposed framework to find best clustering algorithm using multiple agents. In this system, multiple agents may interact with each other to support generic data mining. This work borrows some ideas featured in this system.

In [5] EMADS (Extensible multi-agent data mining framework) evaluated using two data mining scenarios: Association Rule Mining (ARM) and Classification.

EMADS can find the best classifier providing the highest accuracy with respect to UCI machine learning data set. The work described here borrows some of the ideas featured in EMADS.

Authors in [6] proposed new algorithm to detect Outlier. Clustering algorithms PAM, CLARA AND CLARANS and ECLARANS is proposed for detecting outliers. They have focused on outlier detection in health data sets such as Pima Indians Diabetes data set and Breast Cancer Wisconsin data set using partitioning clustering algorithms. In order to find the best clustering algorithm for outlier detection several performance measures are used. The experimental results concluded that the outlier detection accuracy was very good in the proposed ECLARANS clustering algorithm compared to the existing algorithms.

In [7] authors classified stocks into clusters based on stock return and valuation ratio as an investment criterion. They collected stock data at different times from Bombay Stock Exchange for year 2007-2008. They have used K-Means, Fuzzy C-Means and SOM(self-organizing map) for clustering. K-Means algorithm generated most compact clusters as compared to fuzzy C-Means and SOM. Then stocks selected from given clusters to build portfolio that minimize risk and maximize the return.

Authors in [8] discussed about various types of clusters techniques and measured good clustering algorithm based on different criteria like Scalability, Analyze mixture of attribute type, Find arbitrary-shaped clusters, Minimum requirements for input parameters, Handling of noise, Sensitivity to order of input records, High dimensionality of data, Interoperability and usability

A FRAMEWORK FOR PORTFOLIO MANAGEMENT USING CLUSTERING

An approach which performs the process autonomously that needs more user interaction by way of selecting the appropriate user specifies objectives are the primary goal of this research [9][10]. The system will also choose the most compact cluster for knowledge extraction and also for better understanding. Thus, level of automation will be incorporated in this system is an important issue. The system will perform the process based on user interface agent, clustering agent, data agent, ranking agent, validation agent and portfolio manager. User interface agent will be used to provide a general description of the problem at hand in terms of high level goals and objectives, or provide specific details about the data analysis or mining task to be performed. Clustering agents will be used in this system to perform different clustering techniques by using selecting appropriate clustering algorithm. Clustering technique will be used to find new patterns in the proposed research [11]. Various clustering techniques such as Fuzzy C-Means, DBSCAN, K-means can be used to perform cluster analysis [12]. The automated system will choose appropriate one technique based upon the data types, size of the data. Attribute selection (prioritization, ranking) techniques will be used to select the appropriate attributed to complete the mining process by means of agent. Sometimes, it may happen more than one algorithm can be suitable for selected attribute then these algorithms will be executed and result will be sent to validation agent. The validation

agents will analyze the quality of cluster among the clusters produced by different clustering agents. Finally validation agent will select most compact cluster for portfolio construction. From these aspects, a framework will be developed to analyze the cluster, detect the cluster and portfolio management by means of automated system and an agent technology.

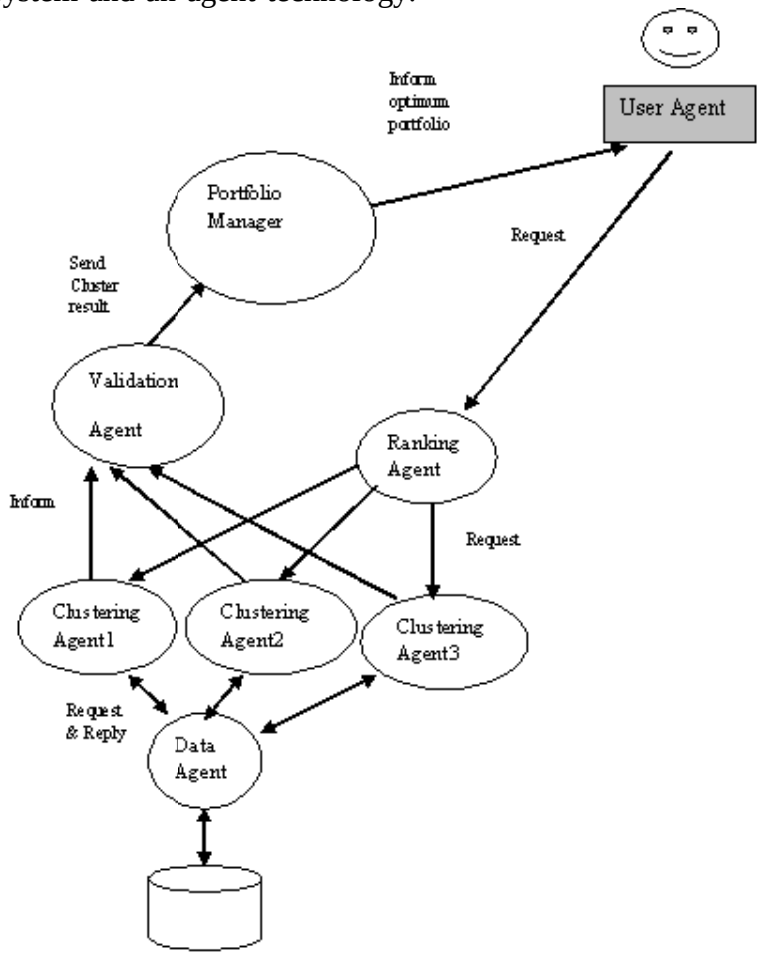

Figure 1 An agent based framework for portfolio management using clustering

METHODOLOGY

This research needs necessary procedures that will interact with the user agent and accept high level goals, rank the attribute and highest ranked attribute is selected for data mining task, collect relevant data from database, selection of appropriate clustering techniques, cluster detection, portfolio management and portfolio evaluation.

User Interface Agent

The user interface agent interacts with the user in assisting him / her to perform data analysis and mining activities [13][14][15]. Investors will provide a general description of the problem at hand in terms of high level goals like investment

objectives relate to what the investor (user) wants to accomplish with the portfolio. Objectives are mainly concerned with risk and return consideration.

Ranking Agent
Once the user goal is identified, the ranking agent will help in ranking the attributes. Ranking is done by number of factors such as query weight, memory space, properties of the attribute type and similarity between the objects [16]. The highest ranked attributes are taken for clustering.

Data Agent
Once ranking is done on attribute, data agent will collect relevant data.

Clustering Agent
The clustering agent will implement specific algorithms. Thus, the clustering agent will be responsible for performing the cluster formulation and generating the results. Cluster formation is defined as grouping of objects that are similar to one another within the same cluster and are dissimilar to the objects with other clusters. Various clustering approach can be considered to cluster different types of attributes, numeric and categorical data. Clustering are also done depends upon data set, data size, and data types. The clustering agent will choose the appropriate clustering algorithm for better cluster formations.

Validation Agent
The validation agent is responsible for selecting most compact cluster results. It is used here to analyze the formulated clusters quality based on quality parameters. Generally, clustering algorithms will produce clusters, based upon input data. But, all clusters are not good cluster. This agent will select most compact cluster for building an efficient portfolio.

Portfolio manager
Portfolio manager is responsible for many activities aimed at optimizing the investment of one's funds. This includes security analysis, portfolio analysis, portfolio selection, portfolio revision and portfolio evaluation.

CONCLUSION

Automated data mining is an emerging concept in data processing. In this research work, entire mining process is carried out by different intelligent agents with the help of automated system based investor's objective. The major goal is to satisfy investor's attention and interest.

This research work mainly focused on framework for mining process from which the suitable mining techniques are analyzed based on the data set and attribute nature. Clusters are formulated and also a detection technique is used to analyze the quality of the cluster with respect to database selected by the user. Thus, intelligent agent identifies whether new cluster is of good quality or not.

REFERENCES

[1] E. Mangina, 2005, " Intelligent Agent-Based Monitoring Platform for Applications in Engineering", International Journal of Computer Science & applications 2(1), pp. 38-48.

[2] D. Gilbert, 1997, "Intelligent Agents: The Right Information at the Right Time" IBM Corporation, Research Triangle Park, NC USA.

[3] A. Seydim, 1999, "Intelligent Agents: A Data Mining Perspective" Southern Methodist University, Dallas.

[4] S. Chaimontree, K. Atkinson, and F. Coenen, 2010, "Multi-agent based Clustering: Towards Generic Multi-Agent Data Mining", 10th Industrial Conference, ICDM 2010 Berlin, Germany pp. 115-127.

[5] K. Albashiri, F. Coenen, and P. Leng, 2009, " EMADS:AN EXTENDIBLE MULTI-AGENT DATA MINER". Knowledge- Based Systems 22(7), pp. 523-528

[6] S.Vijayarani, S.Nithya, 2011, "An Efficient Clustering Algorithm for Outlier Detection" International Journal of Computer Applications 32(7) pp. 0975 – 8887.

[7] S.R. Nanda, B. Mahanty, M k Tiwari, 2010 "Clustering Indian Stock Market Data for Porfolio Management", Expert System with Applications 37 pp. 8793-8798

[8] P. Rai, S. Singh, 2010, "A Survey of Clustering Techniques", International Journal of Computer Applications 7(12) pp. 0975 – 8887.

[9] V. Saravanan, K. Vivekanandan, 2004, "Design and Implementation of Automated Data Mining Using Intelligent Agents in Object Oriented Databases", Intelligent Information Processing, pp. 221- 226.

[10] Sunderesh S. Heragu, Robert J. Graves, Byung-In Kim and Art St. Onge, 2002, " Intelligent Agen tBased Framework for Manufacturing Systems Control", IEEE Transactions on Systems, Man and Cypernetics – Part A : Systems and Humans, 32(5).

[11] R. Tagliaferri, A. Bertoni, G. Miele, "A Review on Clustering and Visualization Methodologies for Genomic Data Analysis",

[12] R. Xu, D. Wunsch II, 2005, "Survey of Clustering Algorithms", IEEE Transactions on Neural Networks, 16(3), pp. 645-678.

[13] E. Ogston, B. Overinder, M. Steen, and F. Brazier, 2003, "A Method for Decentralized Clustering in Large Multi-Agent Systems ", AAMAS'03, ACM 2003.

[14] I. Tudor, L. Ionita, 2009, "Intelligent Agents as Data Mining Techniques used in Academic Environment", The 4th International Conference on Virtual Learning ICVL, pp 380 – 384.

[15] M. Ingram, H. Kremer, and N. Rowe, 2003, "Distributed Intrusion Detection for Computer Systems Using Communicating Agents".

[16] P. Porras, and R. Kemmerer, 1992, "Penetration State Transition Analysis: A Rule-Based Intrusion Detection Approach, " Proceedings of the Eighth Annual Computer Security Applications Conference.