|| Volume 3 || Issue 8 || August 2018 || ISSN (Online) 2456-0774
INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCH
AND ENGINEERING TRENDS

An Approach for Generating Utility Pattern by Reducing Search Space

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Abstract—**This paper offers the effective formula for the utility pattern mining by reducing search areas. High utility item sets Mining is upgrades or next edition of the quality frequent item set mining framework because it have subjectively outlined utility rather than statistics-based support activity. User-defined utility is predicated on data not out there within the dealings data set. The goal of high utility item set mining is to seek out all item sets that offer utility larger or capable the user given threshold. It often reflects user preference and might be portrayed by associate external utility table or utility perform. The defect of this approach is that it doesn't think about the applied mathematics facet or facet of item sets. A utility-based measure is incorporating user-defined utility in addition as a raw applied mathematics facet of information. So, it's substantive to outline a specialized sort of high utility item sets and utility-frequent item sets that area unit nothing however a set of the high utility item sets in addition because the frequent item set.**

Keyword - *Data Mining, MEU, Two Phase Algorithm, Utility Mining*

I INTRODUCTION

Data mining is that the principle of sorting meaningful knowledge or needed knowledge from giant amounts info and choosing out the relevant information. it's in the main employed by business intelligence organizations and in money analysis, however it's currently a day's oftentimes employed in the sciences to extract data from the terribly great amount of knowledge sets generated by fashionable experiments and observation strategies followed by someone. it's been represented as the nontrivial extraction of antecedent unknown, implicit, and probably terribly helpful data from the knowledge—the info—the data and the science of extract-ING helpful information from giant data sets or databases the term referred to as data mining is typically employed in regard to analysis of knowledge, like in AI, it's associate degree omen term with variable meanings during a big selection of various field and contexts. Data processing is taken into account together of the sub field within the technology field of information discovery. data processing is closely associated with the sector of applied statistics and its sub fields descriptive statistics and inferential statistics The term data processing is often accustomed apply to the 2 separate processes of prediction and data discovery. Data discovery provides apparent data that includes a clear type and volume and it will understand by a user United Nations agency is reading it. Foretelling i.e. prophetic modelling provides predictions of future events and should be clear and read-able in some approach like rule based mostly systems and not clear or opaque in others like neural networks.

Further, some data processing systems like neural networks square measure inherently back-geared towards pattern recognition and prediction, instead of data discovery data processing is most often used for client Relationship Management applications these applications will contribute considerably additional within the bottom line. More subtle strategies could also be accustomed optimize across campaigns in order that we will predict that channel and which provide a personal is possibly to retort to - across all potential offers. Instead of contacting a chance or client through a call center or causation mail, solely prospects that square measure expected to own a high chance of responding to a suggestion square measure contacted. In past years there square measure many strategies and algorithms are developed for utility mining. The efficiency is often an element that has been thought-about for future improvement of the prevailing algorithmic rule. The utility of associate degree item will be associate degree number worth, such as the amount sold-out, or a true worth, like a margin of profit, total revenue, or cost. They outlined the matter of utility mining. By analyzing the utility relationships among Item set s, they known the utility sure property and also the support sure property. The utility of associate degree item will be associate degree number worth, like the amount sold-out, or a true worth, like a margin of profit, total revenue, or cost. They outlined the matter of utility mining.

By analyzing the utility relationships among Item set s, they known the utility sure property and also the support sure property. Item set s during a dealing info with utility values on top of a given threshold. Efficient discovery of high utility Item set s from transaction databases crucial task in data processing. However, mining high utility Item set s presents a bigger challenge than frequent Item set mining, since high utility Item set s lack the anti-monotone property of frequent Item set s. dealing Weighted Utility (TWU) projected recently by re-searchers has anti-monotone property, however its associate degree overestimate of Item set utility and thus results in a bigger search area. UP-Growth and UP-Growth+ algorithms square measure discovered for mining high utility Item set s. They projected a compact tree structure, referred to as Utility pattern tree (UP-Tree) and it maintains all the knowledge of high utility Item set s. back few years we tend to projected FP-Growth algorithmic rule for mining solely sizable amount of frequent Item sets s, however not generate the high utility Item set s. they need the difficulty of manufacturing giant number of candidate Item set s and possibly it reduces the mining performance in terms of area and speed necessities.

II LITERATURE SURVEY

In past years there are units many strategies and algorithms are developed for utility mining. The potency is usually an element that has been thought of for future improvement of the present algorithmic rule. In Literature Review we tend to offer the summary of some existing strategies.

In 2004Hong Yao, Howard J. Hamilton, and Cory J. Butz projected a brand new approach that's A Foundational Approach to Mining Item set Utilities from the Databases [4]. They projected theoretical model. They outline 2 kinds of term connected with utility for things group action utility and external utility. The utility of associate degree item is associate degree number price, like the no of item sold, or a true price, like a gain profit, total expenditure, or total value. They outlined the matter within the utility mining. By analyzing the utility relationships of Item set s, they known the properties like utility sure and also the support sure and also the mathematical model of utility mining supported these properties.

In 2005 to deal with the disadvantages in MEU (Min-ING victimization expected utility) Ying Liu, Wei-keng dynasty, Alok Choudhary, projected a unique Two-Phase algorithmic rule which will a lot of effectively prune candidate Item set s and alter the calculation for the utility [1]. It orderly or well reduces the search area and also the value of memory and needs computation but previous. In first section, they outline a model for transaction-weighted utilization mining that holds a Transaction-weighted Downward Closure Property. (The main purpose to introducing this new thought isn't to outline a brand new drawback, however to utilize its property to prune the search area in higher method.). In second section, they performed info scan to seek out the high transaction-weighted utilization of Item set s.

In 2006 Yao H and Hamilton J, projected Mining Item set utilities from group action databases. one in all the well-known algorithms that is employed for mining all high utility Item set s is that the Mining. This algorithmic rule use operate Scan, Calculate and Store, Generate, Prune, realize out—and see is found during this algorithmic rule use Prior ideas to get candidate set so find high utility item set repeat this method till now a lot of l candidate generation is feasible.

Alva Erwin, Raj P. Gopalan, N.R. Achuthan projected A bottom-up Projection based mostly algorithmic rule for Mining High Utility Item set s in 2007 that is Mining High Utility Item set s from a group action info is to seek out the item sets that have utility on top of a user-defined threshold price. This drawback is associate degree extension of Frequent Item set Mining, that discovers Item set s that occur oft within the data set. the matter of finding High Utility Item set s is somewhat difficult, as a result of the anti-monotone property thus helpful for pruning the search area in standard Frequent Item set Mining technique doesn't apply to that or not abundant useful. thus projected a brand new algorithmic rule known as CTU-PRO that mines high utility Item set i.e. s by bottom up traversal of a compressed utility pattern i.e. CUP tree. They tested the algorithmic rule on many distributed and dense knowledge sets, scrutiny it with the opposite offered recent algorithmic rules for mining High Utility Item set and also the results show that our algorithm works a lot of with efficiency than older one. The projected algorithmic rule for utility mining is victimization the pattern growth. They developed a brand new compact knowledge illustration named Compressed Utility Pattern tree i.e. CUP-tree to mine the utility, and a freshly projected algorithmic rule named CTU-PRO for mining the whole set of high utility Item set s. The TWU thought is employed for pruning the search area in CTU-PRO; however it avoids a re-scanning of the info to work out the particular utility of high TWU Item set s. The algorithmic rule creates the CUP-Tree named as international CUP-Tree from the group action info when 1st finding the individual high TWU things.

In 2008 dominion P. Gopalan, Alva Erwin, and N.R. Achuthan projected analysis on economical Mining of High Utility Item set s from giant Data sets. High utility Item set s mining extends frequent pattern mining to find Item set s in a very group action info with utility prices on top of a given threshold value. However, mining high utility Item set s having a larger challenge than frequent Item set mining, since the high utility Item set s has lack the anti-monotone property of frequent Item sets. They implement a parallel projection theme to use disk storage once the most memory is insufficient for handling giant data sets. Experimental analysis shows that our algorithmic rule is and therefore results in a bigger search house. They projected Associate in nursing rule that uses TWU with pattern growth supported a compact utility pattern tree system. Projected rule and system extend the pattern growth approach, and taking into consideration the shortage of anti-monotone property used for pruning utility based mostly pattern. They compared the performance of CTU-PROL against the 2 section rule and CTU-Mine and got the new one is best.

In 2008 Hsin-Yun Huang, Yi-Cheng Chen, Hua-Fu Li, Yu-Jiun Liu, and Suh-Yin Lee projected algorithmic rule efficient mining of high utility Item set s has become one in all the foremost fascinating and useful data processing tasks with several broad applications [2]. They projected 2 economical algorithms nothing however one-pass algorithms, MHUI-BIT and MHUI-TID, for mining of high utility Item set s from knowledge streams inside the transaction-sensitive sliding-window. 2 effective representations of knowledge item associate degree an extended composition tree-based outline arrangement area unit developed for up the potency of mining high utility Item set s. The projected algorithms higher perform than the present algorithms for mining high utility Item set s from offered knowledge streams. Mining of high utility Item set s is one in all the foremost fascinating and trending analysis issues of knowledge mining. They projected 2 economical and effective one-pass algorithms for mining a collection of high utility Item set s type a transaction knowledge stream. The projected algorithms area unit smart one-pass mining strategies and trounce the present algorithms for mining high utility Item set s from the info streams. Future work includes the mining top-k high utility Item set s from knowledge set and mining high utility Item set s from data streams with the constraints.

In 2009 S. Jayanthi, S. Shankar, and Dr. T. Purusothaman projected a quick rule for Mining High Utility Item set. FUM rule is employed for mining all high utility Item

set s.FUM rule generates high utility Item set s by victimization Combination Generator. Compare to U mining rule, it's straightforward and quicker. The Combination Generator (T) could be a methodology that is employed to get all the combos of the things for the mining. Once variety—sizable amount of Item set s area unit known as high utility Item set s and as number of distinct things will increase within the input info. It takes the Item id and therefore the item level because the input that is usually denoted by variable loop. The factorial computation methodology is outlined during this, to get factorial of variety given.

In 2010 Vincent S. Tseng, Cheng-Wei Wu dialect, Bai-En Shie, and Duke of Edinburgh S. Yu projected an information structure, named UP-Tree, and so describe a replacement algorithm [7], known as UP-Growth, The framework of the UP-Growth: Associate in Nursing economical rule for top Utility Item set Mining methodology projected approach isn't sup-ported the normal framework of transaction-weighted utilization mining model. UP-Tree facilitate the mining performance and avoid scanning original info repeatedly, projected rule could be a compact tree structure, known as UP-Tree to keep up the knowledge of transactions and high utility Item set s. the development of UP-Tree will be performed with 2 scans of the initial info. Within the 1st scan of info, the dealings utility of every dealings is computed. At identical time, TWU of every single item is additionally accumulated. When scanning info once, things and their TWUs area unit obtained. By TWDC property, if the TWU of Associate in Nursing item is a smaller amount than minimum utility threshold, its super sets area unit inauspicious to be high utility Item set s. The item is termed inauspicious things.

In 2011 S. Shankar, Dr. K. Premalatha, S. Kannimuthu projected i Fum - Improved quick Utility Mining. The most step of FUM rule take vital time to figure that is Combination Generator (T). Within the existing system FUM combination generation is performed for Item set s and its set on faith one vital condition. Combination Generator (T) - Generate all doable combos of Item set T FUM rule fail to envision this condition thus it generates the combos for the already generated set of Item set s likewise, if it repeats in an exceedingly next dealings of the input info.hence the projected rule avoids the additional computations and enhances potency.

Jose and Arumugam P projected Advance Mining of High Utility Item set s in transnational information in 2013 .Many analysis and algorithms offer investors with the technical tool to manage their stocks and predicting their market field. However the techniques don't seem to be ample to provide all the invention and prospects. The sales executives arrange their yearly, month wise target and their predictions i.e. known as historical analysis, data processing approach used extensively within the markets and facilitate within the analysis. Field it's helpful for locating fascinating relationship hidden in giant data sets. The uncovered relationships will be painted within the kind of association rules. Ancient Prior rule takes more room, time, and memory for generation of candidate. They projected the rule used for transnational high utility item set mining. This rule build to search out association and correlation will generate less variety of candidates. therefore the sales person will use this utility item set dealings for his or her designing distributor/dealer model wise ,month wise, product wise, target setting.

In 2014 D. Usha Nandini, Ezil surface-to-air missile Leni, M. Maria Nimmy projected Mining of High Utility Item set s from Transnational Databases [8]. Economical discovery of high utility Item set s from transnational databases crucial task in data processing. UP-Growth and UP-Growth+ algorithms area unit projected for mining high utility Item set s. They projected a compact tree structure likewise, known as Utility pattern tree i.e. UP-Tree and it maintaining the knowledge of high utility Item sets s. few year back we have a tendency to projected FPS-Growth rule for mining solely the massive variety of frequent Item set s, however not generate the high utility Item set s. they need the problem of manufacturing sizable amount of candidate Item set s and possibly it decreases mining performance in terms of house and speed demand. However, our previous study desires more room and execution time. UP-Growth and UP-Growth+ becomes a lot of and a lot of economical as per info contain long transactions and generate only a few variety of candidates than the FPS-Growth rule. The experimental results and comparison consolidate its effectiveness. Many algorithms area unit wont to show the performance of UP-Growth and UP-Growth+.

Anbhule Reshma V. and a lot of ranee N. offers research on Mining High Utility Item sets From dealings info In 2014 that is Mining high utility item sets from a transnational info suggests that to retrieve high utility item sets from the transnational info. Here, high utility item set area unit the item set that has highest profit. In projected system, economical rule for Mining High Utility Item sets From Transnational info i.e. UP-Growth rule. For the rule info of high utility item sets is maintained in tree like system named as Utility Pattern Tree. With the assistance of UP-Tree the candidate item sets area unit generated with solely 2 scans of info. In first scan, dealings Utility (TU) of every dealing is get calculated. At identical time dealings Weighted Utility i.e. TWU of every single item is set s in Distributed and Dynamic info Association Rule Mining (ARM) is searching for the frequent Item set s or patterns among the present things from the given info. High Utility Pattern Mining is become the recent analysis with reference to data processing. The projected work is High Utility Pattern for distributed and dynamic info. the normal technique of mining frequent Item set mining embrace that the info is inactive and astraddle, that entail extreme communication overhead once the info is distributed, and that they doing waste in calculation resources once the info is incredibly dynamic. to beat this drawback, Utility Pattern Mining rule is intended, within which Item set s square measure maintained in tree based mostly organization, referred to as Utility Pattern Tree, and it generates the Item set while not store the complete databases, and has cellular communication overhead once mining is with reference to dynamic databases and distributed databases.

In 2014 G. Saranya and A. Deepak Kumar proposed Implementation of Efficient Algorithm for Mining High Utility Item set s in Distributed and Dynamic Database Association Rule Mining (ARM) is finding out the frequent Item set s or patterns among the existing items from the given database. High

Utility Pattern Mining is become the recent research with respect to data mining. The proposed work is High Utility Pattern for distributed and dynamic database. The traditional method of mining frequent Item set mining embrace that the data is sedentary and astride, which entail extreme communication overhead when the data is distributed, and they doing waste in calculation resources when the data is very dynamic. To overcome this problem, Utility Pattern Mining Algorithm is designed, in which Item set s are maintained in a tree based data structure, called as Utility Pattern Tree, and it generates the Item set without store the whole databases, and has cellular communication overhead when mining is with respect to dynamic databases and distributed databases.

III SYSTEM OVERVIEW

A. Proposed Approach

Illustrate Through associate Example: think about an easy transnational info with utility table.

Table 1: Simple Transactional

TID	Transactions
T01	(C,18),(E,1)
T02	(B,6),(E,1),(D,1)
T03	(C,1),(E,1),(A,2)
T04	(A,1),(D,1),(E,1)
T05	(C,4),(E,2)
T06	(B,3),(C,2),(D,1)
T07	(B,10),(D,1),(E,1)
T08	(A,3),(D,3),(E,1),(C,25)
T09	(A,1),(B,1)
T10	(B,6),(C,2),(E,2)

In the given review of literature there as several approaches has been projected in recent few years, they incur the matter of manufacturing an oversized range of candidate item sets for top utility item sets. Such an oversized range of candidate item sets reduces the mining performance in terms of search house requirement, execution time, and in term of memory demand for the mining. True might become worst once the info contains numerous transactions or long high utility item sets.

Table 2: Utility Value of Each Item

Item	Profit
A	3
B	10
C	1
D	6

Proposed Approach is a terribly economical thanks to elimination of surprising item set from the group action to seek out high utility item sets. the prevailing level-wise utility mining technique as well as the Expected Utility mining (EUM) and 2 section methods(TP) furthermore as Sharing Frequent things Set Mining (ShFSM) , Direct Candidate Generation (DCG), and quick Utility Mining(FUM) generate sizable amount of candidate. Projected approach not solely reduces search area however increase performance.

Table 3: Transaction-Weighted Utility and Actual Utility

One item set	TWU	Actual utility	Count	High utility item set
A	109	24	5	N
B	280	240	5	Y
C	178	50	5	Y
D	253	36	4	Y
E	374	50	8	Y

Now from the table eight we've got to eliminate the item set that has the utility price but the minimum given utility prices during this case the item A is deleted from the table because it have utility price but the given minimum utility value. That the remaining item as those item that satisfy the given threshold price i.e. minimum high utility threshold price i.e. value.

For two items set us using self-joining method one high utility item sets.

For two item set we tend to mistreatment self-joining technique one high utility item sets now we tend to delete those 2 item set that has less utility worth than the given minimum utility mining utility threshold worth. Therefore here delete 2 item set (C, D) and (B, C) that not glad the specified threshold. Remaining item set area unit high utility item set. Now for the 3 item sets we tend to area unit is part of the 2 high utility item sets.

Table 4: After Deleting A

TID and Item	B	C	D	E
T01	0	18	0	1
T02	6	0	1	1
T03	0	1	0	1
T04	0	0	1	1
T05	0	4	0	2
T06	1	0	0	0
T07	10	0	1	1
T08	0	25	3	1
T09	1	0	0	0
T10	6	2	0	2

Table 5: Merging Similar Transactions

TID and Item	B	C	D	E
MT1	0	23	0	4
MT2	16	0	2	2
MT3	0	0	1	1
MT4	2	0	0	0
MT5	0	25	3	1
MT6	6	2	0	2

Table 6: (The Two Candidates Itam Set With Utility Value)

Two Item set	TWU	Actual Utility	Count
BD	182	172	2
BE	254	240	3
CE	178	85	5
DE	253	56	4

Now delete the item set that has utility price but the minimum given utility threshold. Thus solely group (B, D, E)

which satisfy the minimum threshold price and is nothing however the high utility item set here.

Table 7: Three Candidate Item Set with Utility Value

Two item set	TWU	Actual utility	Count	High utility itemset
BCE	72	72	2	N
BDE	182	182	3	Y
CDE	48	48	5	N

The overall working process of the proposed approach is shown in the above figure it is clear From the figure that EPA not only reducing the candidate set but also increases performance overall. Form the experiment it clear that proposed algorithm perform well and compared to the TP. Proposed method is best by reducing arithmetic complexity, number of candidate generation and memory used to execute algorithm.

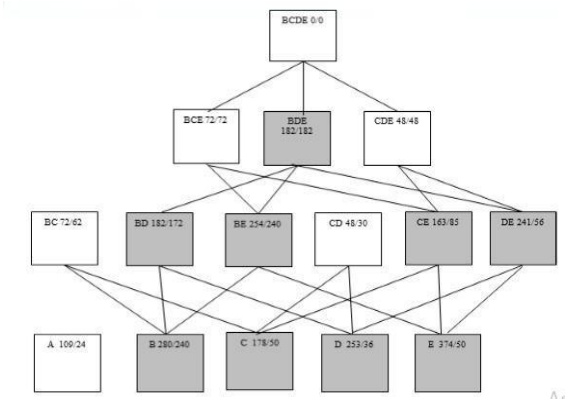

Figure 1: Search Space for Proposed Algorithm

B. Architecture of Utility Mining System

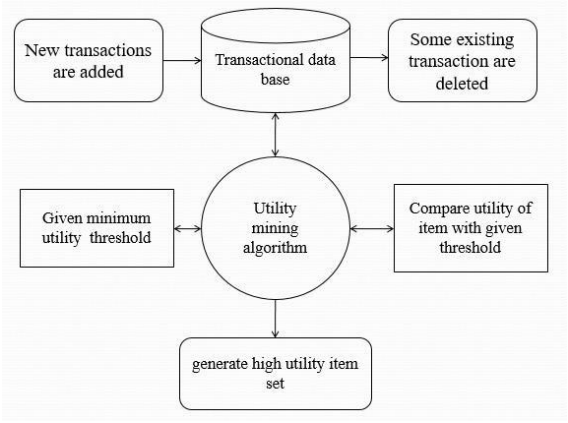

Figure 2: Block Diagram of Utility Mining

C. Aims and objectives for proposed approach

Design associate degree economical formula supported transactions reduction approach that scans the data set and cut back range of candidates. Design associate degree economical formula supported transactions reduction approach that scans the data set and cut back range of calculations. Design associate degree economical formula that generates correct high utility item set for a specific information set. Design associate degree economical formula that minimize execution time and cut back memory demand. Design economical algorithms that cut back arithmetic complexity in term of multiplications.

- Design an efficient algorithm based on transactions reduction approach which scans the dataset and reduce number of candidates.
- Design an efficient algorithm based on transactions reduction approach which scans the dataset and reduce number of calculations.
- Design an efficient algorithm which generates accurate high utility item set for a selected data set.
- Design an efficient algorithm which minimize execution time and reduce memory requirement.
- Design efficient algorithms which reduce arithmetic complexity in term of multiplications.

D. Software Requirements Specification

Hardware Requirements

- Processor: Intel 3 or Above
- Hard Disk: 160 GB or Above
- RAM: 2 GB minimum

Software Requirements

- OS: Windows 7 or Above
- Front End: .net 4.0.1/java
- Back End: Mysql 5.5.
- Programming Tools: SQL server management studio, visual studio C sharp

E. Mathematical Model

Let s be the universal item set such as,
s= fI, O, Item, Threshold, T, M, HUIg
Where,
I- input
O- Output
Item- No of item selected
Threshold- Defined threshold value
T- Time required running algorithm
M- Memory required running algorithm
HUI- High utility item set

Success- If time and memory required to find high utility item set using proposed algorithm is less then success.
Failure- If more time required by proposed algorithm to find high utility item set than two phase algorithm and MUE algorithm then failure.

IV SYSTEM ANALYSIS

Table 8 Show level numbers and number of candidate generated in execution in algorithm Two Phase and proposed approach. Number of items taken 5 and number of transaction are 10.

Table 8: Level Number and Number of Candidate Generated In Execution

Level No	Two Phase	Proposed approach
1	5	5
2	10	6
3	10	3
Total	25	14

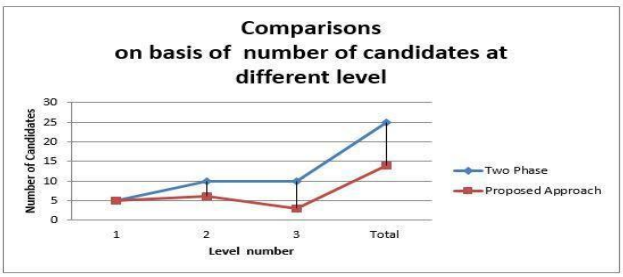

Figure 3: Level Number with Candidates

V CONCLUSION

The main challenges for frequent pattern mining algorithm are nothing but I/O cost, Execution time and Number of Candidates generation, Arithmetic complexity and Memory used are decreases and Accuracy of the algorithm, Scalability in term of number of records is increases. Analyzed TP and Proposed approach using different parameter like threshold value , candidate generation ,number of record ,memory used and accuracy of the algorithm .Form the experiment it clear that proposed algorithm perform well and compared to the TP. It is clear that proposed method outperforms others by reducing arithmetic complexity, number of candidate generation and memory used to execute algorithm. This investigation has presented a new approach, for utility item sets mining 36.

ACKNOWLEDGMENT

Any work cannot be effectively finished while not the motivation and facilitate from learned and professional peoples. i might wish to specific my huge many thanks and feeling towards my guide for motivation and his regular support that has Endorsed Maine to return up with the paper. I might additionally wish to extend my many thanks to any or all my colleagues UN agency have invariably been there at every moment for serving to Maine and in addition terribly grateful to family and friends for his or her support at each purpose.

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