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INDIAN HEALTHCARE SERVICES & DATA MINING TECHNIQUE: STATUS AND CHALLENGES ON ADAPTATION

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ABSTRACT

Health care providers need to be up-to-date using new inventions & methods of treatment, and for this the Health-related institutions have to consistently accumulate the healthcare data. Extracting medical knowledge by structured data mining of many medical records is important for clinical diagnosis support. In the proposed technique, the primary source of data mining is used. In the present study, the best hospital is determined through the mining of data from the questionnaire survey made in the Odisha state. Initially, each data is assigned with the score value based on the required preferences. Moreover, prefix spanning is used for rule generation and the score values were added and finally the best hospital is found with the hospital having highest scores. The proposed technique is implemented in the working platform of JAVA and the results were analyzed.

Keywords: Data mining Tools, Data mining techniques, Healthcare, Prefix span method, Medical Industry

I. INTRODUCTION

The healthcare service sector undergoes tremendous pressure to deliver quality service to patients and doctors across the globe. A healthcare cloud is designed as an interconnection of extensive number of computers and servers specifically dedicated to meet the needs of the healthcare sector. The healthcare service is delivered via an internet connection to the user who can be a either a doctor or a patient [1]. As it is observed and experienced, there are various flaws in our medical system. The private hospitals, even though deliver health care services, have the motive to maximize the profit, due to the fact that patients will not save money for the sake of their life. Another inconvenience associated with our healthcare system is how much reports and prescription one have to store and carry while visiting the doctor [2].

Information & Communication Technology (ICT) has greater potential in bringing larger benefits and positives to healthcare delivery by improving access, with adequate investment, bringing efficiency, widening reach, reducing cost and give a greater mileage in making a healthy India . The Central Government of India announced National Health Mission Program (NHM) with a view of pledging to increase its investment in healthcare by two folds. Various reports have recommended the government to increase its investment in public healthcare [4]. Healthcare services, largely staffed by women, is one arena in which transnational flows have escalated in the past decade, a trend that has been named as one of the

most important global healthcare trends today has noted the increase in women nurses migrating to First World countries, working in public and private settings [5].

Medical tourism industry can be seen as an innovation in healthcare and economic development. Thus public-private partnership (PPP) approach for sustainable development of India's healthcare system should be adopted to earn foreign exchange on one hand, and also to provide "universal healthcare in India by 2020" [6]. The economic and social impact of the development and growth of medical tourism industry for developing countries like India in particular, is highly significant in generating employment opportunities such as: healthcare sector, medical industry, tourism sector, allied healthcare services and hospitality.

Government and private sectors are coming out with various health insurance (HI) schemes. At present four types of HI schemes are functioning in India, viz. social, private, community health insurance, and Government health insurance schemes. By 2011, only 25% of the Indian population had some form of HI. Still a major portion of Indian population is at risk of financial catastrophe of health events as out of the pocket (OOP) expenditure is the most common mode of expenditure [7]. In health services, information systems have assisted to optimize decision making processes and to increase effectiveness of communication channels and infrastructures, such as ERP(????) systems. In the health industry, RS(????) has a significant role in terms of assisting decision making processes about individuals' health [8].

Healthcare-associated infections (HCAIs) are a huge public health problem all over the world, particularly in the developing countries. The developed world has woken up to this threat, and many countries have taken the commendable positive step of introducing laws to monitor and control HCAIs [9]. The government is also trying to track and map existing healthcare providers in order to identify gaps and streamline health service delivery with a review of financing options for managing rising costs and ensuring healthcare remains accessible and affordable [10].

The healthcare industry has generated large amount of data available from record keeping, compliance and patient related data. In today's digital world, it is mandatory that these data should be digitized. To improve the quality of healthcare by minimizing the costs, it's necessary that large volume of data generated should be analyzed effectively to answer new challenges [11]. The management of hospitals needs to adapt itself the challenges of globalization effects, and having improved skills, to meet the expectations of potential market. The quality level of services needs to be improved at the same time. The expectations of patience and staff are analyzed with increasing needs [12].

II. RELATED WORKS

Sreekanth V K *et al*. [13] have proposed an information system that makes use of semantic web techniques to minimize the information asymmetry in Indian healthcare insurance market. The emerging concepts of semantic data mining encourage the cooperative way of existence and reduced chances of exploitation of the client or patient. The huge expenses for healthcare by the larger section of the population in India have made it economically crucial. The healthcare insurance was one of the cost-effective solutions to control the out-of-pocket expenditure in the sector. Nevertheless, the existing information asymmetries in the field of healthcare

insurance bewilder the potential client in selecting the right policy. They are more dependent on the business agents for information and the chances of being exploited become high due to the imbalance in the information.

P. Padma *et al*. [14] have proposed a framework to conceptualize and measure hospital service quality. The dimensions of service quality are determined in Indian hospitals, from patients' perspective. This would enable hospital managers understand how patients evaluate the quality, and so, will aid them to allocate resources to various aspects of healthcare, considered to be important by the patients. A questionnaire was developed for measuring the dimensions of hospital service quality and validated.

Suresh Mopuri *et al*. [15] have proposed low complexity architecture for the Under-determined Blind Source Separation (UBSS) algorithm targeting remote healthcare applications. UBSS algorithm, departing from the typical BSS convention equal number of the sources and sensors present, which was of tremendous interest in the field of Biomedical signal processing especially for remote health care applications. Since such applications are constrained by the on-chip area and power consumption limitation due to the battery backup, low complexity architecture needs to be formulated. UBSS architecture was introduced, followed by the identification of the most computationally intensive module N point Discrete Hilbert Transform (DHT) and finally low complexity DHT architecture was designed to make the entire UBSS architecture suitable for such resource constrained applications.

Kiran Kumari Patil and Syed Thouheed Ahmed [16] have proposed a digital Tele mammography Service System (TSS) to enable trained healthcare workers and patient from the rural primary health care center to consult experts/radiologist remotely at low cost and get done with their digital mammograms analyzed thoroughly. Mammography screening has been proven to be most effective in reducing the mortality rate of breast cancer, with the application of advanced ICT technology to rural primary health care centers for breast cancer detection, will definitely help in early detection of breast cancer and hence increases the survival rate of women. The software architecture and low cost implementation model for a Rural Service Platform was presented to provide an end–to-end solution while touching the next billion under-served populations. It mainly focused on the studies related to digital mammography, system architecture and software components to provide effective healthcare services to rural Indian women.

Dursun Delen *et al*. [17] have examined the healthcare coverage of individuals by applying popular machine learning techniques on a wide-variety of predictive factors. Twenty three variables and 193,373 records were utilized from the 2004 behavioral risk factor surveillance system. The artificial neural networks and the decision tree models were developed and compared to each other for predictive ability. The sensitivity analysis and variable importance measures were calculated to analyze the importance of the predictive factors. The most important predictive factors came out as income, employment status, education, and marital status. Using two popular machine learning techniques, the factors were identified that can be used to accurately classify those with and without healthcare coverage. Moreover, the ability to identify and explain the reasoning of those likely to be without healthcare coverage through the application of accurate classification models can potentially be used in reducing the disparity in healthcare coverage.

Emre Sezgin *et al*.[18] have presented a Health Recommender Systems (HRS) as a complementary tool in decision-making processes in health care services. HRS increase usability of technologies and reduce information overload in processes. The literature review was conducted by following a review procedure.

Major approaches in HRS were outlined and findings were discussed. Moreover, the current developments in the market, challenges and opportunities were presented with regard to HRS and emerging approaches.

Olgun Kitapci *et al.* [19] have investigated the effect of service quality (SQ) dimensions on satisfaction, identifying the effect of satisfaction on word of mouth (WOM) communication and repurchase intention (RI). Improving customer satisfaction (CS) and delivering SQ help service providers to differentiate the offering. The motive was to find out that the statement was true for healthcare sector. A structural equation model (SEM) that utilizes data from 369 patients facing a range of services was used and finds that empathy and assurance dimensions are positively related to customer satisfaction. However, customer satisfaction has a significant effect on WOM and RI which are found highly related.

III. PROBLEM DESCRIPTION

The private hospitals have the main motive to maximize its profit share while delivering health services to the patients during their critical period of life. Every private hospitals or independent doctors have their tie-ups with pathology labs, scan centers and other testing centre and the patients are directed to do all the clinical tests in the prescribed test centres only. Similarly the costs of medicine with the same formulas have a huge difference of rates but the patients have to purchase high rate medicine, of a particular brand, as the commission factor gets associated with it. The government has started public hospitals to serve the society and to provide cheap or almost free treatment, but the situations are worse. Availability of beds in the public hospitals are low in comparison to the demand. Doctors are appointed and paid salaries by the government; but the same doctors prefer private practice due to high returns, even though the doctor is paid government salary. One more problem associated with the healthcare system is how much reports and prescription one have to store and carry while visiting the doctor. There must be a centralized database that stores important medical records from childhood onwards, and also includes records of various immunizations. Another significant problem arises in cases of emergency, as in our country there is a dearth of specialist doctors. Specialist doctor gives services to many hospitals, and thus for a patient, it must be necessary to know that the hospitals have the services of a specialist doctor or not.

Hence, by implementing Data mining technology, some of such problems can be sorted out. The new system will not only help to monitor the doctor but will also help to maintain a persons important health record from the birth itself and thus will be helpful for the doctor also to get know the patients previous medical history and the major treatments undergone.

IV. PROPOSED METHODOLOGY FOR THE ADAPTATION OF INDIAN HEALTHCARE SERVICES WITH DATA MINING TECHNIQUE

The health services provided by hospitals have led to become technically very advanced. Various facilities and equipment runs alternately to support the systems in the hospital building. Healthcare has different groups of stakeholder such as patients, public or visitor, administrative and medical staff. Facility managers play an important role of forecasting the condition of the facilities on their experience and their different values, beliefs, perceptions and expectations. Hospitals are a vital component of the healthcare system, but, at the same time,

are an expensive way to deliver medical care. Therefore, although hospitals deal with patients who cannot be treated elsewhere at the time when hospital treatment can still be effective, hospitals increasingly focus on critical short-term care. They only admit people who are in a serious condition which requires an intensive level of medical or nursing care or individual diagnoses and treatment. There are difficulties in forecasting hospital requirements into the future. The problem is most of the facility managers not participating in the briefing, designing and cost analyzing stages of new building developments. As health facilities tend to operate 24 hours a day making facilities performance function particularly very critical.

Data mining algorithms applied in healthcare industry play a significant role in prediction and diagnosis of the diseases. There are a large number of data mining applications found in the medical related areas such as Medical device industry, Pharmaceutical Industry and Hospital Management. To find the useful and hidden knowledge from the database is the purpose behind the application of data mining. Popularly data mining called knowledge discovery from the data. The knowledge discovery is an interactive process, consisting by developing an understanding of the application domain, selecting and creating a data set, preprocessing, data transformation. Data Mining has been used in a variety of applications such as marketing, customer relationship management, engineering, and medicine analysis, expert prediction, web mining and mobile and mobile computing.

Data mining tools answer the questions that traditionally was a time consuming and too complex to resolve. They prepare databases for finding predictive information. Data mining tasks are Association Rule, Patterns, Classification and Prediction, Clustering. Most common modeling objectives are classification and prediction. Eliminating current health disparities would decrease the costs associated with the increased disease burden borne by certain population groups. Health administration or healthcare administration is the field relating to leadership, management, and administration of hospitals, hospital networks, and health care systems. In the Healthcare sector, every Government spends more money so as to secure a healthy health status of its population.

This paper proposes a new method for the adaptation of Indian health care services with data mining technique. The primary source used for this research is Questionnaire survey. 500 questions have been collected from the respondents to gather the needed data. Once the data are collected from the respondents a score value is assigned to each answer. Then, the score values are added to get the total score values for each respondent's data. Prefix span algorithm is used here to mine the frequent patterns form the data. Prefix Span mines the complete set of patterns but greatly reduces the efforts of candidate subsequence generation. Moreover, prefix-projection substantially reduces the size of projected databases and leads to efficient processing. Rules are generated by using this prefix span algorithm. The score values of each rule is added to get the total score value. The rule which have the high score value is displayed as the best healthcare sector in Odisa region.

The architecture of proposed methodology is shown by the below figure 1.

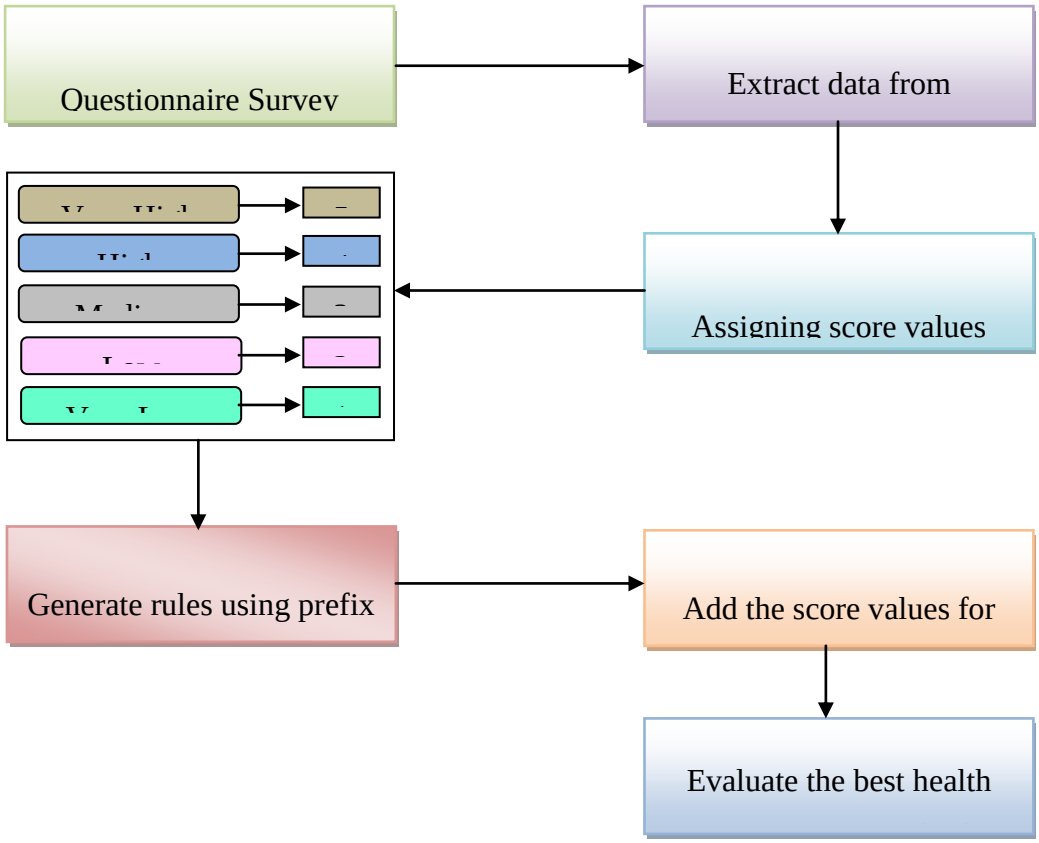

Figure 1. Architecture of the proposed methodology

Moreover, the methodology consists of the following stages namely:

- Extracting data from Questionnaire using Data mining
- Assigning score values
- Rules generation using Prefix span algorithm
- Adding score values for the generated rule
- Evaluate the heath care sector using the High score value

Extracting data from Questionnaire using Data mining:

The data are collected from the respondents along the Odisha region using the Questionnaire survey. Once the data are collected and stored, the next stage is to extract the data from the Questionnaire to gather the needed data for processing. After extracting the data, the score values are assigned to each answer from the respondent.

Assigning Score values:

The score values are assigned to each answer from the respondents. The score values are ranges from 1-5. The following table shows the score values assigned for each answer.

Score Values	
Very High	5
High	4
Medium	3
Low	2
Very Low	1

Table1. Score values assigned for each answer.

The score values are assigned as very high, high, medium, very low and low. The score value 5 is assigned for very high ratings. The score value 4 is assigned for high ratings. The score value 3 is assigned for medium ratings. The score value 2 is assigned for low and score value 1 is assigned for very low. Once the score values are assigned, the rules are generated using prefix span algorithm.

Rules generation using Prefix Span Algorithm:

Prefix span algorithm:

Prefix Span (i.e., Prefix-projected Sequential pattern mining) is a novel sequential pattern mining method, which explores prefix projection in sequential pattern mining. Prefix Span mines the complete set of patterns but greatly reduces the efforts of candidate subsequence generation. Moreover, prefix-projection substantially reduces the size of projected databases and leads to efficient processing. The sequential data mining problem is defined as follows: Given a set of sequences, where each sequence consists of a list of elements and each element consists of a set of items, and given a user-specified min support threshold, sequential pattern mining is to find all of the frequent subsequences, i.e., the subsequences whose occurrence frequency in the set of sequences is no less than min support.

The first scan finds all of the frequent items which form the set of single item frequent sequences. Each subsequent pass starts with a seed set of sequential patterns, which is the set of sequential patterns found in the previous pass. This seed set is used to generate new potential patterns, called candidate sequences. Each candidate sequence contains one more item than a seed sequential pattern, where each element in the pattern may contain one or multiple items. The number of items in a sequence is called the length of the sequence. So, all the candidate sequences in a pass will have the same length. The scan of the database in one pass finds the support for each candidate sequence. All of the candidates whose support in the database is no less than min support from the set of the newly found sequential patterns. This set then becomes the seed set for the next pass. The algorithm terminates when no new sequential pattern is found in a pass, or no candidate sequence can be generated.

Definition 1 (Prefix):

Let us suppose that the items in an element are furnished alphabetically. It is specified that, for a sequence $\alpha = [e_1 \quad e_2 \quad \ldots \quad e_n]$, a different sequence $\beta = [e'_1 \quad e'_2 \quad \ldots \quad e'_m](m \le n)$ is known as a prefix of α , if and only if it fulfills the following benchmarks.

(1) $e'_i = e_i$ for $i \le m-1$;

(2) $e'_m \subseteq e_m$

(3) The entire items in $e_m - e'_m$ are furnished alphabetically subsequent to those in e'_m .

Statement:

The terms such as the sequence, $L\text{-}sequence$ and subsequence employed in the Prefix span Algorithm are expressed below.

Sequence:

A ***sequence*** represents a structured list of item sets. A sequence P is specified by $\lfloor p_1 \quad p_2 \quad \ldots \quad p_q \rfloor$, where $p_q \; [1 \le q \le L]$ represents an item set. Further, p_q is also known as an element of the sequence.

L - **Sequence**:

The number of instances of items in a sequence is known as the length of the sequence. A sequence with length L is termed as an $L\text{-}sequence$.

Subsequence:

A sequence $R = [r_1 \quad r_2 \quad \ldots \quad r_c]$ is labeled as a subsequence of a different sequence $T = [t_1 \quad t_2 \quad \ldots \quad t_b]$ and T as a super sequence of R, represented as $T \subseteq R$, if $1 \le q_1 < q_2 < \ldots < q_c \le b$, then $t_1 \subseteq r_{q_1}, t_2 \subseteq r_{q_2}, \ldots, t_b \subseteq r_{q_c}$.

The Prefix Span algorithm is effectively employed to create the sequential patterns for any input from the sequence database D_s with minimum support threshold. The output is produced in the shape of an absolute set of sequential patterns.

Definition 2 (Suffix):

Given a sequence $\alpha = [e_1 \quad e_2 \quad \ldots \quad e_n]$ (where each e_i corresponds to a frequent element in S. Let $\beta = [e'_1 \quad e'_2 \quad \ldots \quad e_{m-1}e'_m](m \le n)$ be the prefix of α. Sequence $\gamma = [e''_m \quad e_{m+1} \quad \ldots \quad e_n]$ is called the suffix of α with regards to β denoted as $\gamma = \alpha / \beta$ where $e_m^n = e_m - e'_m$.

Definition 3 (Projected database):

Let α be a sequential pattern in a sequence database S. The α projected database, denoted as $S \mid \alpha,$ is the collection of suffixes of sequences in S with regards to prefix α. To collect counts in projected databases, we have the following definition:

Definition 4 (Support count in projected database):

Let α be a sequential pattern in sequence database S, and β be a sequence with prefix α.The support count of β in α-projected database $S \mid \alpha,$ denoted as support $S \mid \alpha(\beta),$ is the number of sequences γ in $S \mid \alpha,$ such that $\beta \subseteq \alpha \cdot \gamma.$

Algorithm:

- **Input:**

  A sequence database S and the minimum support threshold $\min - \sup$
- **Output:**

  The complete set of sequential patterns
- **Method:**

  Call Prefix Span $(\langle\ \rangle, S, S \mid \alpha)$
- **Subroutine:**

  Prefix Span $(\langle\ \rangle, S, S \mid \alpha)$
- **Parameters:**

  α : A sequential pattern, l : length of α, $S \mid \alpha$: the α projected database if $\alpha \neq \langle\ \rangle,$ otherwise the sequence database S
- **Method:**

1. Scan $S \mid \alpha$ once, find the set of frequent items b such that

   (a) b Can be assembled to the last element of α to form a sequential pattern; or

   (b) $\langle b \rangle$ Can be appended to α form a sequential pattern.

2. For each frequent item b, append it to α form a sequential pattern α', and output α'

3. For each α' , construct α' -projected database $S \mid \alpha'$ and call PrefixSpan $(\alpha', l+1, S \mid \alpha')$

The initial process of PrefixSpan is to scan the sequential database and to extract the length-1 sequence. Then the sequential database is divided into various partitions based on the number of length-1 sequences and each partition is the projection of the sequential database that takes the corresponding length-1 sequences as prefix. The projected databases only contain the postfix of these sequences by scanning the projected database all the length-2 sequential patterns that have the parent length-1 sequential patterns as prefix can be generated. Then the projected database is partitioned again by those length-2 sequential patterns. The same process is executed recursively until the projected database is empty or no more frequent length-k sequential patterns can be generated. An essential advantage of the PrefixSpan is that no candidate sequence needs to be generated.

Adding score values for the generated Rule:

Once the frequent patterns are mined using prefix span algorithm the next stage is to add the score values for the generated rule. Each generated rule has its corresponding score values. The score values of each rule is added to get the total score value.

Evaluate the heath care sectors using the High score value:

After calculating the total score value for each rule, the next stage is to evaluate the health care sector using the high score value. The rule which has the high score value among all the others is selected as the best healthcare sector. Once the best healthcare sector is selected along the Odisha region it will be displayed.

V. RESULT AND DISCUSSION

The proposed method is implemented in the working platform of JAVA. The results were generated and tested using Java program under JDK 1.7.0 on Net beans 8.0.2 with machine configuration is given in Table 2.

Machine Configuration	
Processor	Pentium(R) Dual-Core
OS	Windows XP
CPU Speed	2.80GHz
RAM	1.99GB

Table 2: Machine Configuration

The proposed methodology is introduced in order to help in the healthcare sector using Data mining. So that, the primary source in the form of questionnaire is taken with the hospital datas and analyzed. For analysis, the hospitals under the Odisha region were analyzed. Here, the concept of Data mining is utilized to extract the datas from the Questionnaire. The ranking of the best hospitals is made for the given datas.

The ranking is made by means of four steps. First, the score values were assigned for the datas based on its value. Then the rules were generated using Prefix span algorithm. In the third step, the score values for the generated rule was added and the ranking is made on the heath care sector using the Highest score values.

The questionnaire includes 138 components. Among these, some of the key components were chosen. The chosen key component and the assigned value of the score value is given in the below table 3.

Key Components	Scores
Qualification (Q)	Q5 to Q2
Designation (D)	D5 to D1
Experience (E)	E4 to E1
Good clinical examination (GCE)	5-2
Good diagnosis (GD)	5-1
Adequate medical equipment (AME)	5-1
Neat and clean hospital premises (NCHP)	5-2
Ease of obtaining drugs (EOD)	5-2
Speed of Service (SS)	5-2
General safety (GS)	5-1

Table 3: Key Components and its Score values

Moreover, the score values determined for the datas like Qualification, Designation and Experience which were collected from the primary questionnaire survey is tabulated in the below tables 4 to 6.

Qualification (Q)	Credits
Post Graduate	Q5
Graduate	Q4
12th	Q3
10th	Q2

Table 4: Score of Qualification

Designation (D)	Credits
Management	D5
Doctor	D4
Medical Student	D3
Technical	D2
Non Technical	D1

Table 5: Score of Designation

Experience (E)	Credits
More the 8 yr	E4
5-8 yr	E3
3-5 yr	E2
Below 3 yr	E1

Table 6: Score of Experience

Also, the GUI generated for the proposed method is given in the below figure 2. In the GUI the top five ranking datas were displayed. Moreover, the key components and its score values were also shown along with the ranks.

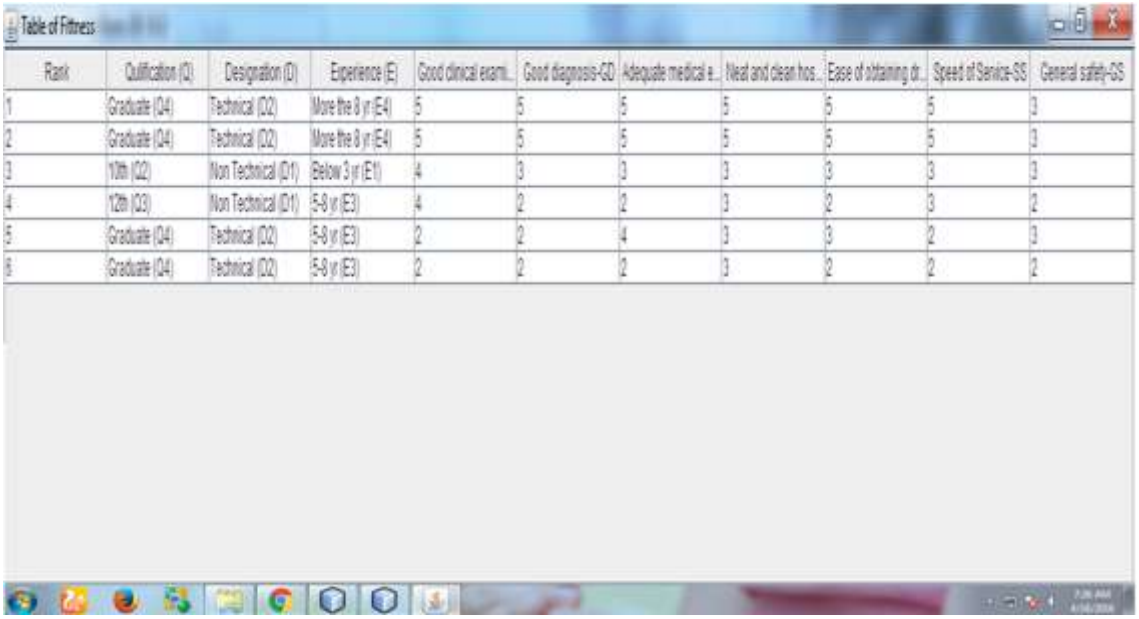

Figure 2: GUI showing the rank of most excellent Hospitals

VI. CONCLUSION

The proposed technique focuses on providing affordable healthcare services in terms of ranking the best hospitals in the undeveloped regions with least hospital facilities. In order to provide such facility, 138 structured questionnaires had distributed to the respondents throughout the Odisha region for gathering needed data. Through the concept of data mining, the datas were extracted and the scores were given for the data based on the required preference datas. Also, the rules were generated for the datas using prefix spanning. Finally, the attained scores were added and hospitals were ranked on the basis of data having highest scores. The efficiency of the proposed technique is analyzed with the results. In the simulation outputs, the topmost five hospitals were retrieved on the ranking basis.

REFERENCES

[1] Maulik Parekh and Dr.Saleena B., "Designing a Cloud based Framework for HealthCare System and applying Clustering techniques for Region Wise Diagnosis", 2nd International Symposium on Big Data and Cloud Computing, Procedia Computer Science , No. 50, 2015, pp. 537-542.

[2] Gaurav Bhatia, Ajay lala, Ashish chaurasia and Ramandeep rajpal, "Implementation of Cloud Computing Technology for the Improvement of Entire Healthcare Services in India".

[3] G.N.Akhade, Dr. S.B.Jaju and Dr. R.R.Lakhe, "A review on healthcare service quality Dimensions", Sixth International Conference on Emerging Trends in Engineering and Technology, 2013.

[4] Ganeshkumar S Hiregoudar, Dr H Rajashekar and Dr K.S Raghuram, "Evaluation and Analysis of Technology Acceptance of Healthcare Professionals in Karnataka, South India", 2015.

[5] Sonya Sharma and Sheryl Reimer-Kirkham, "Faith as social capital: Diasporic women negotiating religion in secularized healthcare services" Women's Studies International Forum, No.49, 2015, pp.34–42.

[6] Anitha Medhekar, "Public-Private Partnerships for Inclusive Development: Role of Private Corporate Sector in Provision of Healthcare Services", International Relations Conference on India and Development Partnerships in Asia and Africa, Procedia - Social and Behavioral Sciences, No. 157,2014, pp.33 – 44.

[7] Hugara Siddalingappa, G.C. Harshith, M.R. Narayana Murthy,Praveen Kulkarni, and D. Sunil Kumar, "Health insurance coverage and healthcare expenditure pattern in rural Mysore", Indian journal of medical specialities, No.6, 2015, pp.151-154.

[8] Emre Sezgin and Sevgi Ozkan, "A Systematic Literature Review on Health Recommender Systems" The 4th IEEE International Conference on E-Health and Bioengineering, November 2013.

[9] M. Biswal, A. Mewara, S.B. Appannanavar and N. Taneja, "Mandatory public reporting of healthcare-associatedinfections in developed countries: how can developing countries follow", Journal of Hospital Infection, No. 90, 2015, pp.12-14.

[10] Nahdatul Arm Abd Rani, Mohamad Rizal Baharum ,Anis Rosniza Nizam Akbar and AbdulHadi Nawawi, "Perception of Maintenance Management Strategy on Healthcare Facilities", Procedia - Social and Behavioral Sciences , No.170, 2015, pp.272 – 281.

[11] J.Archenaa and E.A.Mary Anita, "A Survey Of Big Data Analytics in Healthcare and Government", 2nd International Symposium on Big Data and Cloud Computing, Procedia Computer Science , No. 50 , 2015, pp. 408 – 413.

[12] Imran Aslan, Orhan Çınar and Üstün Özen, "Developing Strategies for the Future of Healthcare in Turkey by Benchmarking and SWOT Analysis", 10th International Strategic Management Conference, Procedia - Social and Behavioral Sciences, No. 150, 2014, pp. 230 – 240.

[13] Sreekanth V K and Dhrubes Biswas, "Information Asymmetry Minimization System for Potential Clients of Healthcare Insurance in Indian Context using Semantic Web", Proceeding of the IEEE Students Technology Symposium, 2014.

[14] P. Padma, L. Prakash Sai and Chandrasekharan Rajendran, "A Comprehensive Framework for Measuring Service Quality Perceptionsof Patients: A Case of Indian Hospitals", International Conference on Service Systems and Service Management, 2008, pp. 1-6.

[15] Suresh Mopuri, P Sreenivasa Reddy, Karthik Ch, Siva Prasad A, Amit Acharyya and Siva Ramakrishna V, "Low complexity Underdetermined Blind Source Separation System Architecture for Emerging Remote Healthcare Applications", 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), 2014.

[16] Kiran Kumari Patil and Syed Thouheed Ahmed, "Digital Tele mammography Services for Rural India, Software Components and Design Protocol", International Conference on Advances in Electronics, Computers and Communications (ICAECC), 2014, pp. 1-5.

[17] Dursun Delen, Christie Fuller, Charles McCann and Deepa Ray, "Analysis of healthcare coverage: A data mining approach", Expert Systems with Applications, No.36, 2009, pp.995–1003.

[18] Emre Sezgin and Sevgi Ozkan, "A Systematic Literature Review on Health Recommender Systems, "The 4th IEEE International Conference on E-Health and Bioengineering, November 2013.

[19] Olgun Kitapci, Ceylan Akdoganand İbrahim Taylan Dortyol, "The Impact of Service Quality Dimensions on Patient Satisfaction, Repurchase Intentions and Word-of-Mouth Communication in the Public Healthcare Industry", Procedia Social and Behavioral Sciences, No.148, 2014, pp. 161-169.