Data Mining in Healthcare

⇒ The issue of health care assumes prime importance for the society and is a significant indicator of social development. Health is clearly not the mere absence of disease but confers on a person or group's freedom from illness and the ability to realize one's potential. Health is therefore best understood as the indispensable basis for defining a person's sense of well-being. The delivery of health care services thus assumes greater proportion, and in this context the role played by information and communication technology has certainly a greater contribution for its effective delivery mechanism. The application of data mining is specifically relevant and it has been successfully applied in medical needs for its reliable precision accuracy and expeditious beneficial results.

- **What is Health Care?**

√ The prevention, treatment, and management of illness or the preservation of mental and physical well-being through the service offered by the medical, nursing, and allied health professions.

- A major challenge facing healthcare organizations is the provision of quality services at affordable costs. Quality service implies correct diagnosis and administering effective treatments to patients. Poor health care organizations diagnosis can certainly lead to disastrous consequences which are unacceptable. Health care organizations must also minimize the cost of clinical tests. It can achieve these results by employing appropriate computer-based information and/or decision support systems. Health care data is **massive** and includes patient centric data, resource management data and transformed data. Therefore, health care organizations must have the ability to computationally analyze data that is stored from treatment records of millions of patients. Thereby, **data mining** techniques may help in answering several important and critical questions related to health care.
- The healthcare industry has increased in size and content over the years

√ Health care is the attention to the physical health of human being

➢ **What is data mining?**

√ Data mining is the analysis of large data sets to discover patterns and use those patterns to forecast or predict the likelihood of future events. That said, not all analyses of large quantities of data constitute data mining. We generally categorize analytics as follows:

- Descriptive analytics:-Describing what has happened
- **Predictive analytics: -Predicting what will happen**
- Prescriptive analytics:-Determining what to do about it

It is to the middle category **predictive analytics** that data mining applies. Data mining involves uncovering patterns from vast data stores and using that information to build predictive models.

√ Data mining is the process of identifying and extracting valid, potentially useful, and ultimately understandable patterns of data from a complex data. This encompasses a number of technical approaches, such as clustering, data summarization, classification, finding dependency networks, analyzing changes.

√ The current evaluation of data mining functions and products is the results of influence from many disciplines, including databases, information retrieval, statistics, algorithms, and machine learning

➢ How data mining work?

√ The large amounts of data are a key resource to be processed and analyzed for knowledge extraction that enables support for cost-savings and decision making.

- Data mining provide healthcare professionals an additional source of knowledge for making decisions. The decisions rests with health care professionals.

√ Data miners commonly use the cross industry standard process for data mining to study the data. This process involves six steps:

1. Business understands

   Identify the project objectives and requirement from business perspective and define data mining problem
2. Data understands

   Collect the initial data and become familiar with it, and look for any data quality problems
3. Data preparation

   Build data set from row data
4. Modeling

   Use data mining software to analyze
5. Evaluation

   Evaluate the achievement of the project objectives by comparing data mining modeling and their result using yardstick.
6. Deployment

   Implement the data mining results

➢ Data Mining in Healthcare

√ Data mining holds great potential for the healthcare industry to enable health systems to systematically use data and analytics to identify inefficiencies and best practices that improve care and reduce costs. Some experts believe the opportunities to improve care and reduce costs concurrently could apply to as much as 30% of overall healthcare spending.

√ Healthcare industry today generates large amounts of complex data about patients, hospitals resources, disease diagnoses, electronic patient records, medical devises etc.

That can make some problem such as: -

- Too much unnecessary care
- Avoidable harm to patient
- Preserve incentive in how we pay for care
- Lack of transparency
- Too much money is wasted

Data mining help to solve the above problem: -

- Segment customer/patient accurately group into with similar health patter
- Predict medical diagnosis
- Forecasting treatment cost
- Predict length of stay in hospital
- Predict total cost of patient care
- Patient receive better and affordable health care service

➢ Data mining applications in healthcare

Healthcare industry today generates large amounts of complex data about patients, hospital resources, disease diagnosis, electronic patient records, medical devices etc. Larger amounts of data are a key resource to be processed and analyzed for knowledge extraction that enables support for cost-savings and decision making. Data mining applications in healthcare can be grouped as the evaluation into broad categories: -

- Treatment effectiveness

Data mining applications can develop to evaluate the effectiveness of medical treatments. Data mining can deliver an analysis of which course of action proves effective by comparing and contrasting causes, symptoms, and courses of treatments.

- Healthcare management

Data mining applications can be developed to better identify and track chronic disease states and high-risk patients, design appropriate interventions, and reduce the number of hospital admissions and claims to aid healthcare management. Data mining used to analyze massive volumes of data and statistics to search for patterns that might indicate an attack by bio-terrorists.

- Customer relationship management

Customer relationship management is a core approach to managing interactions between commercial organizations typically banks and retailers-and their customers, it is no less important in a healthcare context. Customer interactions may occur through call centers, physicians' offices, billing departments, inpatient settings, and ambulatory care settings.

- Fraud and abuse Detect

fraud and abuses establish norms and then identify unusual or abnormal patterns of claims by physicians, clinics, or others attempt in data mining applications. Data mining applications fraud and abuse applications can highlight inappropriate prescriptions or referrals and fraudulent insurance and medical claims.

- Medical Device Industry

Healthcare system's one important point is medical device. For best communication work this one is mostly used. Mobile communications and low-cost of wireless biosensors have paved the way for development of mobile healthcare applications that supply a convenient, safe and constant way of monitoring of vital signs of patients. Ubiquitous Data Stream Mining (UDM) techniques such as light weight, one-pass data stream mining algorithms can perform real-time analysis on-board small/mobile devices while considering available resources such as battery charge and available memory.

- Pharmaceutical Industry

The technology is being used to help the pharmaceutical firms manage their inventories and to develop new product and services. A deep understanding of the knowledge hidden in the Pharma data is vital to a firm's competitive position and organizational decision-making.

- Hospital Management

Organizations including modern hospitals are capable of generating and collecting a huge amount of data. Application of data mining to data stored in a hospital information system in which temporal behavior of global hospital activities is visualized.

Three layers of hospital management:

- Services for hospital management
- Services for medical staff
- Services for patients

- System Biology

Biological databases contain a wide variety of data types, often with rich relational structure. Consequently, multirelational data mining techniques are frequently applied to biological data. Systems biology is at least as demanding as, and perhaps more demanding than, the genomic challenge that has fired international science and gained public attention.

⇒ Data mining has great importance for area of medicine, and it represents comprehensive process that demands thorough understanding of needs of the healthcare organizations. Knowledge gained with the use of techniques of data mining can be used to make successful decisions that will improve success of healthcare organization and health of the patients