

# Some background on data mining and machine learning.

[Business](#), [Decision Making](#)



Some topics about which we should have some knowledge to understand the research well are discussed in this chapter. Section 2.

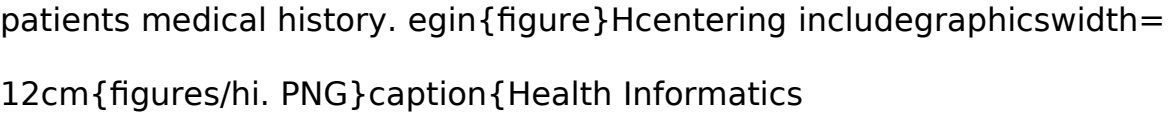
1 describes Health Informatics while section 2. 2 describes big data in health informatics, 2. 3 for Intensive medicine, 2. 4 for ICU readmission and 2. 5 for INTcare. Different scoring techniques are discussed in section 2.

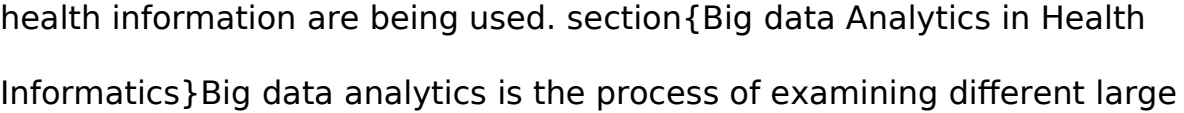
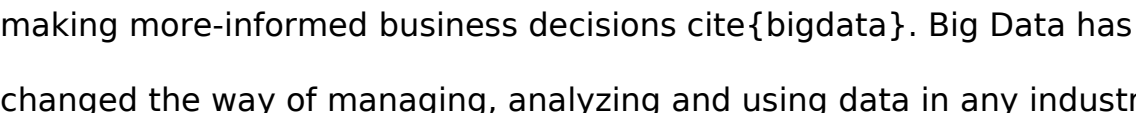
6. Section 2. 7 shows a background on data mining and machine learning.

Different data mining approaches and machine learning algorithms are shown in section 2. 8. section{Health Informatics}Health informatics is the study of techniques to store health information and ways how they can be utilized. The National Library of Medicine (NLM) defines health informatics as “ the interdisciplinary study of the design, development, adoption and application of IT-based innovations in healthcare services delivery, management and planning” cite{nml}. It includes computer science, social science, information science etc. The concept of health informatics is shown in figure ef{Healthinfo} adapted from cite{health}. The purpose of health informatics is delivering better health care to patients. It also aimed to reduce health care cost.

Health informatics include data analysis, knowledge management, acquisition and representation of data, managing changes, information integration etc. It is a large field. It is a scientific field that is developing rapidly and computer techniques are being used to improve health care

technology. Sometimes we need data about patient in many field such as to analyze the changing of factor for particular disease, to observe the pattern of medicine composition, to m-health support etc. Health informatics provides us with these supports. So now-a-days it is an important field of study. It helps health care, doctors, patients in different way. For example, as data are recorded patient need not to worry about their previous report or history.

Doctors can suggest best medicine at first time as he can easily check the patients medical history.  Health informatics reduces the cost as same test need not to be repeated as results of previous test are resided in the database and also also are summarized. Moreover health informatics is really beneficial in complex decision system.

For supporting clinical decision making such as predicting ICU readmission health information are being used.  Big data analytics is the process of examining different large data sets to disclose hidden patterns, unfamiliar relations, market trends, customer preferences and other useful information which may help in making more-informed business decisions . Big Data has changed the way of managing, analyzing and using data in any industry. Health care is one of the most promising sectors where big data can be applied to bring changes . Health care analytic may help by reducing costs of treatment, predicting epidemics, avoiding inevitable diseases and improving

the quality of life. Along with world population, average human lifespan is increasing and bringing new challenges to today's health care systemcite{biblog}. So big data plays a vital role in health informatics. Big data analytics can be used in scheduling work shift of health-care professionals.

The electronic health record (EHR) is an great application of data analytis in health care. Patient medical history are recoded here. Another application is telemedicine.

Telemedicine is getting prescribed by a health professional without meeting him. It promotes remote diagonosis. Data analytics can reduce the visit to emergency room (ER). It also helps in separation patient in demographic group and in predictive analysis. section{Intensive Care Medicine}Intensive care medicine, a special branch of medical science is mainly concerned with the diagnosis and treatment of critically ill patients.

Usually the patients whose condition can be improved and who are at most critical condition get the aid of Intensive Care medicine. Studies have suggested that ICU volume and quality of aids for mechanically ventilated patients has a good relation cite{kahn2006hospital}. Intensive Care Medicine(ICM) usually investigate, diagnosis and provide organ system support or treatment to critically ill patients of the hospital , specially the ICU. It also ensures patients safety , ethics and proper system management . Usually ICM professionals provide aids to these nine conditions: Heart, kidney, liver, respiratory & gastrointestina failure, sepsis, patients with acute

condition, less consciousness, recovering from major operation and maternal complication. section{ICU Readmission}Readmission to ICU can occur due to same disease, or for new illness, or as a consequence of previous stay.

Readmission to ICU increase the risk of mortality. ICU Readmission can be defined as get admitted to ICU within same hospitalization or within a certain time period after discharge.

A patient is said to be admitted to ICU if he is taken to ICU, get cleaned and connected to ICU machine and get diagnosed. A patient is provided the following support are said admitted: egin{itemize}item Advanced respiratory supportitem Circulatory support item Basic respiratory monitoring and support item Neurological monitoring and item support Renal supportend{itemize}If a patient is reconnect to this support after discharge with a certain time period (30 days ) is called readmitted. ICU readmission results in consumption of cost, medical resource etc which is unwanted. Previous work shows 4-14\% people get readmitted to ICU.

But readmission can be prevented by avoiding unplanned discharge and prediction of readmission can help doing so. section{INTcare}INTcare is mainly an decision making or support system for intensive care. It is an agent based system.

Agents are responsible both for data acquisition and model updating. The INTCare is a Decision Making Support Systems (DMSS)based on the Knowledge Discovery from Databases(KDD) and the Agent-Based paradigms, to support intensive care medical activities. In particular, the system is

intended to assist the physicians' decision making by: 

- item detecting action demanding conditions by continuously scanning automatically acquired data and applying the relevant model to predict next day failure of six systems (liver, respiratory, cardiovascular, coagulation, central nervous and renal)
- item maintaining an up-to-date in-hospital death probability value used in end-of-life decision making and
- item evaluating scenarios for the evolution of the condition of the patient, allowing physicians to compare the consequences of different medical procedures

[cite{gago2009intcare}](#). [end{itemize}](#)The INTCare system has a vision to help doctors decide about the best care to provide their patients. Such system is expected to reduce medical errors, to fasten clinical interventions and, overall, to provide better care by having the required information at the right place, at the right time [cite{santos2011intcare}](#). [section{Currently Used ICU Scoring Systems}](#)There are many scoring techniques. This scores are used to predict readmission and mortality of ICU patient. Some of them are discussed in the following sub-sections.

[subsection{APACHE}](#)Acute physiology and chronic health evaluation (APACHE) is the most used scoring technique to find severity of illness. It was first developed on 1978. 34 variables were used then to evaluate patient care in ICU. That time it was called acute physiology score(APS). Data was collected within 24 hours of ICU readmission and score was calculated for worst hour. The scoring was from 0 to 4.