Preliminary Investigation on Prediction, Management and Prevention of Diseases using Healthcare Systems Through Big Data Analytics

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Abstract—**Healthcaresystems are intended to encounter the health care requirements of target populations. The three main components of Health care systems are Prediction, Management and Prevention. Predictions in Health care systems paves growth opportunities, technology and trends related to investigation of health issues in Health care domain. Management in Health care systems is to minimize or get rid of these issues and also achieving high effectiveness and efficiency. Prevention is the most important part where earliest predictions avoid the occurrence thereby lead to prevention of diseases.**

Big Data Health care system Analytics is a pervasive system made use of to define medical related data that is enormous in quantity and that goes on budding using time. These data be able to be utilized to track and mine data and/or information for evaluation or exploration purpose related to Health care system. Health care system exists from a long time and a review is done for studying and suggesting the best practices related to the same.

Keywords— Health care systems, Prediction, Management, Prevention, effectiveness, efficiency, Big Data Analytics

I.   INTRODUCTION

Health care systems are intended to encounter the Health care requirements of target populations. There are an extensive variations of universal Health care system. These systems have remained subsidized by the Countrywide Health Care Insurance Endowment, to which employers and employees make required payments.

Health care systems are having three major components - Prediction, Management and Prevention of sicknesses. Predictions in Health care systems paves growth opportunities, technology and trends related to Health care domain. Management in Health care systems achieve effectiveness and efficiency. Prevention of sicknesses is the major part where earliest predictions lead to medication and cure thereby prevention of diseases..

II.   BIG DATA ANALYTICS

Big data analytics is the process of extracting useful information by analyzing different types of **big data** sets. Companies that include Amazon, Google, Apple etc., use it.

Big Data Analytics is a name made use of to define data that is enormous in quantity and that goes on budding using time. Big Data comprises of **structured**, unstructured and semi-**structured** data. This data be able to be utilized to track and mine data and/or information for evaluation or exploration purpose.

As big data endures to pervade our usual lives, there has been an important modification of emphasis from the hype contiguous neighboring it to discovery of realistic price in its use.

Big data analytics [1, 2] is the frequently complicated process of investigative **large** and diverse **data** sets -- or **big data** -- to discover data and / or information with hidden patterns, unknown correlations, market trends and customer fondness that can aid establishments formulate knowledgeable commercial verdicts.

Big data technologies **such** as Hadoop and cloud-based analytics fetch **noteworthy** budget returns when it emanates in storing large volumes of **data** – plus they can organize more effective approaches of executing business. Faster, better decision making.

Big data analytics helps bureaucracies connect their data and manipulate it to recognize novel prospects. That, in turn, heads to smarter business changes, more efficient ventures, sophisticated earnings and more contented clients.

Big Data analytics tools and techniques are intensifying in requirement owing to the functions of **Big Data** in businesses. Establishments is capable of fast realizing innovative potentials and increase novel visions to proceed their business professionally. These tools benefit in endowing eloquent evidence for succeeding better business decisions.

A. Advantages

1.   Faults in the group are identified instantaneously.

2.   New strategies of our collaborations are noticed immediately

3.   Service advances significantly.

4.   Fault detection the instant it occurs, and appropriate actions reserved to edge the smash up.

5.   Cost reserves.

6.   Improved transaction perceptions that can guide to extra income.

7.   Retain client developments.

B. Disadvantages

1. needs distinct computer influence.

2. With actual understandings needs a changed means of operations inside the company.

III. PREDICTIVE ANALYTICS IN HEALTH CARE SYSTEMS

Prediction is guesstimate of nearby imminent future said or formally written governmental and / or valid authorized private agencies emanating statements about their investigations to the medias, or any legal authenticated authorities and / or celebrities and / or civic persons are a source of any retained reports or speeches or blogs, podcasts, YouTubes that includes listing financial details or political issues or health issues or fashionable jewelry/dress models or educational issues currently prevailing added with their opinion manipulating what is and / or about what they think will happen in the mere future.

Widely verified, validated and acknowledged real-time control of such predictions in health care domains are very crucial and need-of the hour for discovering the current health issues especially exploring the chronic diseases and their comorbidity will benefit a huge mass particularly, the earliest prediction of the same is best thereby to put forth its preventive measures can be effective and efficient. This prediction requirements are best when they are inquisitively far advanced into the future. These achievable unconstrained remote and far ahead future quantified predictions are invaluable additions providing unpredictable influence and control over health care protection and prevention measures that is implemented. This fundamental forecasting chattels of this poignant.. Predictive Big Data Analytics Systems [3 - 11] impacts the extent of the forecasting limit, as well as the achievable predictions, are automated using Artificial Intelligence and Machine Learning Systems [12 – 14] learnt continuously using modern deep learning, transfer learning rapid learning and / or other algorithms and analyzed using the modern data mining techniques [15 – 18] and big data analytics probe deepest using elements, their relationships and properties of both the elements and relationships. The possibility of manipulating the control, based on prior knowledge of the Predictive Big Data Analytics Systems, Artificial Intelligence and Machine Learning Systems, data mining techniques and big data analytics is needed. Designing such complex Health care systems need a team of exponential technocrats with software engineers strong in Software Engineering concepts and Software architects intelligent in Software architecture. They collaborate with each other building synergized Health care decision support systems that are of high use to the welfare of the public and proposed for the reduction of the time, efforts and cost prediction requirements, such that they are within the range of predictability offered by simple predictors. Blending methods and techniques involving highly intelligent systems that includes

Data Science, Big Data Analytics, with Soft-computing and natural optimization techniques extremely influenced by nature inspired optimization algorithms, Artificial Intelligence and Machine Learning techniques, fuzzy – neural networks, Data mining and ware housing techniques, Relational Database Management Systems, Software Engineering, Software Architecture, Expert Systems, Decision Support Systems collaborating with this Health care process and evolving Wise Health care Knowledgebase and Management Information and Intelligent Decision Support Expert Systems for the welfare of the Indian public currently as first step and that can also be scaled throughout the globe very soon after deploying the complete Health care system.

IV. MANAGEMENT AND PREVENTION IN HEALTH CARE SYSTEMS

The health sector has witnessed great explosion and evolution following the development of new computer technologies, and that pushed this area to produce more medical data, which gave birth to multiple fields of research. Many efforts are done to cope with this explosion of medical data on one hand, and to obtain useful knowledge from it on the other hand, moving further taking intelligent decisions using decision support systems for management and/or prevention of diseases [19 - 22] and finally finetuning all these climbing to the highest level stating for wise decisions from intelligent decisions using decision support systems for management and/or prevention with removal of such diseases predicted. This prompted researchers to apply all the technical innovations like big data analytics, predictive analytics, machine learning and learning algorithms to extract useful knowledge and help in making decisions. With the promises of predictive analytics in big data, and the use of machine learning algorithms, predicting future is no longer a difficult task, especially for medicine because predicting diseases and anticipating the cure became possible. In this paper an overview on the evolution of big data in Health care system is presented after a thorough study, review and analysis of the technologies related to this system, and it will be applied on a set of medical data based on a deep learning algorithm. The objective is to predict chronic kidney diseases by using Soft computing techniques and its optimization using nature-inspired techniques. Hence all predictive, descriptive and prescriptive techniques are used.

V. EXISTING HEALTH CARE SYSTEMS

Descriptive Big Data Analytical Systems [25]is restricted to exemplifying data in the tabular and graphical form. Once the data is investigated and anticipated the method of depicting understandings is assigned for us to deal with. Performance analysis, sales and revenue reports, etc. are common examples of descriptive analytics. Association Rule Discovery & Clustering are types of it.

Diagnostic Big Data Analytical Systems [26, 27] is a method of progressive analytics that scrutinizes data or subject to reply the interrogation "Why did it take place?", then is categorized by methods as drill-down, data discovery, data mining and correlations. Past data can be assessed compared to additional data in response to the query of why something occurred?

Predictive Big Data Analytical Systems [23] is a division of innovative data analytics that encompasses the practices of numerous techniques such as machine learning, statistical algorithms and other data mining procedures to estimate upcoming

actions constructed on past information. Few techniques are given as follows: Ordinary Least Squares, Generalized Linear Models (GLM), Logistic Regression, Random Forests, Decision Trees, Neural Networks, Multivariate Adaptive Regression Splines (MARS),

Classification, Choice modeling, Rule Induction, Network/Link Analysis, Clustering /Ensembles, Neural networks, Memory based/Case-based reasoning, Uplift modeling, also known as net response modeling or incremental response modeling etc.,

Prescriptive Big Data Analytical Systems [24] is a blend of data, mathematical models and several business rules. The data for prescriptive analytics contains both internal (within the organization) and external (like social media data). Business rules are preferences, best procedures, restrictions and other limitations.

Soft computing techniques [28 – 35] is the reverse of conventional computing, bonds with rough sets and approximate models and yields solutions to multifaceted realistic problems. Different to hard computing, as it is accepting fuzziness, vagueness, partial truth, and rough calculation. In conclusion, the function model for soft computing is the human mind. Soft computing is built on methods such as fuzzy logic, genetic algorithms, artificial neural networks, machine learning, and expert systems. Though soft computing philosophy and methods were first made known to in 1980s, it has now developed as a foremost research and learning part in automatic control engineering. The methods of soft computing are today actually exercised fruitfully in numerous inland, profitable, and manufacturing and engineering purposes. With the initiation of the low-cost and very highly executing digital computers and the drop in the cost of memory chips it is distinct that the methods and usage in the fields of soft computing will undergo innovative developments.

Nature-inspired optimization techniques [36, 37] are organized methodological algorithms to all nature-inspired algorithms for optimization that includes particle swarm optimization, ant and bee algorithms, simulated annealing, cuckoo search, firefly algorithm, bat algorithm, flower algorithm, harmony search, algorithm analysis, constraint handling, hybrid methods, parameter tuning and control, as well as multi-objective optimizations..

VI. FUTURE HEALTH CARE SYSTEMS

A. Research Objectives

To implement a high-level Wise Health Care Decision Support Expert System with Nature-inspired Optimized Soft Computing techniques.

The Data mining, Soft computing and Nature-inspired optimization techniques are existing. Blending these three techniques will provide an excellent Future Health Care Systems. From this proposed method the Predictive Big Data Analytical Health Care Systems is being designed and at present in the coding phase.

Exponentially Wise Fuzzy-Neuro Outcome based Predictive Big Data Analytical Systems, Artificial Intelligent Systems, Machine Learning Systems, Wise Inference Engine based on Knowledge/Intelligent-base Systems, Management Information/Intelligent Systems, Wise Decision Support Systems, Health Care Expert Systems that uses Soft Computing techniques and natural nature-inspired optimization techniques for exemplary results have been identified for evaluation and creation of a high-quality outstanding superior Health Care Expert Systems.

B. Strengths of the research

- Accomplish better geographic distribution, together with rural and regional areas,

- Consider the innovative medical therapies and medicine available around the globe.

- Simplify the facilities of innovative service models for instance the start on of telephone based, and Mobile based outreach services

- Qualify the focus on precise residents for example homeless people, indigenous populations and refugees

- Reinforce the progress of local teamwork models concerning related health specialists, GPs and psychiatrists

- Aid the expansion of associations at a local level among prime mental health care services and additional mental health programs for instance private school-based programs or deficiency initiatives

- Allow cooperative and collaborative approaches to enlisting and sustaining workforce

- Arrange for security and sustainable system.

- Hold up national support and at a state level.

- Easy access to elementary medical care.

- Reasonable medical practices required to be able to treat chronic and complex diseases

C. Weaknesses of the research

- Not cost efficient and very complex compared to Better Access

- Does not presently provide beset service provision information to those facts that are in utmost demand.

- There are some potential duplication and overlaps for instance even to the fact of effectiveness in the same offices services and allied health professionals operate.

- There are not enough incentives in existing funding provisions for efficiency and therefore high cost prevails

- Difficulty in dealing demand for services, yet complications in labor force, owing to covered subsidy.

- Quality assurance.

- Some hard to reach to few groups of populations.

- Health care constraints due to shortages of facilities provided.

- No jobs, no perfect or inexpensive health plan

- Not everybody is proficient of dealing his/her health care plan.

VII. FUTURE WORKS AND ENHANCEMENTS

Domains where researchers can have a keen eye on includes Un-parallelized agility for hands-on patient care. A list of 12 health care issues [38] and another of 10 health care list issues [39]. Also, eight most disruptive issues in health care [40] were discussed. These artefacts imparts prudent evidence concerning the influential imminent contests by the health care and ideas to benefit them to rise above tackling them. [41,42] 1. Health care rising costs. 2. Health care regulatory challenges.   3.Medicinal and technological advancement challenges. 4. Training and education challenges. 5. Ethical challenges. The major problems of health services in India [50] includes negligence of the rural population, culture method, inadequate outlay for Health, social inequality, shortage of medical personnel, medical research, expensive health service, etc.

As per Healthline Newsletter due to several reasons, Texas' Health care System is One of the worst in the Country" - September 2018. But at present, some improvements have been shown & ranked 36th among the states.

VIII.CONCLUSIONS

Based on the technological advancement challenges and the education challenges were studied and discussed throughly, a full and in-depth exploratory study on health care issues have been completed and the second step of Predictive Big Data Analytics is being discovered as on-date.

The definite necessities and strategies are active, and deviations are growing at any time deprived of announcements dynamically. It is the concerns of the researcher's for procurement of the most up-to-date indications right away from the Health care application and testing services, and the hospitals and curricula in the health care domain. Denoting to each program's web pages, bulletins, and other publications for the most in-progress information. Researchers are in authority for this appreciative Health Care Expert System requisites, as well as other establishments, requirements, policies, and procedures related to this Health Care Expert System being developed; for enhancing this system incrementally and iteratively agile, appropriate procedures and methodologies will be followed; for understanding intelligent unique policies/procedures and for subsequent through properly follow-ups concerning all the proceedings is performed each time for constructing this product - wise decision support system.

Proposed Systems that is to be cautiously and critically designed for the outcome as the best blended Health care products namely, an Exponentially Wise Fuzzy-Neuro Outcome based Predictive Big Data Analytical Systems, Artificial Intelligent Systems, Machine Learning Systems, Wise Inference Engine based on Knowledge/Intelligent-base Systems, Management Information/Intelligent Systems, Wise Decision Support Systems, Health Care Expert Systems that uses Soft Computing techniques and natural nature-inspired optimization techniques for exemplary results have been identified for evaluation and creation of a high-quality outstanding superior Health Care Expert Systems.

Ambiguity, uncertainty and over-generalization are the adversaries of these robust Health Care systems. An attempt is made for its resolution by implementing a unique way i.e. an exhaustive study, understanding, and analysis of all these concepts in this journal paper to evade these drawbacks, then visualize an optimal solution phase ahead evaluating and creating a high-quality outstanding superior Health Care Expert Systems as the further enhancements. This invaluable system will be a high-ranking, practical and real-time implementable system that solves all the issues related to health care.

IX. ACKNOWLEDGMENT

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