

Health Care Digitalization and Machine Learning

Ajinkya Yelne¹ and Archana Raut²

¹G H Raison College of Engineering/M-Tech Computer Science and Engineering, Nagpur, India.

Email: ajinkya.yelne.cs@ghrce.raisoni.net

²G H Raison College of Engineering/Assistant Professor Computer Science and Engineering, Nagpur, India

Email: archna.raut@ghrce.raisoni.net

Abstract—Digital health can be defined as the use of wearable technology, connected software solutions, artificial intelligence, machine learning, and big data is for empowering and portioning patients to achieve healthcare through informed healthcare choices and available resources. Increased access to health knowledge results in fewer medical visits and improves healthcare as providers deliver high-quality service and outcomes when they can target individual needs. Online Consultation through Digital has grown during pandemics and has become an essential aspect of our life. As costs go down, more patients can access services thereby increasing the reach of healthcare facilities even in areas lacking adequate medical staff which eventually results in digital health care platforms and online consultation. Machine learning is helping digital health care to optimize the results of the search in finding better doctors, treatment, hospitals, and consultations. Certain ML aspects help digital platforms to predict the disease and various other health parameters. Our paper is a review of the digitalization of health care and how machine learning is helping in this context.

Index Terms— Digital health care, Machine learning, online medical consultation and digital platforms.

I. INTRODUCTION

Digitalization of health care industry has increased the data related to hospitals, clinics, patient's history, and various diseases. All this data can help us to deliver a better solution to patients on digital platform through machine learning. Machine learning is widely used to optimized this data. The key players of the digital platform are E-physician, pharmacy, diagnostics, patients and hospitals. This health care and services are digitalizing in India on large scale and this data can be used to optimized the new challenges. We can identify various patterns by data analytics and predict the required outcome by machine learning. While looking closer to machine learning it is classified into 4 types on the basis on input that is available with us and our required output that we desired. Four types of machine learning are supervised learning, semi-supervised, un-supervised and reinforcement learning. All the above machine learning is used to predict the desired output which can optimized our health care applications. Prediction is nowadays very useful in digital health care applications to predict patients' health and give a preventative approach.

II. LITERATURE SURVEY

Aspects of Digitalization of Healthcare in India. (2020) [2] From the paper author has explained a clear and effective delivery for the services to their consumers and citizens of the nation, and appreciates in a true sense of

the India's digitalization. [2] Query and challenges in Digitalization are also well explained.[2] This vast digital health sector will continue to develop, grow and evolve, making healthcare worldwide an even bigger symbol. [2]

Machine Learning in Healthcare. (2019) [1] In this paper, author is using machine learning algorithms and are defined to use machine learning algorithms for analysing different types of healthcare data like clinical, omics, and sensor data which has a impressive result as followed. [1] It results in the hybrid approach performing well with an accuracy of 92.86% for BPM and 85.71% for HR. [1] Algorithms used to get the following output are SVM, Logistic regression, NLP, Random Forest, K Nearest Neighbour. [1]

Diabetes Prediction using Machine Learning Algorithms (2019) [3] Following paper gives a comparison between the machine learning models and pipeline model on different data set i.e., Accuracy with PIMA Dataset. Logistic Regression exceptionally withheld highest accuracy of 96%. [3] More-over in application of pipeline gave AdaBoost classifier as best model with accuracy of 98.8%. [3]

COVID-19 Unborn Soothsaying Using Supervised Machine Learning Models (2020) [4] An ML- grounded vaticination system is been proposed for prognosticating the threat of COVID19 outbreak encyclopaedically. [4] It proves that ES can performs stylishly in the most current soothsaying sphere given the nature as what data is and size of the dataset. LR and Lariat has well approach for soothsaying and outcomes to some extent for prognosticate death rate and confirm cases. [4] Graphical analysis is given by the author on COVID-19 case death cases is a deadly time-series worldwide.

Diabetes Vaticination Using Ensembling of Different Machine Learning Classifiers (2020) [5]. All the trials, which is shown in this literature, was conducted and performed under the same experimental conditions using the Pima Indian Diabetes Dataset to check the feasible outcome [5]. A robust frame for diabetes vaticination was in the outlier rejection, for the missing values, in data standardization, to point selection, K-fold cross-validation, and for different Machine Literacy of ML classifiers such as k-nearest Neighbour, Decision Trees, Random Forest, AdaBoost, Naive Bayes, and XG Boost and Multilayer Perceptron (MLP) were employed on the data sets. AUC as 0.789, 0.934, 0.92, 0.66, 0.50, 0.75 and 0.95 independently which outperforms the state-of-the-art results by 200 in AUC [5].

III. DIGITALIZATION OF HEALTHCARE

Research, analysis and digitalization of health care data are the three important factors in modern healthcare applications. While research we came across big data of hospitals and clinics. Hospitals are assembled with different doctors, specialty and facilities. This data of a single hospital is important in digital application. Classification of Hospitals in digitalization application is shown in figure 1.

LEVEL	CARE	Service
LEVEL 1	HOME CARE/ MEDICARE	Home care service, Doctor on call
LEVEL 1	PRIMARY CARE	Primary Care Physician, Family Physician or Public Health Clinic
LEVEL 2	SPECIALTY PHYSICIAN CARE	Specialist Physician
LEVEL 3	HOSPITAL CARE	Acute Care General Hospital or Ambulatory Surgical Center
LEVEL 4	SPECIALTY HOSPITAL CARE	Specialty Acute Care Hospital

This is also true of the healthcare sector wherein blending the digital approach can help attack the issues of access, affordability, and quality. Digital health results are powered by technologies similar as artificial intelligence (AI) and machine literacy (ML). [6] Espousing these with forestallment, opinion, and cure can help India run near to the thing of digital health for all. This is because health-tech is an integral element of the Fourth Industrial Revolution, and of a society where dates are adding, as is the population of the senior. Unlike space tech where India formerly holds a high place, health-tech is still at an incipient stage. Telemedicine is an innovative approach in digitalizing the health sector by which we can get rare drugs at our doorsteps. Although there's relinquishment, the need of the hour is to nurture this element more. Telemedicine has shown immense

pledge during COVID-19 in terms of access to discussion at home. Prophetic Analytics make healthcare decision-making further robust and allow for croaker- case relations to come more humane and care-grounded as opposed to rushed and transactional. [6] The need for digitalization is to spread mindfulness about available health care installations.

IV. DIGITAL HEALTHCARE PARAMETERS

1. **SCALABLE MODEL:** A viable and aligned business model, value creation vs capture, user vs. payer, go-to-market model.
2. **PROVEN VALUE:** Demonstrates safety & efficiency through clinical trials and/or real-world use, creates compelling Return on Investment (e.g.: cost, quality, patient outcomes) for user.
3. **ROBUST/COMPLIANT PRODUCTS:** Protects patient privacy, complies with regulations, achieves interoperability and high-quality reliable production.
4. **DELIGHTFUL EXPERIENCE:** User centered (e.g.: patient, clinician) experience, easy to use, integrates into existing work flows.
5. **TALENT AND AGILITY:** Enabled by an agile organizational engine.



V. USE OF MACHINE LEARNING IN DIGITAL APPLICATIONS

In the era of digitalization Machine learning play an important role for analysis and prediction of the available labeled data, big data, structured and unstructured data. Data related to health care are very much popular in machine learning projects as:

1. Diabetes Dataset
2. Cancer Dataset
3. Heart Dataset
4. Heart Disease Dataset
5. Hepatitis Dataset
6. Covid 19 Dataset

Above Data sets are widely used for predictions and presentation of various diseases related to the datasets. Thus, it enhances our digitalization applications and create a social economic welfare for our society.

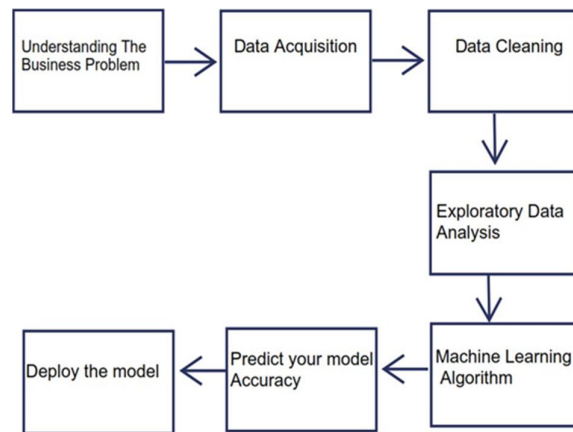
VI. MACHINE LEARNING

Machine learning enables us to analyze the data and predict the required outcome as per data. As types of machine learning is are diversified according to data and outcomes. Supervised machine learning is further diversified into classification and regression model which is widely used for analysis and prediction in health care industry. We can get the desired output by following steps in machine learning to build a model.

Step 1: Firstly, some raw data is entered through the user into the system, for processing.

Step 2: After the data is taken from the user the data will be converted into machine language so that the further process can be done easily.

Step 3: The processed data will now be transferred for comparison with dataset used in this project to predict the disease according to the data.



Step 4: Now the main aim of the project will be executed with the help of following algorithms Logistic Regression, Decision Tree and Random Forest. These are algorithms used for prediction after comparing with the dataset.

Step 5: Now the final predicted result will be sent for testing purpose once again and after that the result will be stored inside data pre-processing block for converting it into Graphical representation.

Step 6: Now the final result will be displayed with accuracy value with the Stock price.

Visualization of above steps is shown in Figure 2.

Process to train a machine learning model is shown in Figure 2. Machine learning model takes raw input data then model is trained in on the basis of interpretations, algorithms and processed to the outcome model as trained model.

VII. CONCLUSIONS

In this context, the author has an approach towards Digital health enterprise, and the approach depends on undergoing the right information awareness at the right place and the right time for the needful person to use in digital format. Operation of digital health care is categorization and machine learning literacy approach in digitalization. Digital healthcare and use of machine learning aspect will help system-wide processes and institutions give more effective and predictive services for a longer period, demonstrating the significance for consumers, clinicians and healthcare systems.

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