

## Chapter 5

# Prediction Models for Healthcare Using Machine Learning: A Review

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### ABSTRACT

*Healthcare is always a sensitive issue for all of us, and it will always remain. Predicting various types of health issues in advance can lead us to a better life. Various types of health problems are there like cancer, heart diseases, diabetes, arthritis, pneumonia, lungs disease, liver disease, and brain disease, which all are at high risk. To reduce the risk of health issues, some suitable models are needed for prediction. Thus, it became as a motivational factor for the authors to survey the existing literature on this topic thoroughly and have consequently to identify suitable machine learning techniques so that improvement can be possible while selecting a prediction model. In this chapter, concept of survey is used to provide the prediction models for healthcare issues along with the challenges associated with each model. This chapter will broadly cover the following: machine learning algorithms used in health industry, study various prediction models for Cancer, Heart diseases, Diabetes and Brain diseases, comparative study of various machine learning algorithms used for prediction.*

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## INTRODUCTION

We as human beings, stand the highest in the hierarchy of beings, acquire or broaden our existing knowledge by a difficult yet fruitful process called ‘learning’. Mathematically, learning can be defined as acquiring wisdom or awareness by a process of studying, experiencing, analyzing or being taught all the above stated. But if given much thought, the process of learning cannot be defined by mere words, as the process is susceptible to change and is different for everyone.

Machine learning attends to computational learning by employing pattern recognition as it’s base concept. It works by extracting knowledge or information from the data which is fed into it as input. Machine learning is a scopic field that acknowledges the concepts related to the study and formulation of algorithms that can learn from and make predictions on the given data or sets of data called as datasets. It is the crossroads between mathematics, which supplies with all the methods, concepts and theories required for the domain, statistics, a discipline which happens to specialize in the prediction making from the given data, and artificial intelligence, which is nowadays a shorthand for any task which a computer can perform just as well, if not better than humans. Machine learning has become an indivisible element of our lives, or to say it with even more clarity, our lives are strongly influenced by machine learning algorithms, be it a selection of a movie or a TV series to watch or chatbots instructing you on how to get your mixer running again, They’ve covered it all. Various fields which are being influenced are transportation, gaming, environmental protection, security, media, healthcare, and the list can go on. Some major breakthroughs have been witnessed in the field of medicine. A study by Consulting firm Frost & Sullivan claims that the use of Artificial Intelligence in the healthcare industry will most likely grow to \$6.16 billion, at an annual rate of 68.55% between 2018 and 2022. ‘Automatic diagnosis’ using image recognition, disease spot identification using pattern recognition and the use of patient’s data to generate personalized treatment plans for patients, are some of the highlights of the use of artificial intelligence in the healthcare sector. Here, the authors talk about the predictive models of machine learning in detail and look into their types, usage and limitations.

Dealing with diseases before their spread or even diagnosis is a better approach than combating these maladies, and for this purpose, artificial intelligence has proved to be provident. They have proved to be an exceptional resource for the healthcare industry by enabling it to achieve much higher accuracy and thus diagnosis results.

In this chapter, different types of machine learning algorithms are talked about and their implementation is studied on various diseases with the help of a survey conducted. The diseases selected to fulfil this purpose are distinctly general, so as to bolster the reader’s understanding of the disease and thus, the predictive model explained later. The algorithms emphasized in this chapter are K-Nearest Neighbor, Classification and Regression Trees, Support Vector Machine (SVM), Naïve Bayes, Gradient Boosted Regression Tree, Perceptron Back-Propagation, Random Forest in Supervised learning, Linear Regression and Logistic Regression in Semi Supervised learning, K-Means Clustering and Classification in Unsupervised Learning.

The chapter is divided into 5 sections. Section 2 talks about the various machine learning concepts, which are a prerequisite for the subsequent sections. Section 3 gives a brief introduction to the diseases taken for the study and survey. Section 4 illustrates the different machine learning algorithms by dividing them on the basis of the diseases they are used to predict. The results obtained from the survey are tabulated in a precise manner for enriching the reader’s understanding. The final section presents the conclusions drawn and the possible future work in the field.

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