Chapter 15


Kumar Vijay
Manav Rachna International University, India

Saxena Arti
Manav Rachna International University, India

Kumar Suresh
Manav Rachna International University, India

ABSTRACT

Health care is considered as the fundamental right of every citizen and it is principle duty of every country to provide good health care facilities. Many developed countries spend substantial amount of gross domestic product (GDP) on healthcare. In this chapter, we discuss kernel based machine learning techniques, i.e., k-PCA (Kernel principal component analysis) and its related properties with a aim to prescribe cost effective treatments and easy diagnosis of diseases. This objective could be met only by the serious collaboration between physician and data scientist. We discussed that how we could construct a kernel and exact features based on the given dataset. Also, we compared the proposed method with the other methods. For the sake of easy understanding, applications of the proposed method are included in the text.

1. INTRODUCTION

A robust health care system is the foremost factor and the need that can contribute to the personal health of everyone in the changing environment. Unfortunately, health care is a costly affair. [WHO, 2015], world health organization (WHO) revealed that United States alone spent 17.0% of gross domestic product (GDP) on health care in 2012, which is the highest among the globe and the expenditure in terms of

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percentage of GDP is also growing, which is up from 13.1% in 1990. Every developed country spends substantial amount of their GDP on providing health care facilities to their citizens. The estimated details of some developed countries are as:

1. France spent 11.6% of GDP on health in 2012, which is up from 10.1% in 1990.
2. Germany spent 11.3% of GDP, which is up from 10.4% in 1990.
3. Canada increased spending from 10.9% of GDP in 2012 to 8.7% in 1990.
4. United Kingdom spent 9.3% of GDP in 2012, which is up from 6.9% in 1990.

Overall, the trend represents that one should increase the budget of health care, which is not feasible for the countries with low GDP. Therefore, certain reforms in health care solutions need to be incorporated. Globally, health care systems should be efficient enough at treating patients as well as reducing costs of the treatments.

[Blumenthal, 2010], to keep this in mind, the United States established the Health Information Technology for Economic and Clinical Health (HITECH) Act in 2009. The purpose of the act is to establish programs to improve the quality of health care, safety and efficiency by using information technology in health care to make meaningful use of electronic health records (EHR) and secure electronic sharing of information. The ultimate aim of the act is to create more information-based, higher-quality based health care system. Also, the act provide incentives to eligible professionals and health care centers, who adopt, implement, upgrade or demonstrate meaningful use of e-health records (EHR) technology. Therefore, health care providers have collected huge amount of structured and unstructured data, which this data helps in the improvement of the existing health care systems with a goal to reduce the cost of the treatments.

World Health Organization (WHO) estimates that the expenditure on health care reveals a trend of increasing costs, the existing health care systems are not efficient enough to treat the patients at reasonable cost. Various incentives and programs were proposed by the authorities to develop information based e-health care systems by using machine learning tools in medicine. These tools will definitely enhance the level of existing system of health care.

In this chapter, we propose new methods for the modeling of individual response to the treatment. It also improves the collaboration between machine learning experts and clinicians.

2. BACKGROUND

No doubt, machine learning is a tool to deal with the large datasets with the outcome to produce meaningful information but the real challenge is that what to do with all the available data. These larger datasets includes more relational, temporal, unstructured data in complex form collected through multiple sources. These heterogeneous datasets urges the technology to develop new tools for practical purposes. [Page, 2015], machine learning offers variety of new tools for the analysis of data that can be used to improve health care among patients. [Mitchell, 1997], machine learning is the generalized area of artificial intelligence which focuses on algorithms, learns from the concerned datasets and construct models used for the purpose of decision making. We encountered with many applications of machine learning without even thinking of it.