

Research Article

Machine Learning ensemble model to support and provide alerts for heart disease patients

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Received 10 Nov 2020, Accepted 10 Dec 2020, Available online 01 Feb 2021, **Special Issue-8 (Feb 2021)**

Abstract

In this work, an effective scientific advice device that makes use of a quick Fourier transformation-coupled gadget studying ensemble model is proposed for short-time period disease danger prediction to provide persistent heart disorder patients with appropriate recommendations approximately the want to take a medical check or not on the approaching day based totally on reading their clinical information. The enter series of sliding home windows based at the patients time collection statistics are decomposed by way of the usage of the short Fourier transformation so one can extract the frequency facts. A bagging-based totally ensemble model is utilized to predict the patient's condition someday in advance for generating the final recommendation. A combination of 3 classifiers synthetic neural community, least squares-help vector gadget, and naive bayes are used to construct an ensemble framework. A actual-lifestyles time series tele health facts gathered from chronic heart disease patients are applied for experimental evaluation. The advise device yields excellent recommendation accuracy and offers an powerful way to lessen the threat of wrong hints in addition to reduce the workload for coronary heart sickness sufferers in carrying out frame assessments every day. The proposed system is a promising tool for reading time collection medical statistics and providing correct and dependable pointers to sufferers laid low with persistent heart diseases.

Keywords: Time Series Analysis, Intelligent Systems, Medical Data, Heart Disease, Recommender Systems

Introduction

In Chronic diseases had been one of the major public health worries international, which account for over 50% of world mortality and for that reason require increasingly medical attentions and sources in nowadays's an increasing number of elderly societies. Heart disorder, one of the most not unusual continual diseases, is presently registering one of the highest death quotes of the non- infectious illnesses, causing a high related cost in prevention and remedy. Due to a lack of medical pointers that may be routinely generated for a higher treatment and care, the life first-rate of continual heart disorder patients has been substantially affected. Telehealth structures have become increasingly famous and are effective manner to deal with the challenges posed by means of the cares of patients with chronic illnesses, and therefore have enjoined speedy developments in many nations because of its low-fee and speedy carrier delivery. Most telehealth offerings are introduced through Web-primarily based packages which use Web browsers and Internet, collectively with sensors, cellular and wearable devices. Given the significance of disease chance prediction in the scientific area [26] in addition

to the urgency of acquiring extra effective analytic techniques for sickness risk prediction, great efforts are needed to decorate the satisfactory of evidence primarily based decisions and pointers in the telehealth environment. For the case of continual heart ailment patients, they need to undertake numerous every day clinical checks to monitor their ordinary heart health situations thru the telehealth machine. Yet, sporting out various medical checks each day inside the cutting-edge practice brings lots of inconvenience and even burden to the sufferers and adversely affects their existence quality. Producing correct smart guidelines to guide their each day clinical tests can correctly lessen their workload in taking those tests while maintaining the associated health threat in an appropriate low level. In this task, endorse machine provide continual heart sickness sufferers with appropriate tips approximately the need to take a scientific check or not on the approaching day based totally on reading their clinical data.

Review Of Literature

In this paper, an intelligent recommender system is developed, which uses an innovative time series

prediction algorithm to provide recommendations to heart disease patients in the tele-health environment. Based on analytics of each patients medical tests in records, the system provides the patient with decision support for necessity of medical tests. The experimental results show that the proposed system yields satisfactory accuracy in recommendations. The system also offers a promising way for saving the workload for patients and healthcare practitioners in conducting daily medical tests. The research will help reduce the workload and cost in healthcare and help the healthcare industry transform from the traditional scenario to more a personalized paradigm in a tele-health environment. [1]

In the recent aging society, studies on health care services have been actively conducted to provide quality services to medical consumers in wire and wireless environments. However, there are some problems in these health care services due to the lack of personalized service and the uniformed way in services. For solving these issues, studies on customized services in medical markets have been processed. However, because a diet recommendation service is only focused on the personal disease information, it is difficult to provide specific customized services to users. This study provides a customized diet recommendation service for preventing and managing coronary heart disease in health care services. This service provides a customized diet to customers by considering the basic information, vital sign, family history of diseases, food preferences according to seasons and intakes for the customers who are concerning about the coronary heart disease. The users who receive this service can use a customized diet service differed from the conventional service and that supports continuous services and helps changes in customers living habits. [2]

Over the last few years there has been increasing interest in conceptualizing disease etiology within a life course frame- work. This approach is not new to Public Health or unique to epidemiology. However, its current resonance and interest within epidemiology reflects the challenging theoretical framework this approach provides. This issue of the International Journal of Epidemiology has several papers with a life course theme. This accompanying editorial is intended to highlight what we believe are the key conceptual issues around life course epidemiology. We have chosen to use examples from chronic disease epidemiology, but this approach is also applicable within the context of infectious diseases³ and wider notions of health and wellbeing. We have defined a life course approach to chronic disease epidemiology¹ as the study of long-term effects on chronic disease risk of physical and social exposures during gestation, childhood, adolescence, young adulthood and later adult life. It includes studies of the biological, behavioral and psychosocial pathways that operate across an individuals life course, as well as across generations, to influence the development of chronic diseases. [3]

A life course approach to chronic disease epidemiology uses a multidisciplinary framework to understand the importance of time and timing in associations between exposures and outcomes at the individual and population levels. Such an approach to chronic diseases is enriched by specification of the particular way that time and timing in relation to physical growth, reproduction, infection, social mobility, and behavioral transitions, etc., influence various adult chronic diseases in different ways, and more ambitiously, by how these temporal processes are interconnected and manifested in population-level disease trends. In this review, we discuss some historical background to life course epidemiology and theoretical models of life course processes, and we review some of the empirical evidence linking life course processes to coronary heart disease, hemorrhagic stroke, type II diabetes, breast cancer, and chronic obstructive pulmonary disease. We also underscore that a life course approach offers a way to conceptualize how underlying socio-environmental determinants of health, experienced at different life course stages, can differentially influence the development of chronic diseases, as mediated through proximal specific biological processes. [4]

Disease Management (DM) is a system of coordinated healthcare intervention and communications for populations with conditions in which patient self-care efforts are significant. e-DM makes reference to processes of DM based on clinical guidelines sustained in the scientific medical evidence and supported by the intervention of Information and Telecommunication Technology (ICT) in all levels where these plans are developed. This paper discusses the design and implementation of an eDM system which meets the requirements for the integrated chronic disease management following the recommendations of the Disease Management Association and the American Heart Association. [5] The cost of health care in the United States has been increasing at an annual rate of 9.8%, faster than the cost of living, since 1970. This is due to many factors, the most significant being preventable and manageable chronic conditions and diseases, known as comorbidities. These comorbidities are associated with individuals who classify as being overweight or obese, representing 68% of the United States population. This creates a strain on the health care system and the economy. Decreasing the number of overweight or obese individuals is necessary to reduce the prevalence of weight related comorbidities. This can be accomplished through establishing and maintaining the proper energy balance between caloric intake and physical activity. The government leads many efforts to educate individuals on the importance of incorporating nutrition and physical activity. Since limited budgets for encouraging participation exist, a need exists for a system designed to assist policy makers in determining which age cohorts, or groups,

given a level of adherence to recommendations, would result in the most benefit to stakeholders. [6]

Existing System

Existing paintings cope with chronic heart sickness problem. Also, most of them only cognizance on the long term medical prediction. Nevertheless, the quick term prediction, which is studied in our paintings, has turns to be more tough thanthe lengthy-term prediction as sufferers’ conditions can also enjoy more dramatic and abrupt adjustments in the course of the short-time period time-frame.

Problem Statement

Classification problem which includes using type strategies (called classifiers) to predict the need of taking body check of a given scientific dimension and coronary heart sickness.

Proposed System

The proposed machine is a promising tool in healthcare of chronic coronary heart sickness patients. Our advice gadget could be very accepted which may be comfortably carried out to sufferers suffering from different persistent diseases inside the equal or similar telehealth surroundings. The major reason of the take a look at is to investigate the coupling of the short Fourier transformation with a machine getting to know-primarily based ensemble in supplying medical pointers to patients stricken by chronic coronary heart disease as to the necessity of taking a scientific test on the approaching day. In this assignment, a top level view is first provided on the structure of the recommender system accompanied by means of the exact discussion on the quick Fourier transformation and the ensemble gaining knowledge of model, principal technical additives of the gadget.

System Architecture

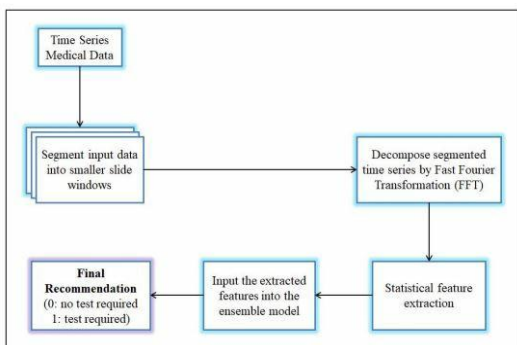


Figure. 1. System architecture

System Requirements

A. Software Requirements

- *Operating System: Microsoft Windows 7 and Above.*
- *Programming Language: Java.*
- *Database: MySQL.*
- *IDE: Netbeans.*

B. Hardware Requirements

- *Processor: Intel Core I3 or Higher*
- *RAM: 4 GB or Higher*
- *Hard Disk: 100 GB (min)*

Mathematical Model

Let S be the whole System, Set S = I, P, O
 Where, Input (I) represented as: I = {I0, I1, I2, I3, I4}
 I0 = Patient Registration Details I1 = Patient Login
 I2 = upload patient health record
 I3 = doctor check patient medical record I4 = give prescription
 Process (P) represented as: P = {P0, P1, P2, P3, P4}
 P0 = Login by Patient-side P1 = Login by doctor-side P2 = Approval of login
 P3 = SVM, CNN
 P4 = Logistic Regression & Random Forest Output (O)
 represented as: O = {O0, O1, O2, O3, O4}
 O0 = show Patient details O1 = receiver id
 O2 = Predict heart disease O3 = Get Prescription
 O4 = view details

Result And Discussion

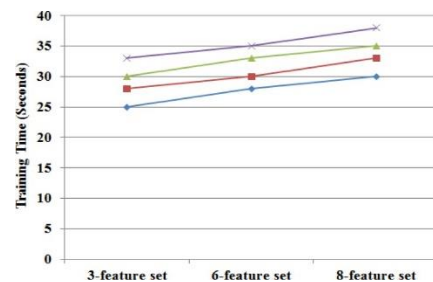


Figure. 2. Comparison of the training time between the base classifiers and the ensemble model.

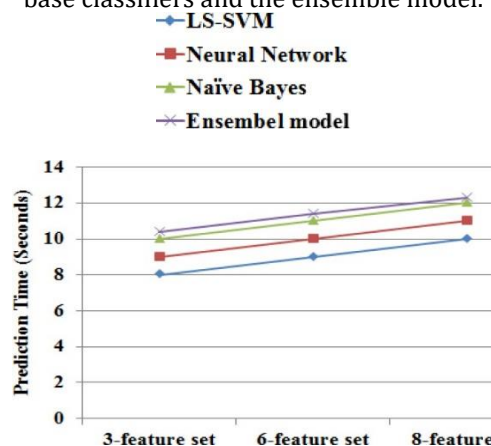


Figure. 3. Comparison of prediction time between the base classifiers and the ensemble model.

Conclusion

In this work, I endorse a advice machine supported via a gadget learning ensembleversion with the short Fourier transformation for short-term ailment hazard prediction and scientific check advice inside the tele health surroundings for patients laid low with continual heart disease. This system applies the quick Fourier transformation, which effectively analyzes the clinical time collection statistics and enter the extracted statistical functions to the ensemble version to generate the correct, dependable pointers for persistent coronary heart disease sufferers. Three popular and capable classifiers, i.e., Neural Network, Least Square-Support Vector Machine and Naive Bayes are used to construct the ensemble framework.

The proposed gadget the usage of all the statistical functions produced by way of the short Fourier transformation yields a better predictive performance for predicting the patient's condition in comparison with the opposite feature sets. The machine is more effective than the man or woman base classifiers used within the ensemble version and outperforms the previously proposed methods to solve the identical trouble. My assessment establishes that my recommendation gadget is effective in improving the great of medical proof based decisions and assist reduce the time prices incurred by the persistent heart sickness sufferers in taking their each day clinical take a look at, wherein improving their general existence quality.

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