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Utilizing support vector machines for predictive analytics in chronic kidney diseases

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Abstract

Chronic kidney disease (CKD), due to rising patients, the high probability of deterioration towards end-stage renal disease and inaccurate estimates of morbidity and mortality, constitutes a heavy burden on the sanitary infrastructure. The aim of this research is to build a model for machine-learning, which uses comorbidity and data on drugs and predicts population prevalence. Predictive health care prediction using machine learning is a daunting activity to help clinicians assess the precise therapies for life-saving. In this paper, the study applies machine learning method in combination with ensemble learning for estimation of chronic kidney disease with clinical evidence. They are based on chronic kidney disease datasets and the efficiency of these models is compared to choose the best classifier for chronic kidney disease prediction. The comparative analysis is estimated in terms of various metrics like classification accuracy, f-measure, percentage error, etc. The results of simulation shows that the proposed ensemble machine learning classifier namely Ensemble Support Vector Machine predicts well the chronic kidney disease from the datasets than other existing ensemble methods.

Introduction

Kidney disease is currently an important concern. That this illness has so many victims. The kidney disease is particularly dangerous and could be fatal if not immediately treated. Doctors will heal the patients on time if they are given an appropriate method to classify patients expected to develop kidney failure in advance (Fig. 1).

CKD puts a huge economic burden on care, health facilities and the economy. The ESRD treatment is either costly or complex to treat with renal replacement therapy. CKD is also compounded by the association of chronic diseases. From the point of view of public health, it is also important that developments in the occurrence of CKD are prediction so that policy makers can make timely decisions to minimise a future rise in the number of cases. Such interventions can include increased community surveillance for CKD risks and awareness strategies as the most successful measures to

combat exacerbation, with minimum associated costs, have been found to be improvements in patient lifestyle [1]. Adequate haemodialysis facilities and preparation of the staff are provided through more mitigation strategies.

The use of machine learning in healthcare to build model predictive diseases has become popular with the availability of biomedical laboratory evidence. In addition, approaches like in-depth learning and ensemble learning have dramatically increased the predictive ability of machine model learning. Exact disease prediction models can be developed by deriving features from the Electronic Health Records (EHR) [2], [3]. On a patient basis, a doctor will measure the inception of CKD with a laboratory examination, analyse parameters like the glomerular filtration rate (eGFR) and use the urinary test to measure the readily accessible albumin-creatinine ratio [4]. Laboratory results, however, are generally not accessible to a wide degree from the viewpoint of public health. However, it is possible to quickly obtain two distinct forms of data from the files of the insurance providers.

In this study, the authors suggested and tested a new approach to feature engineering to exploit this hierarchy, while reducing feature dimensionality at the same time. This model used ensemble support vector machine (ESVM) classifier to classify and predict the instances over CKD datasets.

Section snippets

Background

Popular approaches for EHR data are to gather clinical and laboratory data from sources like billing or claims, download resumes, biography of the patient, and create models of features from them. In previous research, longitudinal data were used to capture temporal patterns to build models of CKD disease prevision.

Ho et al. [9] presented an image interpretation based computer-aided diagnosis. This system identifies and classifies numerous CKD phases. The clustering of the K-means was used to…

Proposed method

In the first step, nominal attributes are converted into binary attributes in the training data. In the second stage, the selection approach of BestFirst functions is used to pick a subset of features to minimise the amount and time of preparation. The BestFirst looks for sequential filtering of the function subsets. Third step is to train the classifying model to build the predictive model for the prediction of invisible data. In the last step, test data estimate the chronic kidney type.…

Results and discussions

This section addresses the assessment of the proposed classification model for the Matlab in a high-end computing. The reliability of the proposed procedure is calculated in this article in the following ways: sensitivity, precision and accuracy.

To analyse model output, test data sets were used. The validation of the test data sets prevented future performance estimate bias because the model was over-adapted to training data sets. In order to normalise variable values to values from −1 to +1…

Conclusions

In this paper, ESVM classifier is used for the prediction of CKD over various datasets. The comparative analysis is estimated in terms of various metrics like classification accuracy, f-measure, percentage error, etc. The test results of the efficiency of the ESVM classification are satisfactory, allowing for the higher sensitivity of up to 100% on imbalanced data and at the same time it acquires lower specificity.…

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.…

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