Chapter 5
A Decision Tree on Data Mining Framework for Recognition of Chronic Kidney Disease

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ABSTRACT

The term chronic kidney disease (CKD) refers to the malfunction of the kidney and its failure to remove toxins and other waste products from blood. Typical symptoms of CKD include color change in urine, swelling due to fluids staying in tissue, itching, flank pain, and fatigue. Timely intervention is essential for early recognition of CKD as it affects more than 10 million people in India. This chapter suggests a decision tree-based data mining framework to recognize CKD from Non chronic kidney disease (NCKD). Data sets derived from open source UCI repository was considered. Unlike earlier reported work, this chapter applies the decision rules based on the clustered data through k-means clustering process. Four cluster groups were identified and j48 pruned decision tree-based automated rules were formatted.

The performance of the proposed framework was evaluated in terms of sensitivity, specificity, precision, and recall. A new quantitative measure, relative performance, and MCC were introduced which confirms the suitability of the proposed framework for recognition of CKD from NCKD.

INTRODUCTION

Kidney is the primary part of the excretory system which removes the excessive body fluids and wastes. The required chemical homeostasis is thereby maintained and thus it prevents any damage to the internal organ. There are situations where kidneys fail to function towards removing toxins and waste product from the blood. Such condition leads to chronic kidney disease (CKD). (Matovinović, 2009; Collister et al., 2016; Levey et al., 2005; Jojoa et al., 2017) Chronic kidney disease (CKD) refers to failure to generate functional aspects of kidney where one has to go for renal dialysis if it is for chronic renal failure. The acute renal failure leads to occurrence of end-stage renal disease (ESRD). The process of dialysis helps in removing the toxins and waste and helps the kidney to function through an artificial mode. The complex renal failure leads to chronic condition where one has to undergo kidney transplantation.

According to a survey 10 – 15% of adult population are being affected by CKD in India can be noted that CKD has been found to be potential indicator for increased cardiovascular disease and death. Studies reveals that CKD has a huge impact on causing hypertension, diabetes, obesity etc. One can refer to the work reported on pathophysiology and kidney disease classification for future understanding (Matovinovic, 2009).The decrease in GFR causes accumulation of Urea, Creatinine and other in blood. Thus affects the regular function of kidney. According to the kidney disease improving global outcomes declaration, Potential indication of CKD can be recognized by GFR of less than 60 ml / minute / $1.73m^2$ (Levy et al., 2005). A detailed review in progression in CKD has been reported (Collister et al., 2016).

Developing country like India needs special attention as the number of people affected crossed 10 million according to a survey reported recently (Matovinovic, 2009). The decline of excretory, metabolic and endocrine functionalities merely indicates the stage of CKD occurrence. The biomarker that identifies the presence of the CKD includes presence of the presence of sediments in the urine, increased level of albumin excretion rate (AER) and albumin creatinine ratio (ACR); structural deformation reflected through the two-dimensional imaging procedure. The occurrence of CKD can be prevented through early intervention mechanism where

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