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Prediction of Early-stage Chronic Kidney Disease Using Machine Learning Algorithms

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Objectives: Chronic Kidney Disease (CKD) is a worldwide public health problem. In the United States, there is a rising incidence and prevalence of kidney failure, with poor outcomes and high cost. CKD is more prevalent in the elderly population. However, while younger patients with CKD typically experience progressive loss of kidney function, 30% of patients over 65 years of age with CKD have stable disease. Our objective was to predict the early-stage chronic kidney disease using machine learning.

Methods: We used secondary data from UCI Machine Learning Repository (Chronic_Kidney_Disease Data Set: http://archive.ics.uci.edu/ml). We had 400 instances with 2 groups where 250 was CKD and 150 was non-CKD patient. We used 24 classes (11 numeric and 14 nominal) in our study. We used decision tree and neural network algorithms to predict early-stage chronic kidney disease.

Results: Our decision tree model achieves 93% (sensitivity), 99% (specificity), 96% (AUC), 99% (accuracy). On the other hand, neural model achieves 100% (sensitivity), 100% (specificity),100% (AUC), 100% (accuracy).

Conclusions: We had acceptable model performances from both predictive models (decision tree and neural network). However, neural network model archive highest performance. In future we may include more variables including other predictive model.