**LITERATURE SURVEY**

**1) Contemporary issues and new challenges in chronic kidney disease amongst people living with HIV**

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Chronic kidney disease (CKD) is a comorbidity of major clinical significance amongst people living with HIV (PLWHIV) and is associated with significant morbidity and mortality. The prevalence of CKD is rising, despite the widespread use of antiretroviral therapy (ART) and is increasingly related to prevalent non-infectious comorbidities (NICMs) and antiretroviral toxicity. There are great disparities evident, with the highest prevalence of CKD among PLWHIV seen in the African continent. The aetiology of kidney disease amongst PLWHIV includes HIV-related diseases, such as classic HIV-associated nephropathy or immune complex disease, CKD related to NICMs and CKD from antiretroviral toxicity. CKD, once established, is often relentlessly progressive and can lead to end-stage renal disease (ESRD). Identifying patients with risk factors for CKD, and appropriate screening for the early detection of CKD are vital to improve patient outcomes. Adherence to screening guidelines is variable, and often poor. The progression of CKD may be slowed with certain clinical interventions; however, data derived from studies involving PLWHIV with CKD are sparse and this represent an important area for future research. The control of blood pressure using angiotensin converting enzyme inhibitors and angiotensin receptor blockers, in particular, in the setting of proteinuria, likely slows the progression of CKD among PLWHIV. The cohort of PLWHIV is facing new challenges in regards to polypharmacy, drug–drug interactions and adverse drug reactions. The potential nephrotoxicity of ART is important, particularly as cumulative ART exposure increases as the cohort of PLWHIV ages. The number of PLWHIV with ESRD is increasing. PLWHIV should not be denied access to renal replacement therapy, either dialysis or kidney transplantation, based on their HIV status. Kidney transplantation amongst PLWHIV is successful and associated with an improved prognosis compared to remaining on dialysis. As the cohort of PLWHIV ages, comorbidity increases and CKD becomes more prevalent; models of care need to evolve to meet the new and changing chronic healthcare needs of these patients.

**2) A machine learning methodology for diagnosing chronic kidney disease**

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Chronic kidney disease (CKD) is a global health problem with high morbidity and mortality rate, and it induces other diseases. Since there are no obvious symptoms during the early stages of CKD, patients often fail to notice the disease. Early detection of CKD enables patients to receive timely treatment to ameliorate the progression of this disease. Machine learning models can effectively aid clinicians achieve this goal due to their fast and accurate recognition performance. In this study, we propose a machine learning methodology for diagnosing CKD. The CKD data set was obtained from the University of California Irvine (UCI) machine learning repository, which has a large number of missing values. KNN imputation was used to fill in the missing values, which selects several complete samples with the most similar measurements to process the missing data for each incomplete sample. Missing values are usually seen in real-life medical situations because patients may miss some measurements for various reasons. After effectively filling out the incomplete data set, six machine learning algorithms (logistic regression, random forest, support vector machine, k-nearest neighbor, naive Bayes classifier and feed forward neural network) were used to establish models. Among these machine learning models, random forest achieved the best performance with 99.75% diagnosis accuracy. By analyzing the misjudgments generated by the established models, we proposed an integrated model that combines logistic regression and random forest by using perceptron, which could achieve an average accuracy of 99.83% after ten times of simulation. Hence, we speculated that this methodology could be applicable to more complicated clinical data for disease diagnosis.

**3) Predict ion of kidney disease stages using data mining algorithms**

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Early detection and characterization are considered to be critical factors in the management and control of chronic kidney disease. Herein, use of efficient data mining techniques is shown to reveal and extract hidden information from clinical and laboratory patient data, which can be helpful to assist physicians in maximizing accuracy for identification of disease severity stage. The results of applying Probabilistic Neural Networks (PNN), Multilayer Perceptron (MLP), Support Vector Machine (SVM) and Radial Basis Function (RBF) algorithms have been compared, and our findings show that the PNN algorithm provides better classification and prediction performance for determining severity stage in chronic kidney disease.

**4) Classification of Chronic Kidney Disease using Logistic Regression, Feed Forward Neural Network and Wide Deep Learning**

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Chronic kidney disease (CKD) is a global health burden that affects approximately 10% of the adult population in the world. It is also recognized as the top 20 causes of death worldwide. Unfortunately, there is no cure for CKD however, it is possible to slow down its progression and mollify the damage by early diagnosis of the disease. Due to a limited number of nephrologists, the early diagnosis of CKD is often not possible for most of the people. Therefore the use of modern computer-aided methods is necessary to aid the traditional CKD diagnosis system to be more efficient and accurate. In this research, our primary focus was to apply 3 modern machine learning techniques namely logistic regression, feedforward neural networks and wide & deep learning to diagnose CKD as well as finding the best performing technique by evaluating their diagnosis performance. To evaluate their performance, f1-score, precision, recall and AUC score was used for logistic regression and an additional loss score was considered for the feedforward neural networks and wide & deep model. We found the feedforward neural network as the best performing technique for CKD diagnosis with 0.99 f1-score, 0.97 precision, 0.99 recall and 0.99 AUC score. Logistic regression produced the lowest result among all and the wide & deep learning with a larger number of hidden layers and neurons found to be effective for larger datasets.

**5) Role of attributes selection in classification of Chronic Kidney Disease patients**

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In the present days the Chronic Kidney Disease (CKD) is a common problem to the public. CKD is generally considered as kidney damage and is usually measured with the GFR (Glomerular Filtration Rate). Several researchers from health care and academicians are working on the CKD problem to have an efficient model to predict and classify the CKD patient in the initial stage of CKD, so that the necessary treatment can be provided to prevent or cure CKD. In this work classification models have been built with different classification algorithms, Wrapper subset attribute evaluator and best first search method to predict and classify the CKD and non CKD patients. These models have applied on recently collected CKD dataset downloaded from the UCI repository. The models have shown better performance in classifying CKD and non CKD cases. Results of different models are compared. From the comparison it has been observed that classifiers performed better on reduced dataset than the original dataset.