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Kidney Stone Prediction using Supervised Machine learning technique

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ABSTRACT: Prediction of kidney stones helps medical professionals make more precise health decisions for their patients. Early detection enables people to adjust their lifestyles and, if necessary, ensure effective medical care using machine learning (ML) could be a good way to decrease and understand Stomach pain symptoms. To choose particular characteristics from the Kidney, the chi-square statistical test is used from the Stone urine dataset. Logistic regression, XGBoost, and Light GBM algorithm have been employed for developing a Kidney stone prediction model and obtained accuracy. To demonstrate how the attributes connect, data visualization was developed. According to the findings of the experiments, the XGBoost algorithm achieves high accuracy during validation for data instances with selected features of the Kidney stone urine analysis dataset

KEYWORDS: Kidney Stone Prediction, XGBoost Algorithm, Data Visualization.

I. INTRODUCTION

Kidney stones are mainly lodged in the kidneys and it is the most common disease of the urinary tract. The prevention of recurrent kidney stones continues to be a critical issue for human health. A deeper comprehension of the mechanisms involved in stone formation is necessary for the avoidance of stone recurrence. End-stage renal failure and chronic kidney disease risk factors have both been linked to kidney stones. Kidney stones may be a systemic condition connected to metabolic syndrome, according to some research. If nephrocalcinosis is present, nephrolithiasis accounts for 2–3% of instances of end-stage renal disease. Kidney stones are solid, hard particles of material that develop as a result of minerals in the urine. They are the result of a synthesis of environmental and genetic influences. This condition can be exacerbated by obesity, particular diets, medicines, a lack of fluids, and other factors. The appearance of automated data mining tools become a must according to the explosion of data, and using such tools assists by reducing the time-consuming in extract useful knowledge from the available data through using a machine learning algorithm. Many strategies are being used to process this enormous volume of data effectively. Medically, data mining is used to analyze the information obtained from research reports, the data obtained are processed using the data mining tool techniques. This report provides a detailed discussion of the ongoing study on kidney datasets utilizing a variety of data mining approaches. This study intended to construct a model for the early diagnosis of kidney stones to give a decision support system.

II. RELATED WORK

Accurate segmentation of kidney tumors can assist doctors to diagnose diseases and to improve treatment planning, which is highly demanded in clinical practice. In this work, we propose multi-resolution 3D V-Net networks to automatically segment kidney and renal tumors in computed tomography (CT) images. Specifically, we adopt two resolutions and propose a customized V-Net model called VB-Net for both resolutions. The VB-Net model in the coarse resolution can robustly localize the organs, while the VB-Net model in the fine resolution can accurately refine the boundary of each organ or lesion. We experiment with the KiTS19 challenge, which shows promising performance.

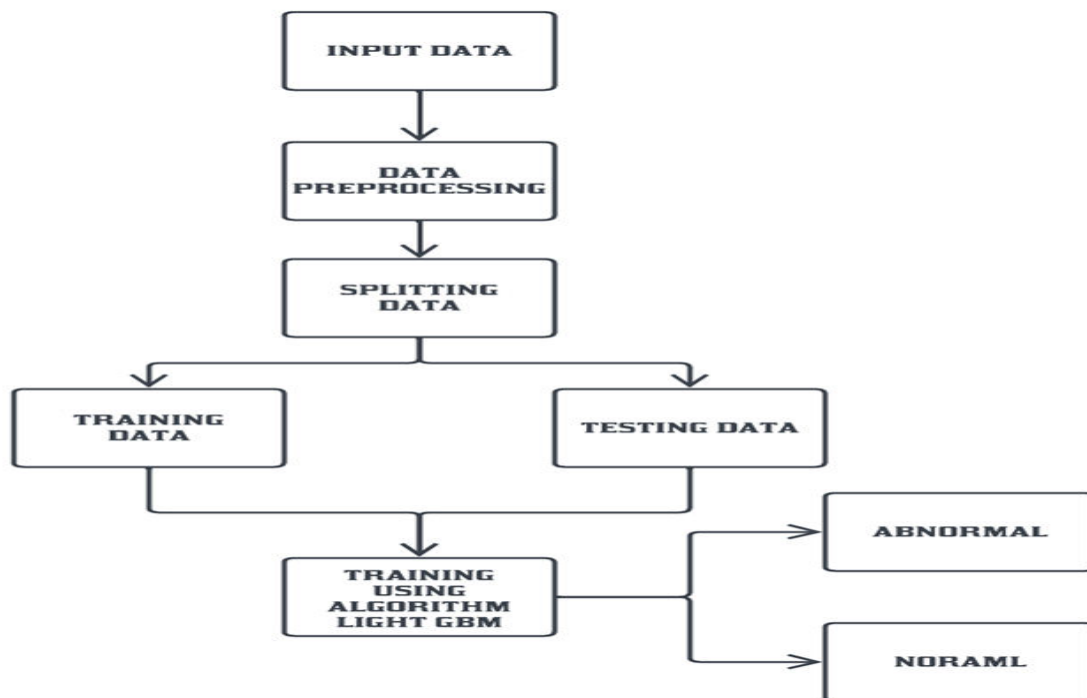
To sum up the past kidney stone dataset analytic models, we locate that the vast majority of them experience either the strategy utilized to attribute missing qualities has a restricted application range or generally low exactness.

Accordingly, in this work, we propose a technique to broaden the application scope of the kidney stone dataset analytic models. Simultaneously, the precision of the model is additionally improved.

III. METHODOLOGY

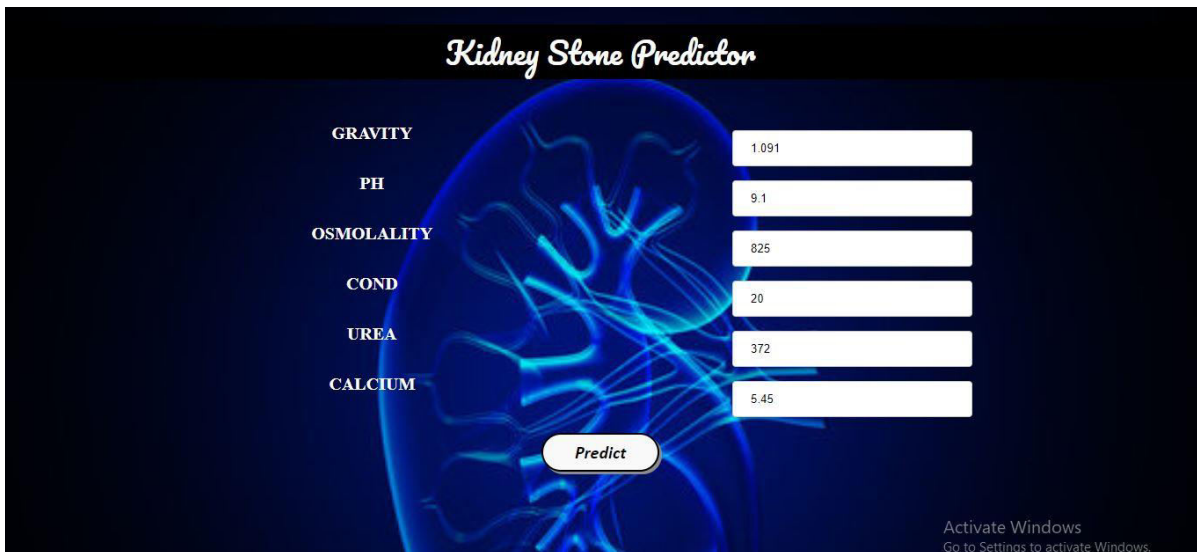
XG Boost is an optimized distributed gradient boosting library designed for efficient and scalable training of machine learning models. One of the key features of XG Boost is its efficient handling of missing values, which allows it to handle real-world data with missing values without requiring significant pre-processing.

In XG Boost, gradient-boosted decision trees are implemented. XG Boost models majorly dominate in many Kaggle Competitions. Decision trees are generated using this approach in a sequential fashion. Weights are significant in XG Boost. Before being fed into the decision tree that predicts results, each independent variable is assigned a weight. The weight of variables that the tree incorrectly anticipated is increased, and these variables are subsequently supplied to the second decision tree. These individual classifiers/predictors then an ensemble to give a strong and more precise mode. It can work on regression, classification, ranking, and user-defined prediction problems.



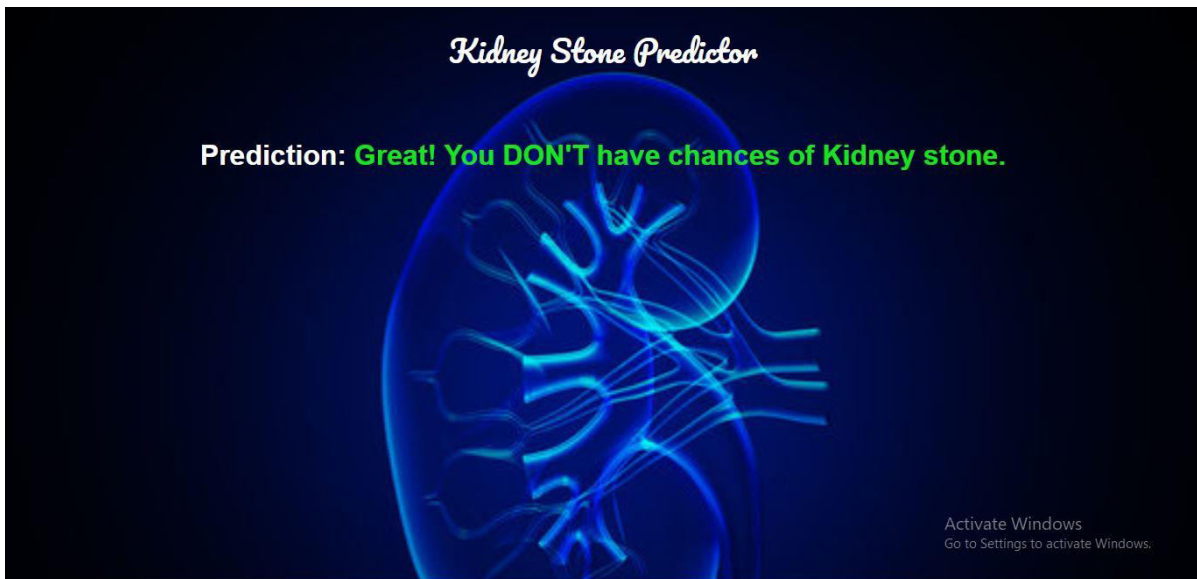
IV. EXPERIMENTAL RESULTS

Fig.1 a shows the input that the XG Boost algorithms takes to perform the prediction. The main page takes the inputs specific gravity of urine, PH of urine, osmolality of urine, conductivity of urine, concentration of urea in urine and concentration of calcium in urine.

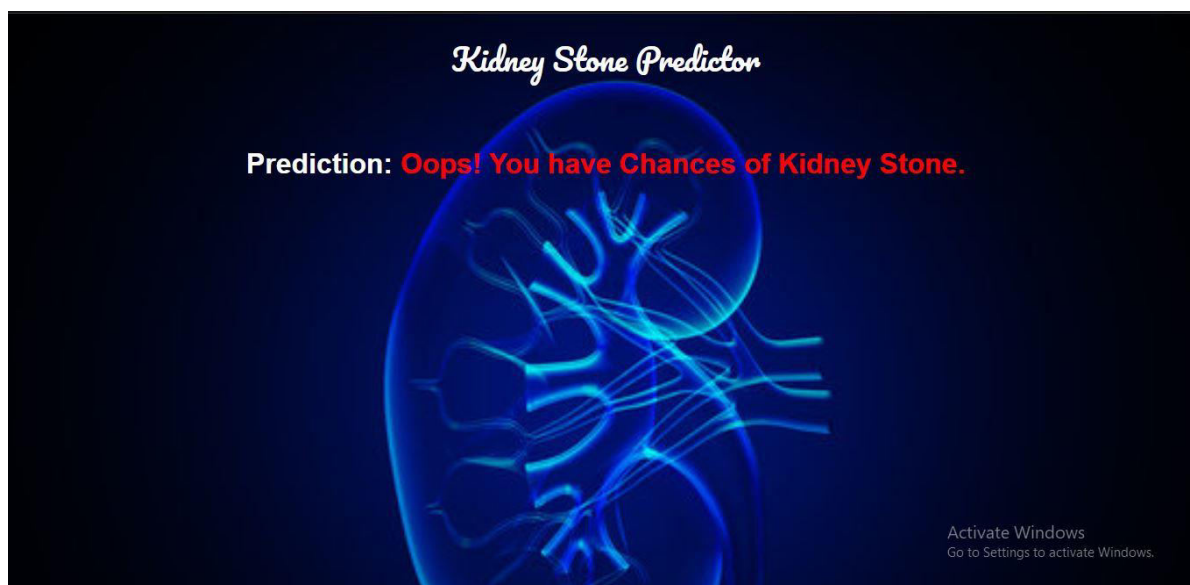


a)

fig b and c shows the result of the prediction performed. b indicates that the user does not have chances of Kidney stone. C indicates that the user has chances of Kidney stone.



b)



c)

V. CONCLUSION

We have implemented a prediction algorithm on a dataset of urine analysis. Our algorithm successfully predicts the chances of having kidney stone. We have applied many algorithms to the dataset and found that XG Boost algorithm to give high accuracy.

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