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Diabetic Retinopathy Using Machine Learning

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Abstract: ***Diabetic retinopathy (DR), the most common diabetes complication and the leading cause of blindness in working - age adults, affects 27 - 35% of diabetics worldwide. Diabetic retinopathy (DR) is the most common diabetes condition and the leading cause of visual loss in working - age people [1]. Manually analyzing digital color fundus images for DR detection takes time and expertise. However, delayed results may cause patients to miss follow - up consultations and receive incorrect information [2]. The impact of advanced retinal glycation on retinal cell function and other diseases is examined. Early diabetes can progress to proliferative diabetic retinopathy (PDR) and diabetic macular edema (DME), so identifying important pathways could help design effective treatments [3]. Diabetes affects all retinal cells, but microvascular disease dominates retinal research. Neovascularization classifies diabetic retinopathy as proliferative (PDR) or non - proliferative. Although diabetes affects all retinal cells, most retinal research has concentrated on microvascular illness. Neovascularization divides diabetic retinopathy (DR) into non - proliferative (NPDR) and proliferative (PR) kinds. DRD from mellitus. Due to pancreatic adrenaline deficiency, diabetes causes chronic high blood glucose. DR increases the risk of vision degeneration in diabetics, especially low - income retirees. Preventing chronic diseases like diabetes requires early detection.***

Keywords: diabetic retinopathy, machine learning, automated detection, fundus images, medical imaging

1. Introduction

Scarring or bleeding from aberrant retinal vasculature can cause irreversible vision loss in DR. It can cause gradual eyesight loss and blindness. The disease is incurable, thus treatment concentrates on vision. Early DR detection and treatment often save sight. Ophthalmologists must study retina scans to diagnose DR, which is expensive and time - consuming. The most common lesions are microaneurysms (MIA), hemorrhages (HEM), soft exudates (SOX), and hard exudates. Most ophthalmologists diagnose DR with retinal imaging. [5]. High blood glucose is caused by diabetes. Clinicians classify diabetes as type 1 or 2. The disease has multiple symptoms, diagnosis, comorbidities, and treatments (3 - 5). Diabetes causes short - and long - term health issues include diabetic ketoacidosis, hyperosmolar hyperglycemia, cardiovascular disease, stroke, chronic kidney disease, foot ulcers, nerve and retinal damage.

2. Literature Review

Diabetic retinopathy (DR), a major microvascular condition, causes most adult vision loss. Diabetes is a global health issue that could affect 34% of 40+ people by 2035.

Lin et al. studied [6]. A large percentage of working - age diabetics have diabetes retinopathy, a dangerous and irreversible disease that causes vision loss or blindness.

Hypertension damages retinal blood vessels. Symptomless diabetic retinopathy is fatal if not detected early (71, 137). We need regular screening and early detection. Microaneurysms, neovascularization, hemorrhages, cotton patches, and retinal exudates characterize acute diabetic retinopathy. Simplify diabetic retinopathy diagnosis and classification [7]. Diabetes is the greatest cause of avoidable blindness in those aged 20–74, with DR being the most prevalent microvascular consequence (1 - 3).

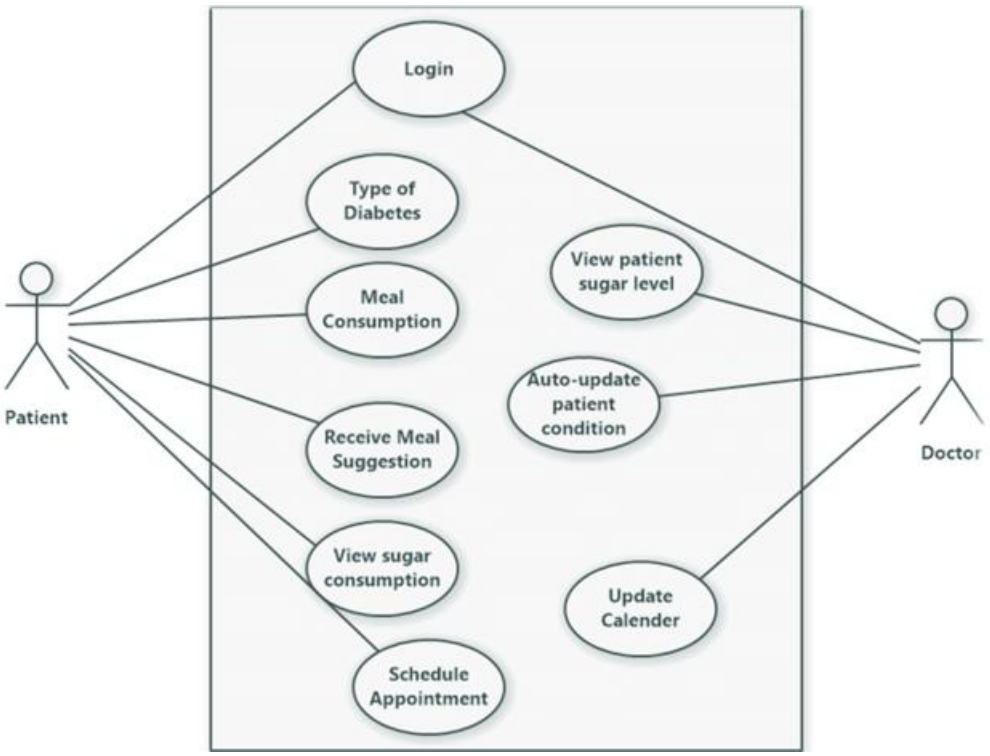
3. Existing System

The obtained results are compared with the results of existing models with in the same domain and found to be improved. The data of diabetic patients collected from the UCI laboratory is used to discover patterns with are KNearestNeighbours (KNN), NaiveBayes (NB), SupportVectorMachine (SVM), DecisionTree (DT), LogisticRegression (LR) andRandomForest (RF). The results are compared for performance and accuracy with the algorithms. The proposed hybrid method returns resultsof78.5%, competing with the other existing methods. Diabetic retinopathy (DR) is a common complication of diabetes associated with retinal vascular damage caused by long standing diabetes. Further more, the diagnosis of D R mostly depends on the observation and evaluation to fundus photographs of which procedure can be time - consuming even for experienced experts. As a result, computer - aided automated diagnosis systems have a high likelihood of successfully detecting DR in a short period of time, which can help to improve DR screening rates and minimize blindness. For a deep learning model, the most important parts that should be focused on are dataset, network architecture and training method. Before being used to train our model, funds images dataset to obtained from public resources is preprocessed and augmented.

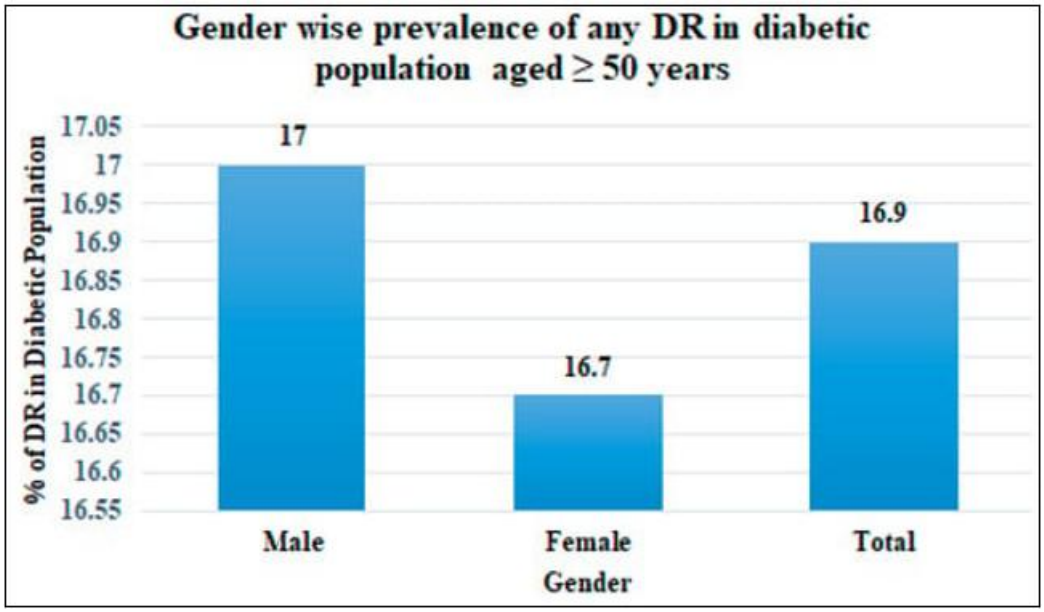
4. Proposed System

In this paper, six machine learning algorithms are used to predict diabetes disease. These
six algorithms are K Nearest Neighbours (KNN), Naive Bayes (NB), Support Vector Machine (SVM), Decision Tree (DT), Logistic Regression (LR) and Random Forest (RF). Comparison of the different machine learning techniques used in this study reveals which algorithm is best suited for prediction diabetes. A dataset of patient's medical record is obtained and three different machine learning algorithms are applied on the dataset. Performance and accuracy of the applied algorithms is discussed and compared. Comparison of the different machine learning techniques used in this study reveals which algorithm is best suited for prediction of diabetes.

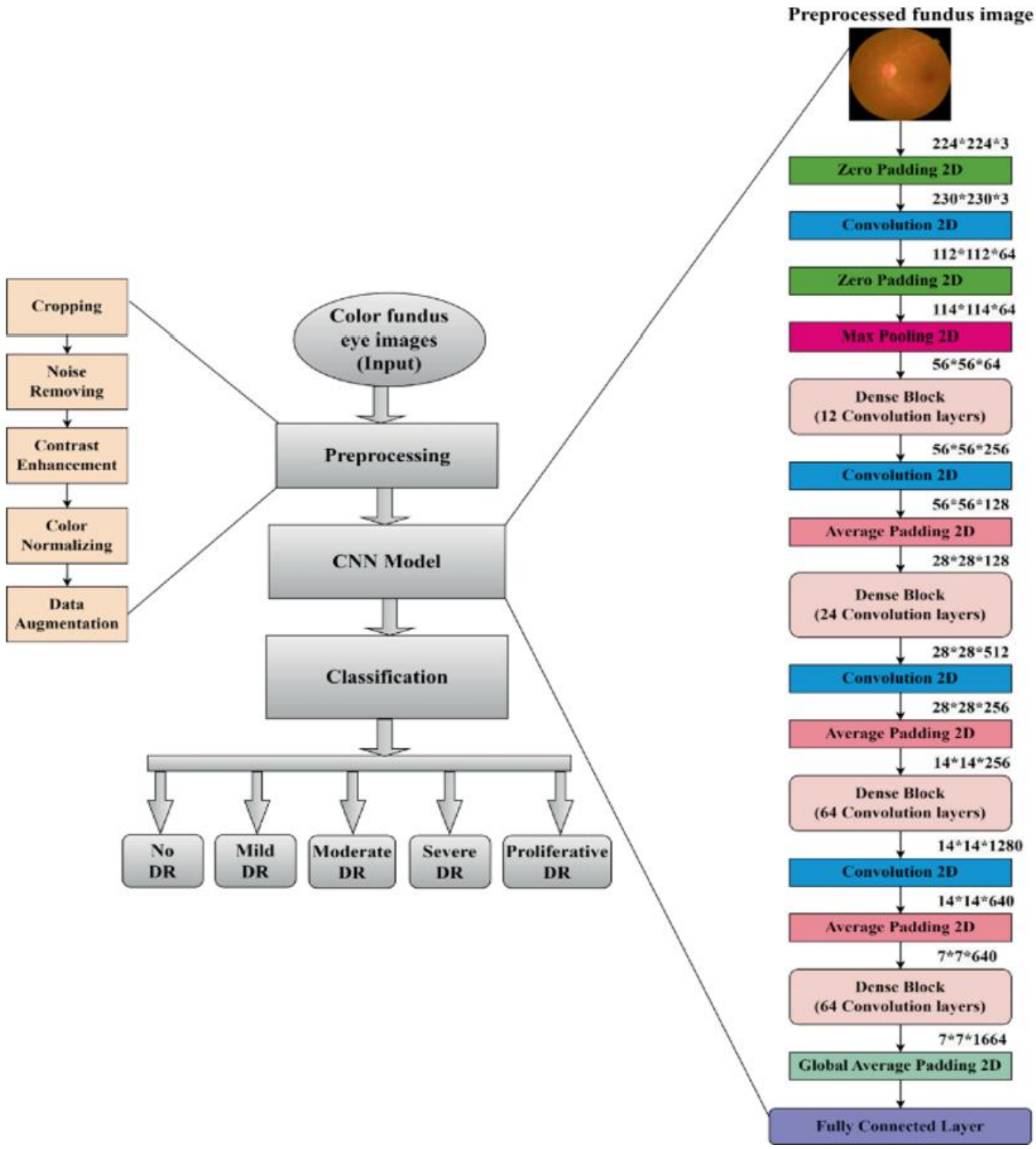
Use Case Diagram



Graph Representation



Data Flow Diagram



5. Future Enhancement

The ocular picture is pre processed via the HE approaches and the modified picture is segmented by k - means clustering. SVM and RF are valuable for the categorization of the usual and unusual part of the ocular picture and also plummeting human mistake that diminishes false recognition and acquires a high precision rate. The recognition rate of RF is 96.62% that expresses a great and stable outcome as compared to the SVM. The profit of the established approach is that it holds the highest precision and also capable of initial phase recognition of DR automatically to overcome human mistakes and diminish the false identification rate that offers the progression which is more truthful, easy, and unproblematic. In the future, we extend our work on different datasets to prove a more general conclusion and exterminate false recognition rate.

6. Conclusion

Diabetic Retinopathy is a disease which causes vision loss rapidly. To the input color retinal images, pre processing techniques like Gray scale conversion. After applying these pre - processing techniques the quality of the images are improved. From the pre - processed images, features were extracted for the classification process. As an achievement of this work, the DR has been classified into two categories NPDR and PDR using PNN and SVM. All the two

techniques used for the classification were good in performance, but SVM is more efficient than PNN. Thus this work has given a successful Diabetic Retinopathy Diagnosing method which helps to diagnose the disease in early stage which mutually reduces the manual work. Experimental results show that PNN has an accuracy of 89.6 %, and SVM has an accuracy of 97.6%. we can improve the efficiency of the correct classification by extracting better features and by increasing the number of data in each class and also by combining with other pattern classification models.

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