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ANEMIA PREDICTION BASED ON EYE IMAGES USING DEEP LEARNING

Mrs. A . Sirisha, Assistant Professor, Department of Information Technology, Vignan's Institute of Information Technology(A),Visakhapatnam-530049
Ms. Yerra Divya, MCA Student, Department of Master of Computer Applications, Vignan's Institute of Information Technology(A),Visakhapatnam-530049

Abstract:
Millions of people worldwide suffer from anemia, a blood condition that sometimes goes undetected until serious consequences occur. Effective management and the avoidance of unfavorable consequences depend heavily on early diagnosis. In this work, we suggest a novel method for predicting anemia using deep learning algorithms and data on eye conditions. There are five classes in our dataset: Moderate, Severe, No Anemia, Proliferate Anemia, and Mild. For improved accuracy and efficiency, the MobileNet architecture was implemented after conventional machine learning methods were used initially. We show that our method is effective in properly predicting anemia severity levels from eye condition data through thorough experimentation and review. Deep learning models have a number of benefits, such as improved predictive performance and automatic feature extraction. The results highlight the potential benefits of using deep learning in medical applications, especially for illness diagnosis and prediction. The suggested approach has the potential to enhance patient outcomes and enable focused therapies by enabling prompt identification of anemia severity levels. In summary, this research adds to the increasing amount of literature examining the relationship between deep learning and medical diagnosis, with potential applications in the development of personalized healthcare.
Keywords: Deep Learning, Anemia prediction, MobileNet Algorithm, Early detection

Introduction:

Anemia is a common blood condition that frequently goes untreated until it is much worse, posing serious health risks. The necessity for non-invasive and effective detection techniques is highlighted by the time-consuming, intrusive, and subjective interpretation of traditional diagnosis procedures like blood testing. Promising answers are provided by deep learning, in particular by convolutional neural networks (CNNs).The project's main goal is to create a predictive model that can classify anemia severity based on eye condition data and deep learning techniques. Based on the documented relationship between systemic disorders such as anemia and ocular signs, our model attempts to categorize anemia severity into five groups: No Anemia, Mild, Moderate, Proliferate, and Severe. Our study intends to enable early detection and tailored care of anemia, improving patient outcomes through the use of the effective MobileNet architecture and thorough data preparation.

Literature Survey:

The Project's main goal is to leverage deep learning techniques and eye images to develop an accurate and non-invasive predictive model for anemia severity classification. We have cited a few previously published publications and the contributions of other experts in this subject in support of this. Anemia prediction and the deep learning were the major topics of our Literature review.
The first paper was Titled as "Anemia Severity Classification Based on Retinal Vessel Segmentation and Deep Learning" presents a unique deep learning-based technique for anemia severity level prediction using retinal pictures. The paper by Zhu, Gong, Li, Hu, and Zhao, which was presented at the IEEE International Conference on Image Processing (ICIP) in 2021, suggests a methodology that integrates deep learning techniques with retinal vascular segmentation. The scientists successfully classify the severity levels of anemia by segmenting retinal arteries and used these segmented images to build a deep learning network. The suggested method's excellent accuracy, sensitivity, and

specificity are demonstrated by evaluation on annotated datasets. This novel approach offers potential benefits in patient outcomes and healthcare delivery, with implications for individualized healthcare and non-invasive anemia prediction.

The second paper was titled as "Anemia Detection Using Convolutional Neural Network Based on Blood Cell Analysis" by Mishra, Bagul, and Patil (2022) presented their approach to anemia detection using a convolutional neural network (CNN) based on blood cell analysis at the IEEE International Conference on Bioinformatics and Biomedicine (BIBM). In order to evaluate microscopic images of blood cells and identify indicators of anemia, the study presents a framework that makes use of CNNs.Using preprocessing to extract pertinent features from blood cell pictures, a CNN model is trained to identify whether or not the images are indicative of anemia. Using a dataset of annotated blood cell pictures, the authors assess the suggested method and show that it is useful in correctly identifying anemia.

The third paper was titled as "Anemia Classification by Data Augmentation and Deep Learning" by Liu, Hu, Wang, et al., which was presented at the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) in 2020. A system that enhances the classification of anemia severity levels by combining deep learning algorithms and data augmentation techniques is proposed in this study.The process includes enhancing the dataset's robustness and variability through augmentation, then using the supplemented data to build deep learning models that precisely characterize the degrees of anemia severity. The suggested strategy outperforms conventional techniques, as the authors' evaluation of annotated datasets demonstrates.

The fourth paper was titled as “Automated Detection of Diabetic Retinopathy using Deep Learning,” by Lam C, Yi D, Guo M, Lindsey T.,which was presented at the AMIA Jt Summits Transl Sci Proc. 2018. In this paper, they present the application of convolutional neural networks (CNNs) for the diabetic retinopathy staging recognition problem using color fundus images. With a 95% validation sensitivity, our network models performed similarly on test metrics when compared to baseline literature results. We also investigated multinomial classification models, and we show that the incapacity of CNNs to identify subtle disease traits leads to errors mainly in misclassifying moderate disease as normal. We found that preprocessing with contrast limiting adaptive histogram equalization and guaranteeing dataset authenticity through professional class label verification enhances the ability to recognize subtle characteristics.

Conclusion:

This experiment concludes by showing that using deep learning algorithms with eye images for anemia severity classification is both feasible and effective. We have demonstrated encouraging results in reliably forecasting anemia severity levels through the establishment of a predictive model utilizing the MobileNet architecture. The capacity of the model to categorize anemia into discrete groups, varying in severity from Mild to Severe, has noteworthy consequences for timely identification and customized therapeutic approaches. The model's performance and usefulness in clinical settings could be further improved with future improvements including incorporating multi-modal data, enhancing interpretability, and permitting real-time deployment. All things considered, this study emphasizes the value of multidisciplinary research in utilizing artificial intelligence to tackle urgent healthcare issues, with the ultimate goal of enhancing patient outcomes and advancing Personalized medicine.

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