**DECLARATION**

We hereby declare that this submission is our work and that, to the best of our knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.

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**CERTIFICATE**

This is to certify that *Project Report entitled ―Comparative Analysis Of CNN Models for Eye Disease Classification* *Using Retinal Images* which is submitted by *Prakhar Rastogi(2000681540031), Jhalak Jain (2000681540022), Paridhi Jain (2000681540030),Krishna Arjun(2100681549001)* in partial fulfillment of the requirement for the award of degree B. Tech. in Department of Computer Science and Engineering (Data Science) of Dr. A.P.J. Abdul Kalam Technical University, U.P., Lucknow., is a record of the candidates own work carried out by them under my supervision. The matter embodied in this Project report is original and has not been submitted for the award of any other degree.

**Date:**  *Mr. Rohit Aggarwal*

**Supervisor**

**ACKNOWLEDGEMENTS**

It gives us a great sense of pleasure to present the report of the B. Tech Project undertaken during B.Tech. Final Year. We owe a special debt of gratitude to our guide Prof. *Mr. Rohit Aggarwal, Department of Computer Science and Engineering (Data Science)*, Meerut Institute of Engineering and Technology, Meerut for his constant support and guidance throughout the course of our work. His sincerity, thoroughness and perseverance have been a constant source of inspiration for us. It is only his cognizant efforts that our endeavors have seen light of the day.

We also do not like to miss the opportunity to acknowledge the contribution of all faculty members of the department for their kind assistance and cooperation during the development of our project. Last but not the least, we acknowledge our friends for their contribution in the completion of the project.

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***ABSTRACT***

This project presents a comparative analysis of Convolutional Neural Network (CNN) models for the classification of eye diseases using retinal images, focusing on optimizing diagnostic accuracy and efficiency. The study evaluates the performance of several state-of-the-art CNN architectures, including VGG16, ResNet50, InceptionV3, and EfficientNet, in detecting prevalent retinal conditions such as diabetic retinopathy, glaucoma, and age-related macular degeneration. Utilizing a large, annotated dataset of retinal images, each model is trained and validated with rigorous performance metrics such as accuracy, precision, recall, F1-score, and AUC-ROC.

The research explores the impact of various data preprocessing techniques, including image augmentation, normalization, and contrast enhancement, on model performance. Furthermore, it examines the benefits of transfer learning by fine-tuning pre-trained models on the specific retinal image dataset. Comparative results highlight the efficiency, computational requirements, and diagnostic accuracy of each CNN model.

Additionally, the study delves into model interpretability, using techniques like Grad-CAM to visualize which parts of the retinal images are most influential in the decision-making process of the models. This aspect is crucial for validating the reliability and trustworthiness of the AI systems in clinical practice.

The findings from this comparative analysis provide valuable insights into the strengths and limitations of different CNN architectures for eye disease classification, offering guidance for the selection and implementation of AI-driven diagnostic tools in ophthalmology. Ultimately, the project aims to advance the development of automated systems that can assist healthcare professionals in early detection and management of retinal diseases, improving patient outcomes and reducing the burden on healthcare infrastructure.

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