Results: Glaucoma Diagnosis from Retinal Fundus Images

This document summarizes the performance of various methods for glaucoma diagnosis, including traditional image processing, machine learning, and deep learning approaches. The results highlight the superiority of the proposed custom-built CNN model in terms of accuracy, generalization, and clinical applicability.

Machine Learning models

Method	**Accuracy (%)**	**Sensitivity (%)**	**Specificity (%)**
Conventional Image Processing	74.43	77.83	71.06
Support Vector Machine (SVM)	83.66	81.75	86.34
K-Nearest Neighbour's (kNN)	83.93	81.28	88.00

Deep Learning models Results:

Models	AUC	F1-score
Alexnet	82.54	84.07
Googlenet	90.48	91.81
Squeezenet	88.89	88.37
Proposed DL	0.9860	0.9207

Generalization of the proposed model over different datasets

Dataset	**AUC ROC**	**F1-score (%)**
ORIGA	0.8834	0.8282
ACRIMA	0.9120	0.8645
REFUGE	0.9003	0.8731
HRF	0.8097	0.7921
LAG	0.9860	0.9207

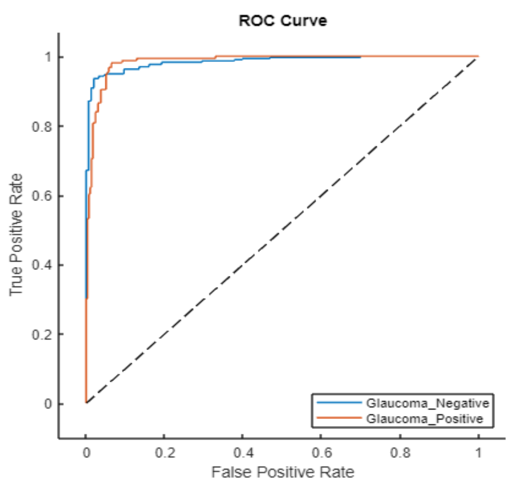

Fig. 1. Area under the curve of ROC of the proposed model

Generalization of transfer learning models over different datasets

Datasets	Alexnet	Googlenet	Squeezenet
ORIGA	71.01	79.98	67.24
ACRIMA	63.2	70.7	69.92
REFUGE	69.41	66.16	63.74
HRF	61.11	65.09	59.47
LAG	84.07	91.81	88.37

Achievements of the Proposed Model

- **Highest Accuracy**: Outperformed all other models **AUC ROC of** 0.9860 and **F1-score** of 0.9207
- **Robust Generalization**: Validated on five datasets, showing superior performance.
- **Clinical Applicability**: Fast prediction time and minimal preprocessing make it suitable for clinical use.
- **Efficiency**: requires no manual feature extraction, reducing subjectivity and increasing reproducibility.

The proposed CNN model provides a reliable and scalable solution for early glaucoma diagnosis and mass screening, addressing challenges in generalization and computational efficiency.