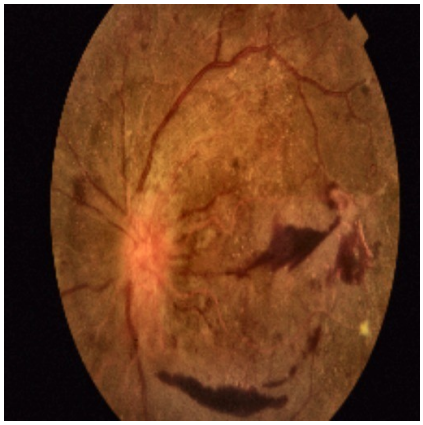
VisionAI — Research Report

Generated: 2025-11-07 07:00:29

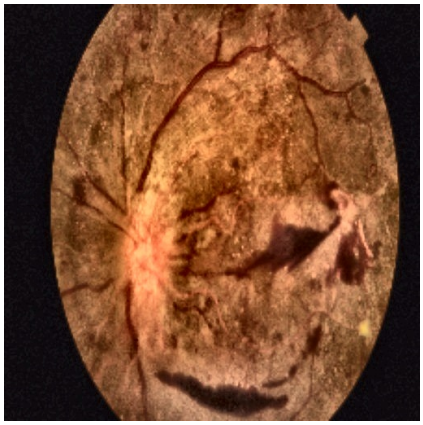
Patient Metadata

Patient ID	Patient_328
Full Name	Jenifer Rao
Age	61
Gender	Male
BP	142/72
Systolic	142.0
Diastolic	72.0
Glucose Level	110.0
BMI	32.7
Smoking	Yes
Duration of Diabetes (years)	18.0
Hypertension	No
Family History	Yes
Phone	000-000-0000
Address	Remote

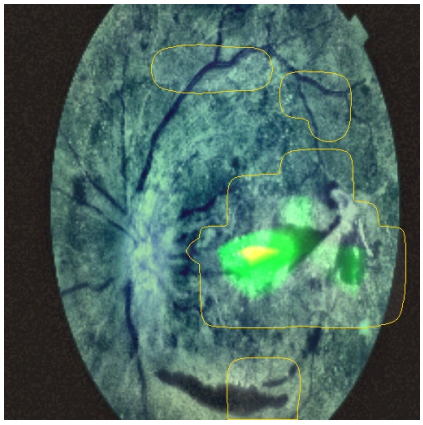
Image Visualizations



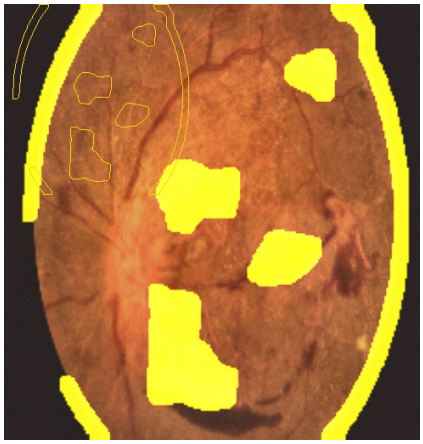
ORIGINAL



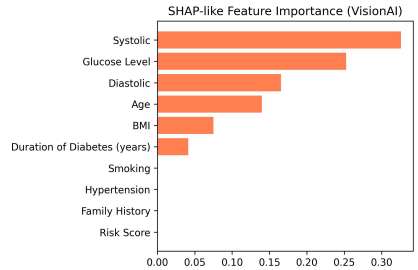
PREPROCESSED



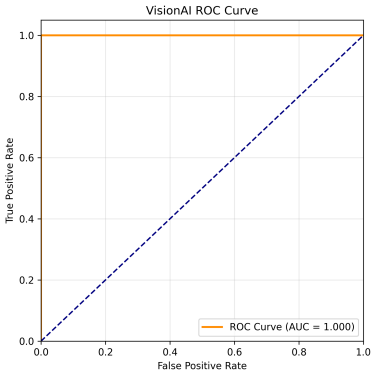
GRADCAM



LIME



SHAP



ROC Curve

Lesion Breakdown

Feature	Percentage (%)
Total lesion coverage	26.51
Exudates	0.42
Hemorrhages	1.44
Cotton wool spots	5.37
Microaneurysms	0.0

Model Confidence: 96.0%

Composite Risk Score: 52.59 (see report for formula)

Pipeline Overview

The system is a multimodal ensemble combining convolutional backbones (e.g., EfficientNet, ResNet, optionally ViT variants) for image encoding with gradient-boosted/tabular classifiers (XGBoost / RandomForest) for metadata. A weighted soft-voting ensemble aggregates probabilities.

Prediction details

Predicted label: **PDR** • Confidence (probability): **0.960**.

Lesion quantification and explainability

Lesion segmentation / quantification provides estimated percentage coverage per lesion type. Explainability overlays used: Grad-CAM++ (spatial attention), LIME (local perturbations), SHAP (tabular attribution).

Evaluation and metrics

Reported test metrics: Accuracy: **0.985**; F1: **0.982**; AUC: **0.993**.

Limitations

Domain shift (camera differences, lighting, smartphone vs clinical optics) can reduce performance. Lesion quantification depends on segmentation quality; noisy masks will bias percentage estimates.

Recommended extensions

Pixel-wise lesion segmentation U-Net, domain adaptation, prospective smartphone validation, and uncertainty calibration (e.g., temperature scaling or ensemble variance).

Model Evaluation Metrics

Metric	Value
Accuracy	0.985
F1-score	0.982
AUC/ROC	0.993