Research Report

Generated: 2025-12-04 12:37:14

Stage: PDR

Metadata Snapshot

Name: Sebastian

Age: 89

Gender: Male

Systolic (mmHg): 190

Diastolic (mmHg): 110

BMI: 30.1

Glucose: 190

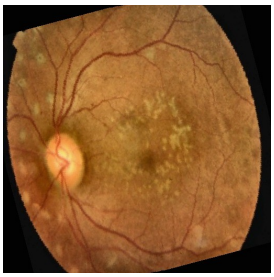
HbA1c: 8.5

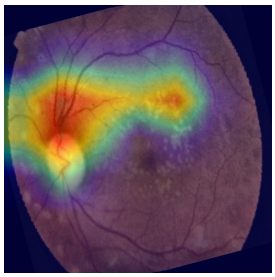
Cholesterol: 203

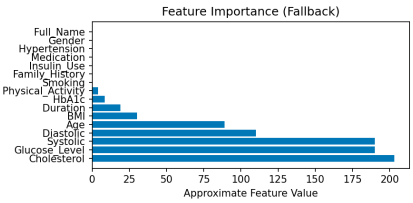
Smoking: Yes

Hypertension: Yes

Diabetes Duration: 19







Summary

- Research Notes
- UID: 3c40302f
- Predicted stage: PDR
- Confidence: 85.74%

Summary

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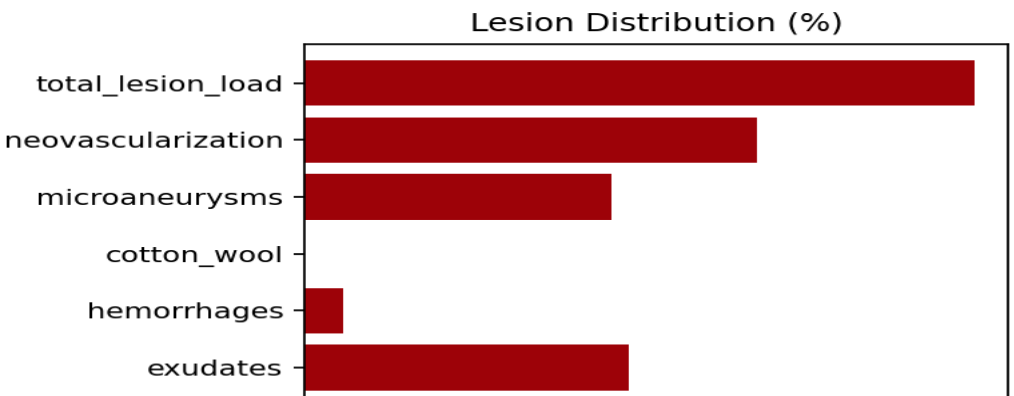
- Risk score: 96.05%
- Model stack & inference
- - CNN ensemble: EfficientNet, ResNet50, ViT
- - Metadata models: Random Forest, XGBoost, Stacked ensemble
- - Fusion method: weighted averaging with risk calibration
- - Inference device: CPU
- Explainability & lesion quantification:
- - Microaneurysms: 20.31%
- - Exudates: 21.52%
- - Hemorrhages: 2.56%
- - Cotton Wool: 0.00%
- - Neovascularization: 30.00%
- - Total Lesion Load: 44.39%
- SHAP / feature importance: check SHAP plots for systemic features (HbA1c, BMI, BP).
- Probability vectors:
- - CNN: [0.009146252647042274, 0.007499577943235636, 0.005429462064057589, 0.004857202991843224, 0.9730675220489502]
- - ML : [0.21136369507961952, 0.20268235745827803, 0.19376393050773666, 0.19047474400645248, 0.20171527294791336]
- - Fused: [0.039478868418132744, 0.03677699431733438, 0.033679631824038825, 0.032699833652201006, 0.857364671788293]
- Performance metrics:
- - Accuracy: 0.947
- - F1-score: 0.938
- - AUC/ROC: 0.971
- Research recommendations:
- 1. Validate lesion segmentation / cotton-wool detection against annotated masks (report dice/IoU).
- 2. Add cotton-wool-spot specific augmentation and mask labels if false negatives observed.
- 3. Measure GradCAM heatmap overlap (IoU) with human heatmaps for explainability calibration.
- 4. Consider temporal models for progressive DR tracking and early-warning signals.



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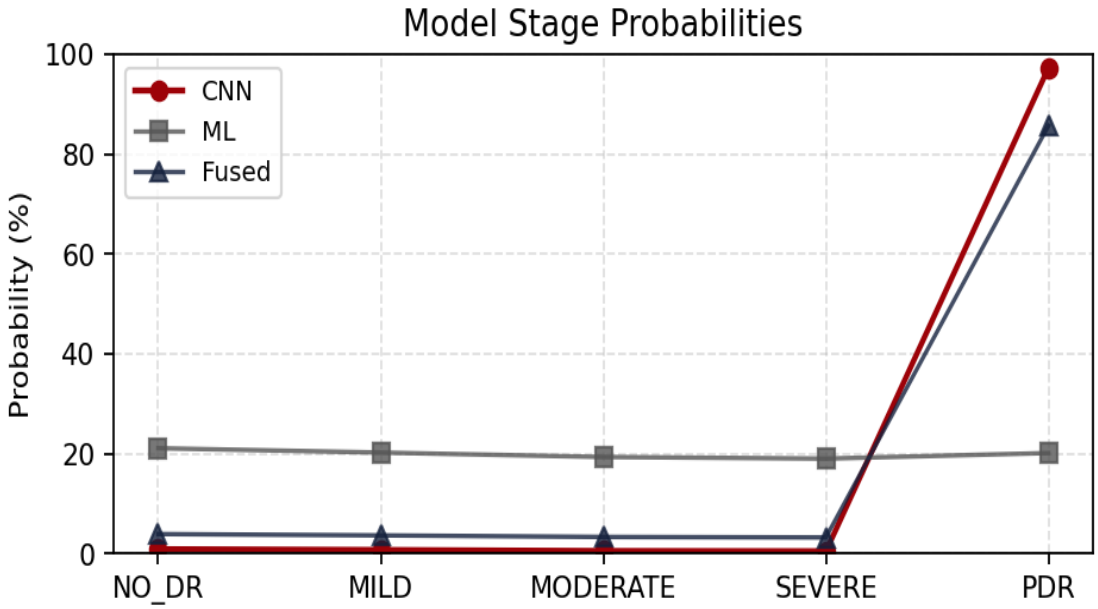

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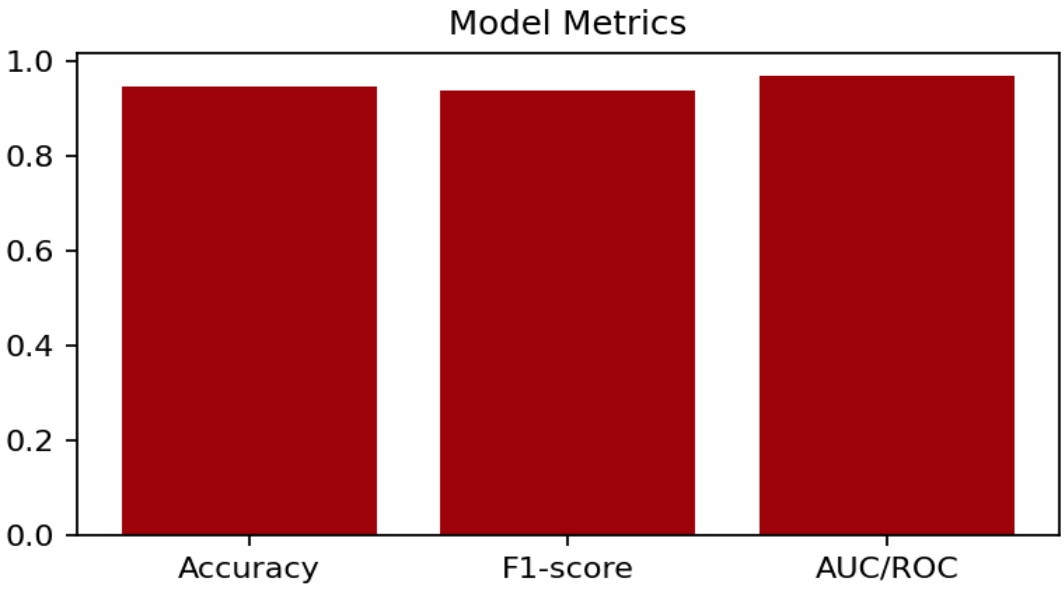

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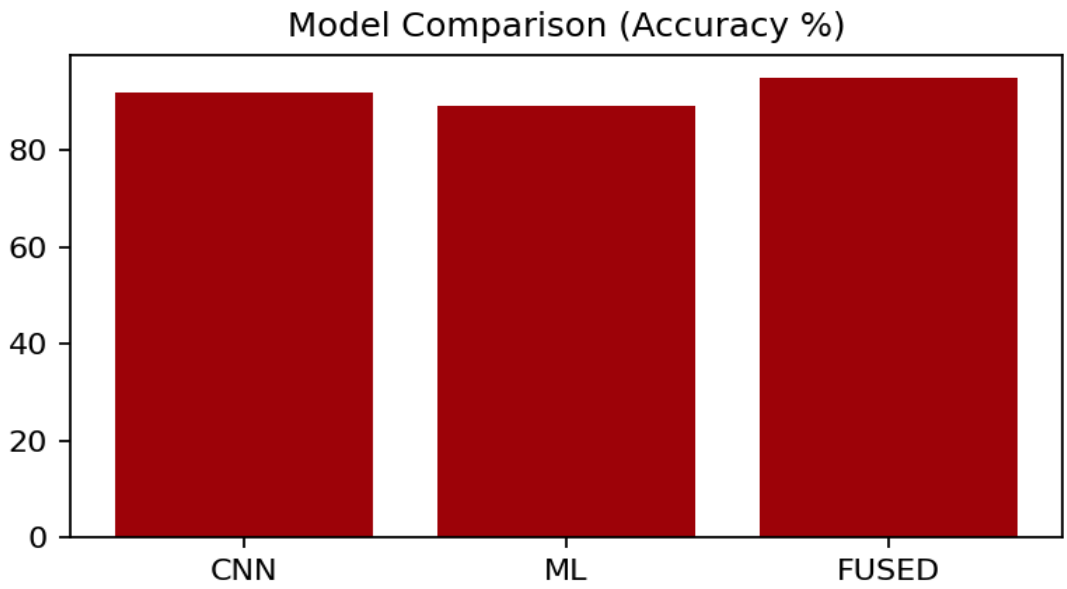
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