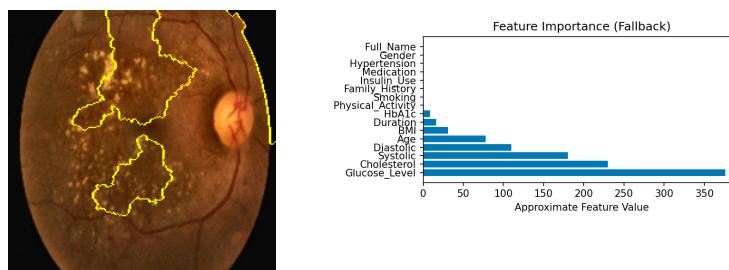
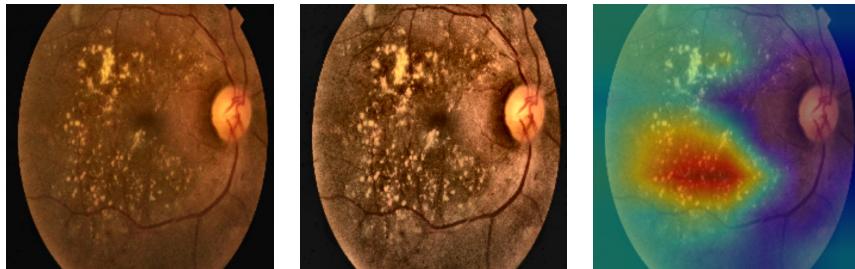


**Stage: SEVERE**

## Metadata Snapshot

|                    |         |
|--------------------|---------|
| Name:              | solomon |
| Age:               | 78      |
| Gender:            | Male    |
| Systolic (mmHg):   | 180     |
| Diastolic (mmHg):  | 110     |
| BMI:               | 30.8    |
| Glucose:           | 376     |
| HbA1c:             | 8.6     |
| Cholesterol:       | 230     |
| Smoking:           | Yes     |
| Hypertension:      | Yes     |
| Diabetes Duration: | 16      |



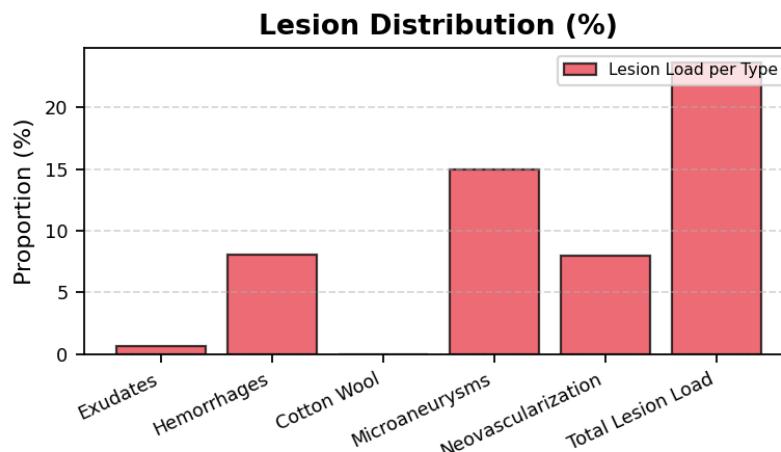
## Research Findings

- Research Notes
- UID: 309d8013
- Predicted stage: SEVERE
- Confidence: 83.6%
- Risk score: 95.42%
- Model stack & inference
- - CNN ensemble: EfficientNet, ResNet50, ViT
- - Metadata models: Random Forest, XGBoost, Stacked ensemble
- - Fusion method: weighted averaging with risk calibration

# Research Findings

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- Inference device: CPU
- Explainability & lesion quantification:
- Microaneurysms: 14.99%
- Exudates: 61.50%
- Hemorrhages: 8.02%
- Cotton Wool: 0.00%
- Neovascularization: 7.99%
- Total Lesion Load: 23.63%
- SHAP / feature importance: check SHAP plots for systemic features (HbA1c, BMI, BP).
- Probability vectors:
- CNN: [0.01661859080195427, 0.009372644126415253, 0.012959725223481655, 0.9499325752258301, 0.011116418056190014]
- ML : [0.21136369507961952, 0.20268235745827803, 0.19376393050773666, 0.19047474400645248, 0.20171527294791336]
- Fused: [0.04583035825762507, 0.03836910264489016, 0.04008035760254893, 0.8360139336333661, 0.03970624786156982]
- 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.



# Model Metrics

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- F1-score: 0.938
- AUC/ROC: 0.971