

# Comparative Analysis of Deep Learning Models

## for Liver Fibrosis Staging

Research Report

**Top Performing Model**

**VIT-B/16**

Accuracy: 97.47%

# Executive Summary

This study evaluates the performance of three distinct deep learning architectures for the automated staging of liver fibrosis from histopathology images: ResNet50 (baseline CNN), EfficientNet-V2 (optimized CNN), and Vision Transformer (ViT-B/16). Key Findings:

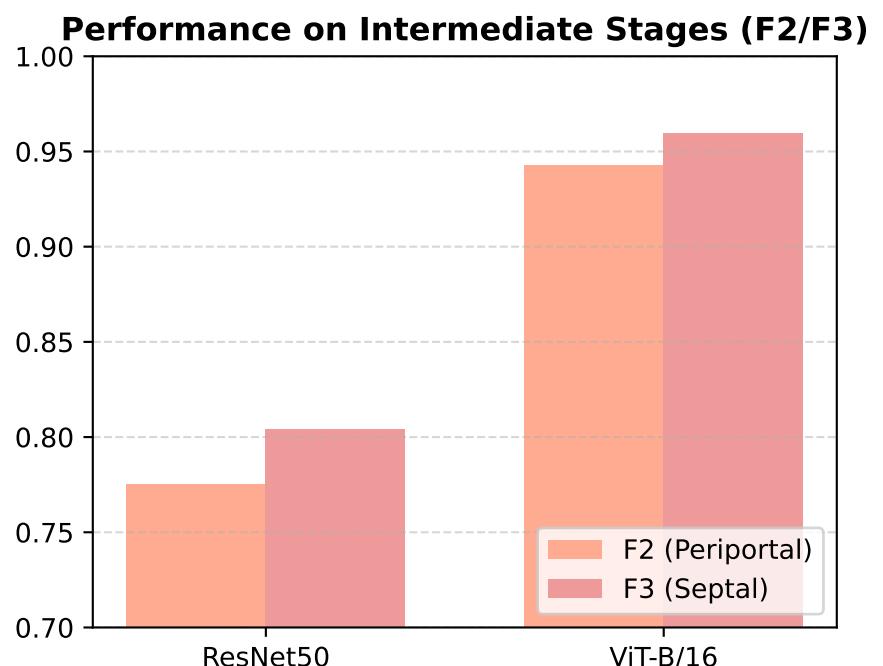
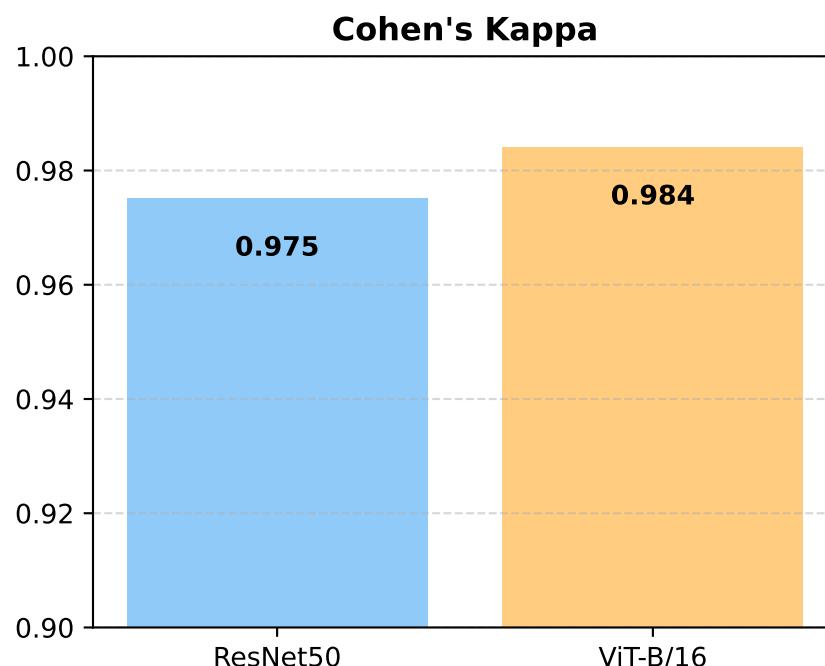
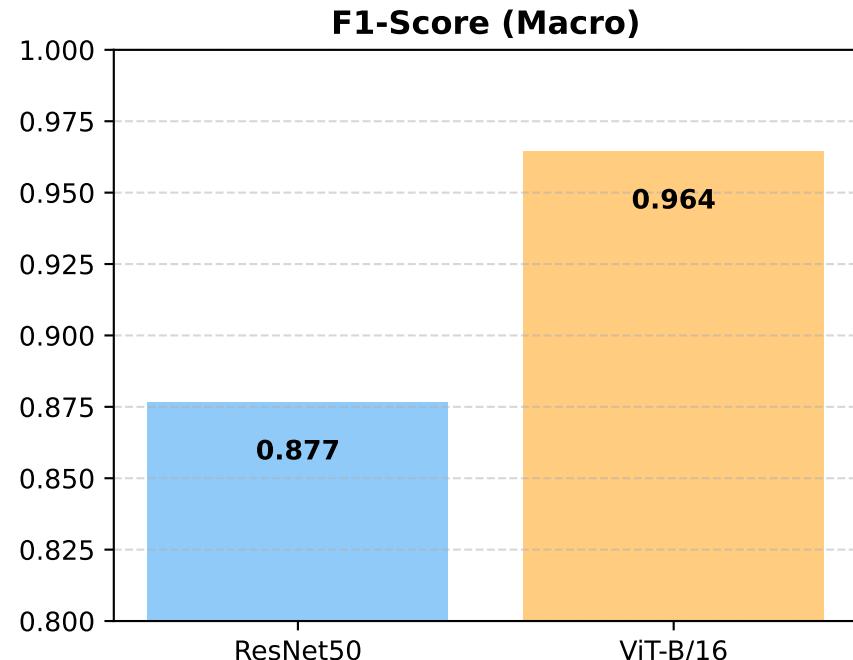
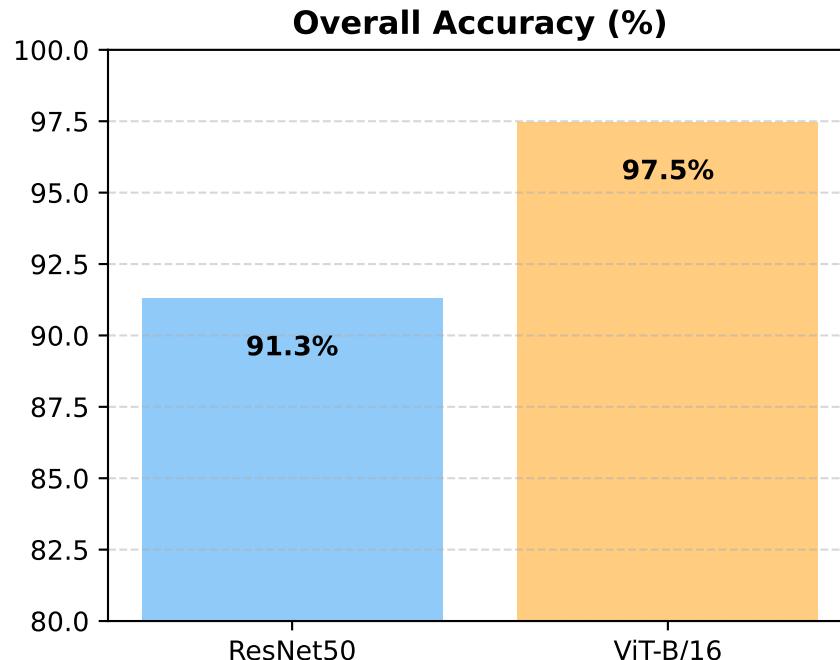
1. Superiority of Vision Transformer (ViT-B/16): The Vision Transformer (ViT-B/16) achieved the highest overall accuracy (97.47%), outperforming the other models (Best CNN: 91.30%). This suggests that the model's architecture is highly effective at capturing global tissue patterns indicative of fibrosis.

2. Resilience in Intermediate Stages: A critical challenge in fibrosis staging is distinguishing between intermediate stages (F2, F3). The ViT model demonstrated an F1-score of 0.9430 for F2 samples, compared to 0.7751 for the ResNet50 baseline.

3. Efficiency vs. Performance: EfficientNet-V2 provided a very competitive performance with a lighter computational footprint, making it a viable alternative for resource-constrained deployments.

4. Clinical Relevance: The high Cohen's Kappa scores (>0.90 for top models) indicate excellent agreement with ground truth, supporting the potential utility of these models as decision support tools in clinical pathology workflows.

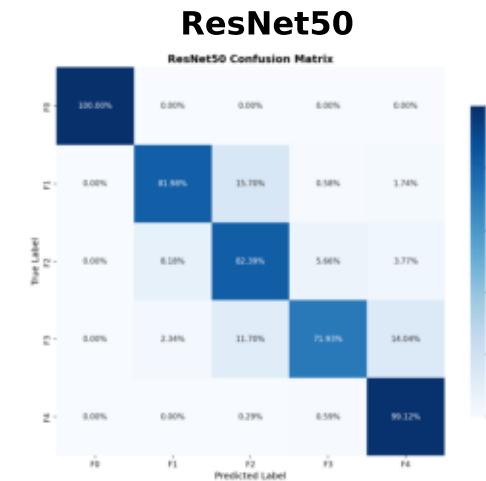
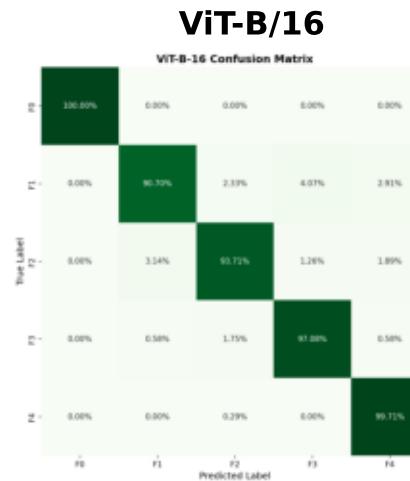
# Model Performance Comparison



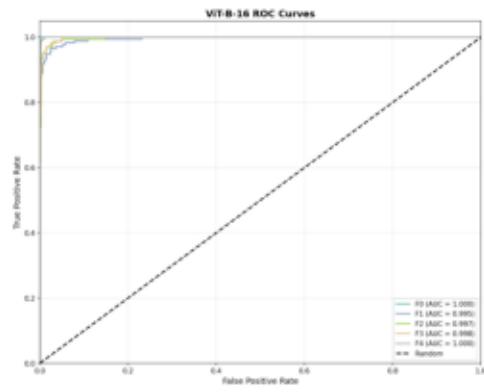
## Detailed Performance Metrics

Metric	RESNet	VIT
Accuracy	91.30%	97.47%
Precision (Macro)	0.8892	0.9669
Recall (Macro)	0.8708	0.9624
F1-Score (Macro)	0.8766	0.9644
Cohen's Kappa	0.9751	0.9841
ROC AUC (Macro)	0.9889	0.9981
F1 - Stage F0	1.0000	1.0000
F1 - Stage F1	0.8545	0.9341
F1 - Stage F2	0.7751	0.9430
F1 - Stage F3	0.8039	0.9595
F1 - Stage F4	0.9493	0.9855

# Confusion Matrices



# ROC Curves

**ViT-B/16****ResNet50**