

Microscopic Image-Based Malaria Parasite Detection Using k-Nearest Neighbor Classifier



Yash Pathak(16014223100), Piyush Choudhury(16014223060), Soham Mishra(16014223082), Vedant Tendulkar(16014223093) K. J. Somaiya Institute of Technology, Mumbai

Introduction

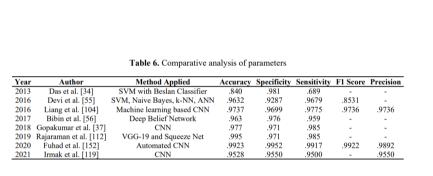
This poster summarizes key research papers on Microscopic Image-Based Malaria Parasite Detection Using k-Nearest Neighbor Classifier, focusing on image-based deep learning methods, model innovation, and diagnostic accuracy.

Paper 1: Pre-trained CNNs (Rajaraman et al., 2020/2021)

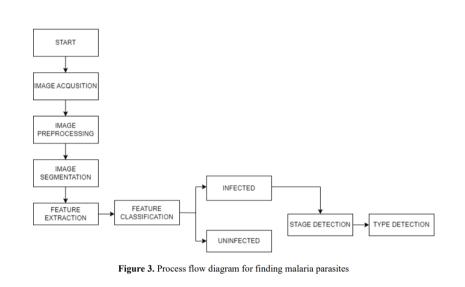
Relevance: Benchmark in thin blood smear analysis. **Novelty:** Transfer learning with pre-trained CNNs.

Results: 99.5% accuracy. PDF number: 14.pdf

Link: https://search.proquest.com/openview/dbd39791fd278e7d60b1208056ae6



Proposed Architecture



Workflow / Example Diagram

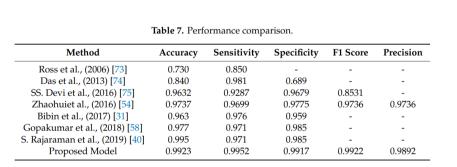
Paper 2: DL on Smartphone (Fuhad et al., 2020)

Relevance: Portable diagnostic solution.

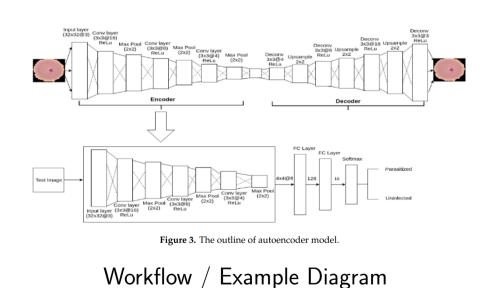
Novelty: Deep learning models optimized for mobile devices.

Results: 99.23% accuracy. PDF number: 6.pdf

Link: https://www.mdpi.com/2075-4418/10/5/329



Proposed Architecture



Paper 3: Transfer Learning Model (Qadri et al., 2023)

Relevance: RBC-based malaria diagnosis.

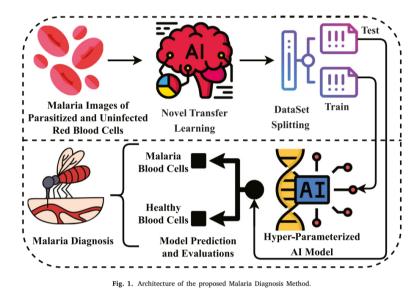
Novelty: Transfer learning for generalized models. **Results:** Distinguishes parasitized vs uninfected RBCs.

PDF number: 2.pdf

Link: https://www.sciencedirect.com/science/article/pii/S277266222300192

Table 5. Model performances on different experiment.									
Image Size	Aug	Method	Test Acc	Test Loss	F1 Score	Precs.	Sens.	Spec.	Size (KB)
(32,32)	Yes	-	0.9915	0.03	0.9914	0.9861	0.9960	0.9865	233.60
(32,32)	No	-	0.9877	0.05	0.9876	0.9892	0.9861	0.9893	233.60
(64,64)	Yes	-	0.9843	0.07	0.9839	0.9836	0.9840	0.9842	954.50
(64,64)	No	-	0.9755	0.15	0.9751	0.9851	0.9650	0.9855	954.60
(32,32)	Yes	Distillation	0.9900	0.04	0.9900	0.9877	0.9920	0.9878	233.60
(64,64)	Yes	Distillation	0.9885	0.04	0.9882	0.9929	0.9836	0.9932	954.60
(28,28)	Yes	Autoencoder	0.9950	0.01	0.9951	0.9929	0.9880	0.9917	73.70
(32,3)	Yes	Autoencoder	0.9923	0.02	0.9922	0.9892	0.9952	0.9917	73.70
(32,32)	Yes	CNN-SVM	0.9893	-	0.9918	0.9921	0.9916	-	-
(32,32)	Yes	CNN-KNN	0.9912	-	0.9928	0.9911	0.9923	-	-

Proposed Architecture



Workflow / Example Diagram

Paper 4: CNN + ViT Ensemble (Ahishakiye et al., 2025)

Relevance: State-of-the-art ensemble model.

Novelty: Combines CNN and Vision Transformer architectures.

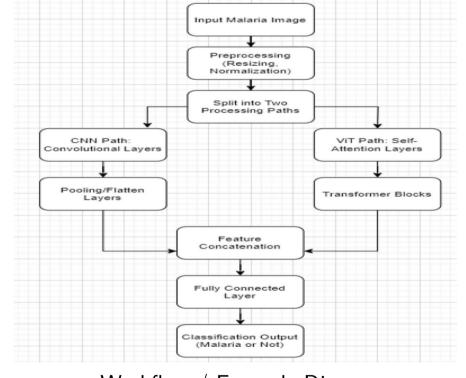
Results: Accuracy 99.64%, Precision 99.23%, Recall 99.75%, F1 99.51%.

PDF: 24.pdf

Link: https://link.springer.com/article/10.1007/s42452-025-06704-z

Model	Accuracy (%)	Precision (%)	Recall (%)	F1-score (%)	Loss
Proposed CNN-ViT ensemble	99.64	99.23	99.75	99.51	0.01
CNN-only (ResNet18)	97.67	97.52	97.64	97.58	0.06
ViT-only (ViT_B_16)	95.75	95.37	95.63	95.45	0.12
Hcini et al. [27]	99.70	Not reported	Not reported	Not reported	0.0476
Bhuiyan & Islam [29]	97.92	Not reported	Not reported	Not reported	Not reported
Hafiz et al. [48]	98.50	Not reported	Not reported	98.50	Not reported

Proposed Architecture



Workflow / Example Diagram

Observations

- Accuracy and robustness have improved over time.
- ► CNN-ViT hybrids outperform classical CNNs.
- Smartphone-based deployment is feasible and accurate.

Summary Table

Paper	Method	Accuracy	Dataset	Year
Rajaraman et al.	CNN	99.5%	Blood smear	2020/23
Fuhad et al.	DL + Smartphone	99.23%	Blood smear	2020
Qadri et al.	Transfer Learning	_	RBC images	2023
Ahishakiye et al.	CNN + ViT	99.64%	Blood smear	2025

Conclusion

- ▶ Deep learning has revolutionized malaria diagnostics.
- ► Ensemble and hybrid models provide near-human accuracy.
- ► Future directions: Explainable AI, federated learning, and real-time deployment.

References

Rajaraman et al., 2020/21; Fuhad et al., 2020; Qadri et al., 2023; Ahishakiye et al., 2025.