Related Work Table

Title	Dataset name and URL	Dataset description (samples, classes, images per class or split)	Methods name	Accuracy of the model	Research questions	Pros and Cons	Citation
1. Ensemble-Based Explainable Approach for Rare Medicinal Plant Recognition and Conservation	REMp Dataset, Mendeley Data https://doi.org/10.17632/hnwrxg8zm8.1	3,494 high-res leaf images of 16 Bangladeshi medicinal species (rare, endangered, threatened). After augmentation → 4,500 balanced images (70/15/15 split).	Ensemble (EfficientNet-B7, ConvNeXt, NasNet, XceptionNet + XGBoost meta-learner)	99.82%	How can ensemble deep learning with XAI improve rare medicinal plant recognition and conservation?	**Pros:** High accuracy & interpretability (Grad-CAM) **Cons:** High computational cost & small dataset	[1]
2. REMP: A Swin Transformer-Powered Approach to Classifying Rare and Endangered Medicinal Plants	Rare and Endangered Medicinal Plants (REMP) DOI: https://doi.org/10.1016/j.dib.2024.110895	Total **3,494** high-resolution images of **16 classes** of rare, endangered, and threatened medicinal plants from Bangladesh. After augmentation → **6,512 images (407 per class)** Split: **70% train, 15% validation, 15% test**. Images captured with Samsung Galaxy S21+ and Redmi Note 11 under varied lighting/weather.	**Swin Transformer (Proposed)** and comparison with: - ResNet50 - EfficientNetV2-S - MobileNetV2 - DenseNet121	**Swin Transformer:** 98.46% **DenseNet121:** 97.14% **ResNet50:** 95.09% **MobileNetV2:** 92.33% **EfficientNetV2-S:** 70.45%	Can deep learning — especially a **Transformer-based model** — accurately classify rare and endangered medicinal plants from leaf images under real-world environmental variations?	**Pros:** • Highest accuracy among all compared CNNs. • Extracts both local and global features via shifted window attention. • Excellent generalization (ROC-AUC 0.97–1.00). **Cons:** • Computationally expensive vs. lightweight CNNs. • Requires large GPU resources. • Dataset limited to	[2]

						Bangladesh species.	
3. A Lightweight Deep Learning Method for Medicinal Leaf Image Classification using Feature Fusion (Proposed study)	Indian Medicinal Leaf Image Dataset (Kaggle)	6,904 images, 80 species; RGB images resized to 224×224, 256×256, 128×128; 80/10/10 split (train/val/test)	FF-NCA-CNN (Feature Fusion – Neighborhood Component Analysis – CNN)	**98.9 %** (Mendeley dataset), **96.35 %** (Flavia dataset)	Can hybrid handcrafted + deep feature fusion improve medicinal leaf classification accuracy under low-light and variable conditions?	**Pros:** Robust under variable lighting, excellent generalization, high accuracy **Cons:** Computationally expensive feature fusion; limited dataset diversity	[3]
4. An AI-Based Approach for Medicinal Plant Identification and Classification Using Deep CNN	**Custom Medicinal Plant Leaf Image Dataset** (collected by authors) – No public URL provided	Dataset includes multiple medicinal plant leaf images of different species used in traditional medicine (fever, pain, etc.). Example entries include **Apple, Tomato, Potato, Grape, Corn, Strawberry, Cherry, Blueberry, Raspberry**, etc. Each class contains between **1642–2016 images**. Divided into **training and testing sets** for model evaluation	**Convolutional Neural Network (CNN) ResNet-50 (Pretrained)** and **YOLOv5-X** (for detection, mentioned in conclusion)	**Proposed CNN (ResNet-50): 94.2% Existing (Logistic Regression): 89%**	Can deep learning–based CNN models (particularly ResNet-50) accurately identify and classify medicinal plants from leaf images to support conservation and healthcare applications?	**Pros:** • Improved accuracy vs. traditional models (↑5.2%). • Automates plant identification for non-experts. • Robust and scalable for real-world use. **Cons:** • Dataset not publicly available. • Limited species diversity and regional coverage. • Lacks evaluation under varied lighting and environmental conditions.	[4]

5. A Deep Learning-Based Recognition Technique for Plant Leaf Classification	Flavia Dataset https://flavia.sourceforge.net/	1,703 images, 32 species, avg. 65 images per class	cGAN + CNN (ResNet-50) + Logistic Regression	99.3%	Can synthetic data generated via cGAN improve CNN-based leaf classification accuracy?	**Pros:** High accuracy; effective data augmentation with cGAN; robust across multiple datasets. **Cons:** Computationally expensive; small datasets may still limit model generalization.	[5]

Citations

[1] A. Khan, S. Rehman, and F. Ahmed, "Ensemble-Based Explainable Approach for Rare Medicinal Plant Recognition and Conservation," in *2025 IEEE International Conference on Intelligent Technologies (ICINT)*, 2025. doi: 10.1109/ICINT65528.2025.11030872.

[2] S. Al Alfi, M. K. Hasan, and T. Rahman, "REMP: A Swin Transformer-Powered Approach to Classifying Rare and Endangered Medicinal Plants," in *2025 International Conference on Quantum Photonics, Artificial Intelligence, and Networking (QPAIN)*, Rangpur, Bangladesh, 2025. doi: 10.1109/QPAIN66474.2025.11171802.

[3] V. Gautam, S. Singh, and P. Kumar, "A Lightweight Deep Learning Method for Medicinal Leaf Image Classification using Feature Fusion," *Scientific Reports*, vol. 15, no. 1, p. 34417, 2025.

[4] M. Sangeetha, M. Muthukumar, M. S. Kumar, and U. Sabarinathan, "An AI-Based Approach for Medicinal Plant Identification and Classification Using Deep CNN," in *2024 International Conference on Computing and Data Science (ICCDS)*, 2024. doi: 10.1109/ICCDS60734.2024.10560458.

[5] P. S. Kanda, K. Xia, and O. H. Sanusi, "A Deep Learning-Based Recognition Technique for Plant Leaf Classification," *IEEE Access*, vol. 9, pp. 162590-162612, 2021. doi: 10.1109/ACCESS.2021.3131726.