Of course. Here is a comprehensive review of all 23 research papers you provided, detailing the title, authors, abstract, methodology, identified gaps, and paper type for each one.

Paper 1

Title: Advanced Medicinal Plant Classification and Bioactivity Identification based on Dense Net Architecture

Authors: Banita Pukhrambam, Dr. Arun Sahayadhas

Abstract Summary: This paper proposes a fully automated system for identifying medicinal plants using computer vision and deep learning. It employs a Convolutional Neural Network (CNN) with a DenseNet algorithm for classification. The model was tested on the Indian Medicinal Plants, Photochemistry, and Therapeutics (IMPPAT) benchmark dataset and a custom dataset from Manipur, achieving high recognition rates of 99.56% and 98.51% respectively, highlighting its potential for smart forestry.

Paper Details: Journal Article, Research Article, Full Length.

Methodology Used:

Preprocessing: Utilizes an Adaptive Vector Median Filter to reduce image noise.

Segmentation: Employs Fuzzy C-Means (FCM) clustering to isolate the leaf from its background.

Classification: A CNN based on the DenseNet architecture is used for the final classification of plant species.

Gaps and Limitations:

The model primarily focuses on leaf images, neglecting other plant features like flowers, stems, or fruits.

The future work section suggests the need to test and improve the model's performance against complex backgrounds and varying lighting conditions.

Paper 2

Title: Ayur-Vriksha A Deep Learning Approach for Classification of Medicinal Plants

Authors: Soham Kadam, Premkumar Varma, Pratiksha Zende, Prof. Savita Adhav

Abstract Summary: The paper introduces "Ayur-Vriksha," a deep learning system for medicinal plant classification, aimed at preserving traditional medicinal knowledge. The system is based on a CNN model using the InceptionV3 architecture and classifies leaves based on features like shape, size, and color. It achieved a 97% classification accuracy on a large custom dataset of medicinal plants.

Paper Details: Journal Article, Research Article, Full Length.

Methodology Used:

Core Architecture: Convolutional Neural Network (CNN).

Feature Extraction: Utilizes the pre-trained InceptionV3 model.

Classification: A Softmax layer is used for final class probability calculation.

Dataset: A large, custom-built dataset named "Ayur-Vriksha" with over 50 leaf samples per plant.

Gaps and Limitations:

The study is validated on a custom dataset, which may limit its generalizability compared to standardized benchmarks.

Identification is solely based on leaf features.

Performance in real-world, uncontrolled environments is not extensively detailed.

Paper 3

Title: Conceptual Architecture of Automatic Medicinal Plants Identification System for Manudevi Region

Authors: Snehalata Bhikanrao Shirude

Abstract Summary: This paper proposes a conceptual architecture for an automatic medicinal plant identification system tailored for the Manudevi region in Maharashtra. The proposed system would take photographs of plants as input, process them using image processing techniques, and convert them into a computer-understandable format to build a standard corpus for identification.

Paper Details: Journal Article, Conceptual/Architectural Paper, Full Length.

Methodology Used:

The paper outlines a high-level methodology and system architecture rather than a specific implemented model. The proposed flow includes:

Developing a standard image corpus of local medicinal plants.

Applying digital image processing techniques for feature extraction.

Annotating images and training a machine learning system.

Using the trained system to identify new plant photographs.

Gaps and Limitations:

The primary limitation is that this is a conceptual paper; no model has been implemented or tested.

It highlights the challenge of environmental variations (light, orientation) affecting image quality, which any future implementation would need to overcome.

Paper 4

Title: Identification of medicinal plant using hybrid transfer learning technique

Authors: Sukanta Ghosh, Amar Singh, Shakti Kumar

Abstract Summary: This study addresses the difficulty of medicinal plant identification by proposing a deep learning approach. Using a Mendeley dataset of 30 species, it applies a hybrid transfer learning technique. The model, which combines PCA for feature reduction and VGG16 for classification, achieves a test accuracy of 95.25%, outperforming other popular transfer learning methods.

Paper Details: Journal Article, Research Article, Full Length.

Methodology Used:

Dimensionality Reduction: Principal Component Analysis (PCA) is used to reduce the feature space and computational load.

Transfer Learning: A pre-trained VGG16 model is employed for the classification task.

Hybrid Approach: The methodology is a combination of PCA and VGG16 to optimize performance.

Gaps and Limitations:

The system suffers from high computational overhead and memory consumption.

It is not suitable for deployment on low-power or embedded systems.

Paper 5

Title: A Novel Approach to Classification of Ayurvedic Medicinal Plants using Neural Networks

Authors: Sameer A Kyalkond, V Manikanta Sanjay, Sudhanva S Aithal, Punit S Kumar

Abstract Summary: This paper presents an automated system for classifying medicinal plants by focusing on textural features of leaves. The proposed technique involves image enhancement, feature extraction, and classification using a CNN. The system is designed to create an automated classifier from leaf photographs taken with mobile phones.

Paper Details: Journal Article, Research Article, Full Length.

Methodology Used:

Core Architecture: The CNN architecture is based on AlexNet.

Process: The workflow involves three stages: 1) Image Capture (using mobile phones), 2) Image Preprocessing, and 3) Feature Extraction and Classification via the CNN.

Dataset: A custom dataset of 1050 medicinal and 550 non-medicinal leaves from Karnataka, India.

Gaps and Limitations:

The system is dependent on leaf images and does not incorporate other plant parts.

The conclusion mentions that the system is not yet a real-time application and requires a user interface and networking capabilities for broader use.

Paper 6

Title: Basil plant leaf disease detection using amalgam based deep learning models

Authors: Deepak Mane, Mahendra Deore, et al.

Abstract Summary: This paper presents a hybrid model to detect diseases in Basil plant leaves. The model uses a CNN for feature extraction and then replaces the final classification layer with a Support Vector Machine (SVM) or K-Nearest Neighbor (KNN). A custom dataset of 803 images covering four diseases and healthy leaves was created. The hybrid CNN+SVM model produced the highest accuracy of 95.02%.

Paper Details: Journal Article, Research Article, Full Length.

Methodology Used:

Feature Extraction: A traditional Convolutional Neural Network (CNN) is used.

Classification: A hybrid or "amalgam" approach is used, where the output of the CNN's feature layers is fed into either a Support Vector Machine (SVM) or K-Nearest Neighbor (KNN) classifier.

Data Augmentation: Techniques were used to balance and expand the custom dataset.

Gaps and Limitations:

The study is limited to a single plant species (Basil).

The dataset is relatively small (803 images), which might affect the model's ability to generalize to a wider variety of conditions.

Paper 7

Title: Automatic Recognition of Medicinal Plants: Based on Multispectral and Texture Features using Hidden Deep Learning Model

Authors: Murad Kabir Md. Rakib, Himanish Debnath Himu, et al.

Abstract Summary: This research uses a deep learning approach with a CNN to recognize medicinal plants from leaf images with high accuracy. The authors collected a dataset of 5 different Bangladeshi medicinal plants. Various models were tested, with VGG16 performing best and achieving an accuracy of 95.48%. The work aims to support the medical sector by providing a tool for plant recognition.

Paper Details: Journal Article, Research Article, Full Length.

Methodology Used:

Core Architecture: Deep Convolutional Neural Networks (CNNs).

Models Tested: A comparative analysis was performed using VGG16, VGG19, Inception-V3, Xception, MobileNet, DenseNet121, and ResNet50. VGG16 was found to be the best-performing model.

Dataset: A custom dataset of 2839 images from 5 Bangladeshi herbal plant species.

Gaps and Limitations:

The dataset is limited to only five plant species.

The authors note the significant challenge of data collection and the need for a high-configuration computer for processing.

Paper 8

Title: Automatic plant recognition using convolutional neural network on Malaysian medicinal herbs: the value of data augmentation

Authors: Noor Aini Mohd Roslan, Norizan Mat Diah, et al.

Abstract Summary: This paper investigates the performance of a CNN for identifying Malaysian medicinal herbs, comparing results from a real dataset and an augmented dataset. The study highlights the scarcity of existing datasets for these plants. The model achieved 75% accuracy on the real data and 88% on the augmented data, demonstrating that data augmentation significantly improves model performance.

Paper Details: Journal Article, Research Article, Full Length.

Methodology Used:

Model: A custom-built Convolutional Neural Network (CNN).

Key Technique: The paper's main focus is evaluating the impact of Data Augmentation (rotation, flipping) on classification accuracy.

Dataset: A dataset of 3000 images from 10 species of Malaysian herbs, which was doubled to 6000 images through augmentation.

Gaps and Limitations:

While showing improvement, the final accuracy (88%) is lower than many state-of-the-art models, suggesting the custom CNN architecture could be further optimized.

The study is limited to 10 species of herbs.

Paper 9

Title: HERBAL LEAF RECOGNITION USING MASK-REGION CONVOLUTIONAL NEURAL NETWORK (MASK R-CNN)

Authors: Laiali Almazaydeh, Reyad Alsalameen, Khaled Elleithy

Abstract Summary: This paper uses the state-of-the-art Mask R-CNN framework to build a classification system for medicinal plants. The system performs not only classification but also detection and instance segmentation. Trained on 30 medicinal plant species from the Mendeley Dataset, the model achieved an average accuracy of 95.7%, providing a bounding box, segmentation mask, and class label as output.

Paper Details: Journal Article, Research Article, Full Length.

Methodology Used:

Core Framework: Mask R-CNN (Region-based Convolutional Neural Network). This is a sophisticated model capable of object detection, classification, and instance segmentation simultaneously.

Backbone Network: ResNet101 with a Feature Pyramid Network (FPN) was used for feature extraction.

Annotation: Manual annotation of images was required to create bounding boxes and masks for training the model.

Gaps and Limitations:

The future work section plans to incorporate this technology into a broader Plant Phenotyping Image Recognition (PPIR) system that includes disease diagnosis and growth rate analysis, which is outside the current scope.

Mask R-CNN is computationally intensive, which could be a limitation for real-time mobile deployment.

Paper 10

Title: Medicinal Plant Identification in Real-Time Using Deep Learning Model

Authors: S. Kavitha, T. Satish Kumar, et al.

Abstract Summary: This research proposes a vision-based smart method to identify medicinal herb plants in real-time using a deep learning model deployed on a mobile app. The study focuses on six plants from a Kaggle database. After resizing and augmentation, a MobileNet DL model is trained. The model achieved 98.3% accuracy and was deployed on the cloud, accessible via a mobile app for real-time leaf identification.

Paper Details: Journal Article, Research Article, Full Length.

Methodology Used:

Model: A deep learning model based on the MobileNet architecture, chosen for its efficiency on mobile devices.

Deployment: The trained model is deployed on the Google Cloud Platform (GCP).

Application: A mobile application was created to capture or upload leaf images, send them to the cloud-hosted model, and receive the classification result in real-time.

Data Augmentation: Used to expand the training dataset.

Gaps and Limitations:

The study is limited to only six species of medicinal plants.

Future work will focus on expanding the dataset to include more species to improve the model's classification performance.

Paper 11

Title: Identification of Medicinal Plants using Deep Learning

Authors: R. Upendar Rao, M. Sai Lahari, et al.

Abstract Summary: This paper focuses on the identification of medicinal plants for the ayurvedic and herbal industry. It explores using feature vectors from both the front and back of green leaves, along with morphological features, to maximize identification rate. A database was created from scanned images of leaves, and a DenseNet model was proposed for classification.

Paper Details: Journal Article, Research Article, Full Length.

Methodology Used:

Model: A Convolutional Neural Network based on the DenseNet121 architecture.

Dataset: A custom dataset of 50 different medicinal plant species, with images captured from both the top and bottom faces of the leaves.

Deployment: The system was developed using Python and Keras/TensorFlow in a Jupyter Notebook environment.

Gaps and Limitations:

The paper mentions that the proposed methods are "not suitable for tiny leaves or plants without a proper leaf," indicating a limitation in scope.

The future scope suggests implementing the system on a portable single-board computer for field use, which the current system is not.

Paper 12

Title: Automated Plant Recognition System with Geographical Position Selection for Medicinal Plants

Authors: Biswaranjan Acharya, Ahona Ghosh, et al.

Abstract Summary: This paper designs an automated plant recognition system that not only identifies the plant but also uses a Google platform to locate plant locations on a map. The system is tested in a case study of India. It can show the detailed location of a particular species and the shortest distance to it from the user's current location.

Paper Details: Journal Article, Research Article, Full Length.

Methodology Used:

Image Recognition: The paper explores three different approaches for leaf recognition:

A morphological algorithm in OpenCV.

A Support Vector Machine (SVM) model in Python.

Image processing and neural network tools in MATLAB.

Geolocation: Integrates with Google APIs to fetch and display the geographical locations of identified plants on a map.

Gaps and Limitations:

The system requires internet connectivity to function.

It faces challenges with OpenCV version compatibility and the high cost of a Python server.

The paper suggests integrating software-defined visible light networking (Li-Fi) as a future enhancement, implying current reliance on Wi-Fi is a potential issue in sensitive areas.

Paper 13

Title: Deep Learning-Based Image Processing for Cotton Leaf Disease and Pest Diagnosis

Authors: Azath M., Melese Zekiwos, Abey Bruck

Abstract Summary: This study develops a model to detect cotton leaf diseases and pests using a deep learning CNN. Focusing on common issues like bacterial blight and spider mites, the model was trained on nearly 2400 images. Using a K-fold cross-validation strategy, the model achieved an accuracy of 96.4%, showing its feasibility for real-time applications and supporting manual pest identification in Ethiopia.

Paper Details: Journal Article, Research Article, Full Length.

Methodology Used:

Model: A custom-built Convolutional Neural Network (CNN) trained from scratch.

Dataset: A dataset of 2400 images of cotton leaves, covering three diseases/pests and one healthy class, collected from farms in Ethiopia.

Validation Strategy: K-fold cross-validation (with K=10) was used for robust model evaluation.

Gaps and Limitations:

The study is limited to a single plant (cotton) and only four classes (3 disease/pest, 1 healthy).

The future work section identifies the need to not only identify the disease but also suggest remedies.

It highlights the challenge of collecting a large number of high-quality training images.

Paper 14

Title: Automated Real-Time Identification of Medicinal Plants Species in Natural Environment Using Deep Learning Models—A Case Study from Borneo Region

Authors: Owais A. Malik, Nazrul Ismail, et al.

Abstract Summary: This paper proposes an automated, real-time plant identification system for medicinal plants in the Borneo region. The system includes a computer vision component, a knowledge base, and a mobile app. An EfficientNet-B1 model was trained on a combined public and private dataset, achieving over 84% Top-1 accuracy. A unique feature is the use of crowdsourcing feedback and geo-mapping through the mobile app.

Paper Details: Journal Article, Research Article, Full Length.

Methodology Used:

Model: An EfficientNet-B1 deep learning model.

System Architecture: An end-to-end system comprising:

A mobile application front-end.

A back-end deep learning model for classification.

A dynamic knowledge base with crowdsourcing feedback and geo-mapping.

Training: Transfer learning with post-training quantization.

Gaps and Limitations:

Real-time accuracy (78.5%) dropped compared to offline testing (87%), likely due to variability in real-world conditions.

The system needs more training data and an increased number of species to improve performance and usefulness in the highly diverse Borneo region.

Paper 15

Title: An AI Based Approach for Medicinal Plant Identification Using Deep CNN Based on Global Average Pooling

Authors: Rahim Azadnia, Mohammed Maitham Al-Amidi, et al.

Abstract Summary: This paper proposes an intelligent vision-based system to identify herb plants using an automatic CNN. The model consists of a CNN block for feature extraction and a classifier block that uses a Global Average Pooling (GAP) layer. Tested on five different medicinal plants at various image resolutions, the system achieved over 99.3% accuracy, proving effective for real-time identification.

Paper Details: Journal Article, Research Article, Full Length.

Methodology Used:

Core Architecture: A custom CNN model.

Key Feature: The classifier block replaces the standard fully connected layer with a Global Average Pooling (GAP) layer to reduce model complexity and prevent overfitting.

Data Augmentation: Image rotation and color manipulation were used to expand the dataset.

Gaps and Limitations:

The study is limited to only five species of medicinal plants.

The paper suggests that future work will involve testing the model on less common medicinal plants and developing a mobile application.

Paper 16

Title: Deep-Learning-Based Classification of Bangladeshi Medicinal Plants Using Neural Ensemble Models

Authors: A. Hasib Uddin, Yen-Lin Chen, et al.

Abstract Summary: This research presents a comprehensive dataset of 5000 images for ten Bangladeshi medicinal plant species. After extensive preprocessing, five state-of-the-art deep learning models are benchmarked, with DenseNet201 performing best (85.28% accuracy). The authors then propose three novel architectures and an ensemble approach. A soft ensemble of the proposed models achieved the highest accuracy of 99%, providing a valuable resource for drug discovery and biodiversity conservation.

Paper Details: Journal Article, Research Article, Full Length.

Methodology Used:

Preprocessing: An extensive pipeline including background removal, unsharp masking, CLAHE, and morphological gradient.

Benchmarking: VGG16, ResNet50, DenseNet201, InceptionV3, and Xception were tested.

Proposed Models: Three novel architectures (DRD, DRCD, IRCD) are introduced.

Ensemble Learning: Both hard and soft ensemble techniques were used to combine the predictions of the novel models.

Gaps and Limitations:

The dataset, while valuable, is limited to 10 species.

Future work aims to expand the dataset and incorporate invariance to rotation, translation, and scaling to improve feature extraction.

Paper 17

Title: An Effective Ensemble Convolutional Learning Model with Fine-Tuning for Medicinal Plant Leaf Identification

Authors: Mohd Asif Hajam, Tasleem Arif, et al.

Abstract Summary: This study leverages transfer learning and fine-tuning of three deep convolutional neural networks (VGG16, VGG19, DenseNet201) to identify medicinal plant leaves from a dataset of 30 classes. The models were ensembled using averaging and weighted averaging strategies. The ensemble of VGG19 and DenseNet201 with fine-tuning achieved the best performance, reaching an accuracy of 99.12% on the test set, outperforming standalone models.

Paper Details: Journal Article, Research Article, Full Length.

Methodology Used:

Base Models: Pre-trained VGG16, VGG19, and DenseNet201 are used as base classifiers.

Core Technique: Ensemble Learning using both averaging and weighted averaging strategies to combine the outputs of the base models.

Fine-Tuning: The base models were fine-tuned on the Mendeley Medicinal Leaf Dataset.

Gaps and Limitations:

The dataset is relatively small (1835 images).

The approach relies exclusively on leaf images, which may not be sufficient for all plant species that require identification from flowers or fruits.