|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Reference** | **Pre-processing** | **Approach** | **Dataset Details** | **Accuracy (%)** | **Key Findings** | **Limitations** |
| **Filter** | **Augmentation** | **Machine learning** | **Deep learning** | **classifier** | **Dataset size** | **Number of Diseases** |
| **[16]** | **-** | **Rotation, Flipping, Zoom, Brightness** | **-** | **Coffee Net** | **SoftMax** | **1747** | **5 classes** | **98.89%** | **CoffNet demonstrated high performance in recognizing coffee leaf diseases** | **The need to expand the data set to include diverse field conditions.** |
| **[17]** | **-** | **Rotation, Flipping, Zoom, Resizing** | **random forest** | **-** | **-** | **10,987** | **2 classes** | **99.00%** | **Effective visual discrimination** | **considering the use of advanced technologies in coffee farming** |
| **[18]** | **-** | **Rotation, Flipping, Zoom, Resizing** | **-** | **Dense Net** | **SoftMax** | **37,939 images** | **4 classes** | **97.57%** | **Excellent results methodology applied to a large dataset.** | **Need for diverse data** |
| **[19]** | **Otsu Thresholding, Morphology** | **-** | **-** | **-** | **Direct identify without a classifier** | **-** | **1 classes** | **-** | **Accurate stain detection** | **affected by noise and need to classify more data.** |
| **[20]** | **Contrast Enhancement** | **Rotation, Flipping, Scaling, Grayscale** | **-** | **SUNet** | **-** | **58.555** | **5 classes** | **-** | **Fast and accurate detection** | **Need for field testing** |
| **[21]** | **NDVI indicators** | **-** | **Random Forest** | **-** | **-** | **-** | **2 classes** | **86.0%** | **Improve detection accuracy** | **Biodiversity is required** |
| **[22]** | **CLMI Index** | **-** | **Random Forest** | **-** | **-** | **-** | **1 classes** | **89.5%** | **Spectral index effectiveness** | **Need for field evaluation** |
| **[23]** | **13 RGB indices** | **-** | **SGD, SVM** | **-** | **-** | **-** | **2 classes** | **83.0%** | **Optically effective detection** | **The image quality is impressive.** |
| **[24]** | **Contrast Enhancement** | **Resizing, Grayscale** | **-** | **Custom CNN** | **SoftMax** | **400** | **2 classes** | **98.1%** | **Accurate distinction between healthy and infected** | **Lack of data diversity** |
| **[25]** | **Grayscale, Contrast** | **Resizing** | **-** | **LDCNN** | **Softmax** | **4626** | **2 classes** | **98.38%** | **Accurate classification with explanation** | **Field trial needed** |
| **[26]** | **-** | **Rotation, Flipping** | **-** | **Efficient Net** | **Softmax** | **4800** | **4 classes** | **99.62 %** | **Some models are superior** | **Need to generalize the results** |
| **[27]** | **-** | **CutMix, Mosaic** | **-** | **YOLOv4** | **-** | **387** | **3 classes** | **81 %** | **YOLOv4 Superiority** | **Color similarity to background and small data set** |
| **[28]** | **Cropping, Background Removal** | **-** | **-** | **EfficientNetB5** | **Softmax** | **5337** | **2 classes** | **92.71%** | **Most Influential Backbone** | **Need for field evaluation** |
| **[29]** | **-** | **-** | **LDA، SVM، RF، ANN** | **-** | **LDA** | **240** | **4 classes** | **91.7%** | **The low-cost AS7265X sensor can be used with machine learning techniques to accurately classify coffee types and origins.** | **Further studies are needed to evaluate performance with larger and more diverse data sets.** |
| **[30]** | **-** | **-** | **-** | **AlexNe** | **Softmax** | **-** | **8 classes** | **95.2%** | **The model demonstrated high generalization ability and reduced bias in classifying certain types of defects.** | **Not using data augmentation techniques may affect the model's ability to generalize to more diverse datasets.** |
| **[31]** | **Cloud and shadow correction.** | **Images divided into 128x128 patches.** | **-** | **U-Net** | **Modified AlexNet** | **54** | **2 classes** | 95.2% | **U-Net model classified coffee plantations accurately** | **Struggles with mixed crops; retraining needed for new regions..** |
| **[32]** | **Background removal and leaf segmentation** | **-** | **-** | **Custom CNN** | **-** | **-** | **4 classes** | **-** | **Low-cost CNN model for diagnosing coffee leaf diseases.** | **Accuracy not clearly reported; limited to specific cases.** |
| **[33]** | **Cloud and shadow correction applied.** | **-** | **-** | **-** | **Spectral analysis only** | **-** | **4 classes** | **-** | **Spectral differences around 700 nm effectively indicated infestation severity** | **No direct classifier; lab-based findings only.** |