East West University

Department of Computer Science and Engineering

Semester: Spring 2024

Assignment Report

Course Code: CSE366

Course Title: Artificial intelligence

Section: 03

Assignment No: 03

Submitted By,

Raiyan Gani

ID: 2021-2-60-120

Submitted To,

Dr. Mohammad Rifat Ahmmad Rashid

Assistant Professor

Department of Computer and Science Engineering

East West University

Date of Report Submission: 21 May, 2024

Assignment: Genetic Algorithm - Computer Vision Assignment

Objective: This assignment is designed to give you practical experience in developing and training deep learning models for computer vision tasks. You have the option to focus on either image classification or object detection, using specific datasets and model architectures.

Dataset Information: The dataset contains 1006 leaf images grouped according to their nutritional deficiencies (Boron, Iron, Potassium, Calcium, Magnesium, Manganese, Nitrogen and others). CoLeaf dataset contains images that facilitate training and validation during the utilization of deep learning algorithms for coffee plant leaf nutritional deficiencies recognition and classification.

CoLeaf Dataset	
Class	Frequency
boron-B	101
calcium-Ca	162
iron-Fe	65
magnesium-Mg	79
manganese-Mn	83
nitrogen-N	64
phosphorus-P	246
potassium-K	96
more-deficiencies	104
healthy	6

Citation: Tuesta-Monteza, Víctor A; Mejia-Cabrera, Heber I.; Arcila-Diaz, Juan (2023), "CoLeaf DATASET", Mendeley Data, V1, doi: 10.17632/brfgw46wzb.1

Link: https://data.mendeley.com/datasets/brfgw46wzb/1

Data Augmentation:

Augmentation Key factors: rotation_range=40, width_shift_range=0.2, height_shift_range=0.2, shear_range=0.2, zoom_range=0.2, horizontal_flip=True, fill_mode='nearest'.

CoLeaf Augmented Dataset	
Class	Frequency
boron-B	683
calcium-Ca	782
iron-Fe	690
magnesium-Mg	686
manganese-Mn	726
nitrogen-N	686
phosphorus-P	713
potasium-K	747

Data Pre-process:

Train - 70%

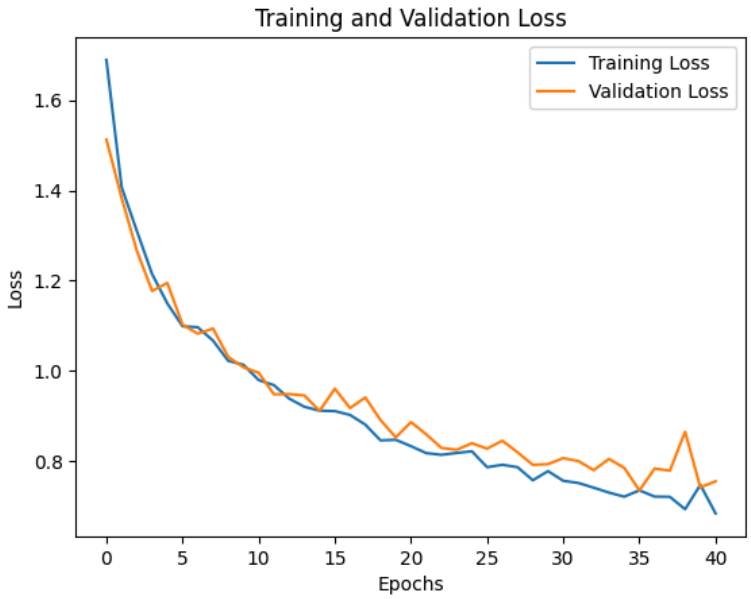
Validation - 20%

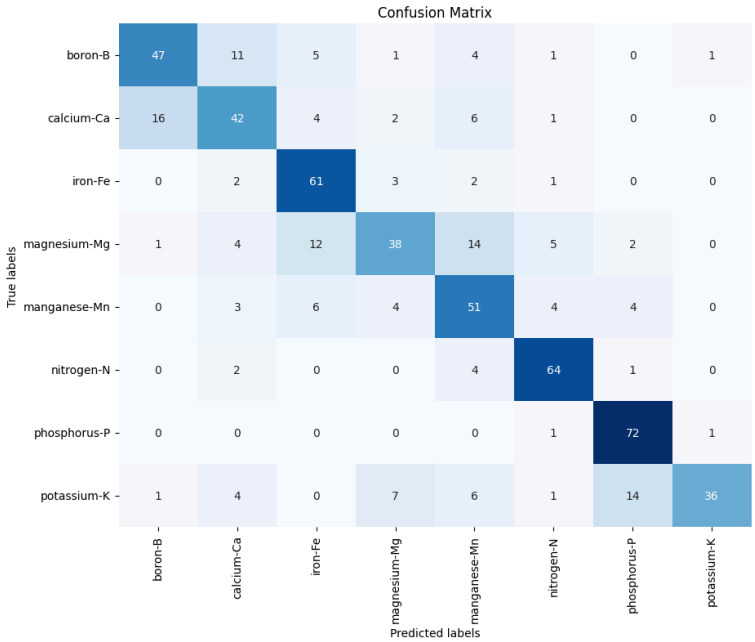
Test - 10%

Model Performance:

Traditional CNN with group normalization:

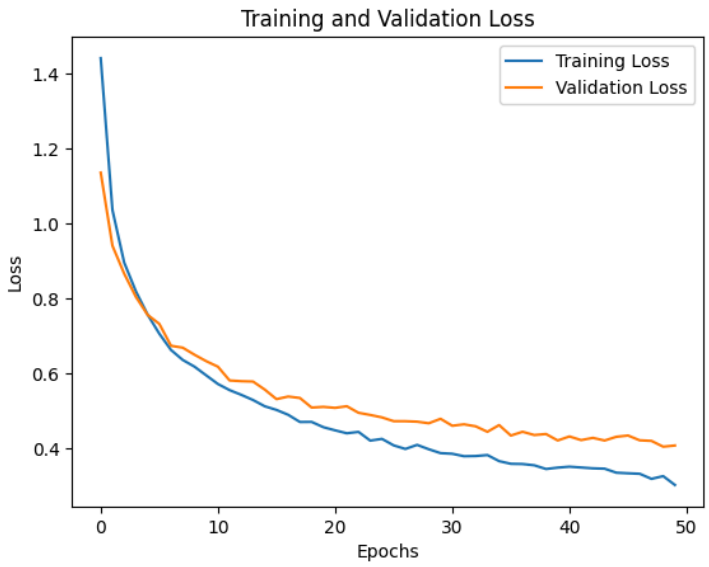
Model	Accuracy	Precision	Recall	F1 score
Traditional CNN	71.85%	73.16%	71.89%	71.16%

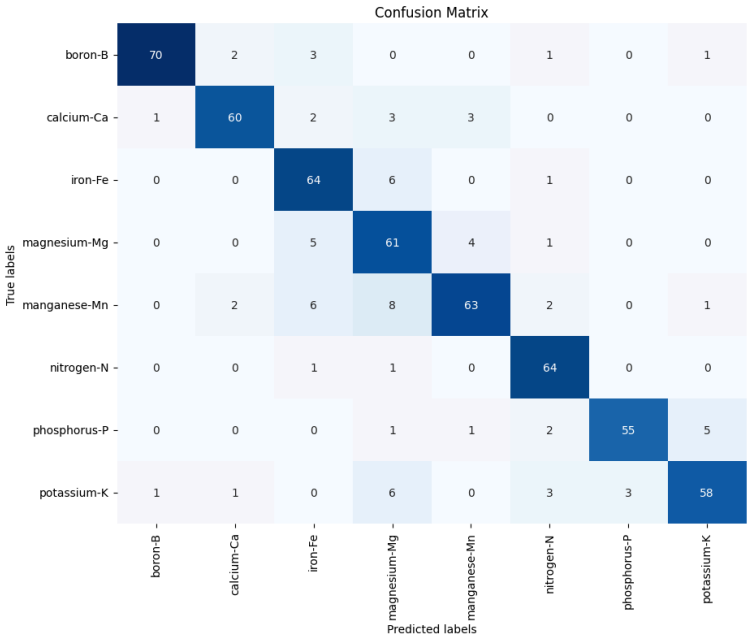




EfficientNet B3:

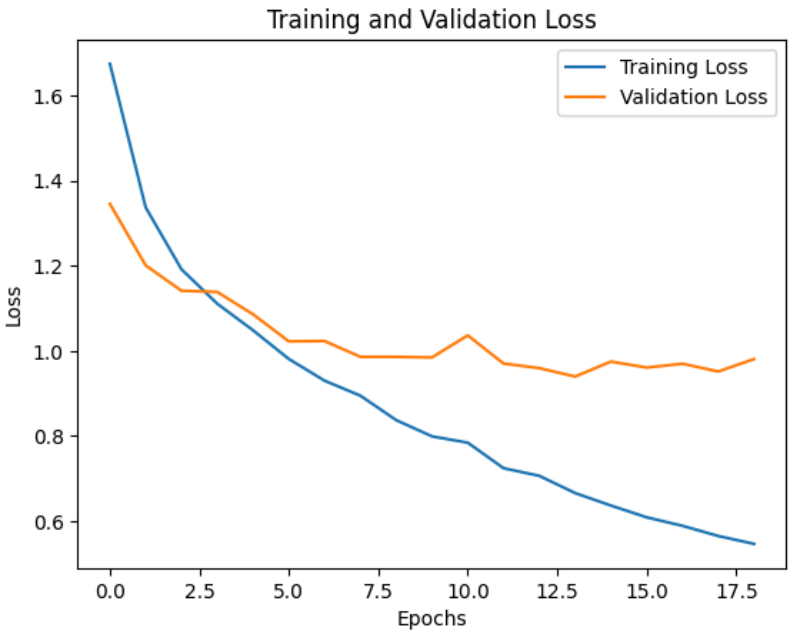
Model	Accuracy	Precision	Recall	F1 score
EfficientNet B3	86.53%	87.34%	86.77%	86.75%

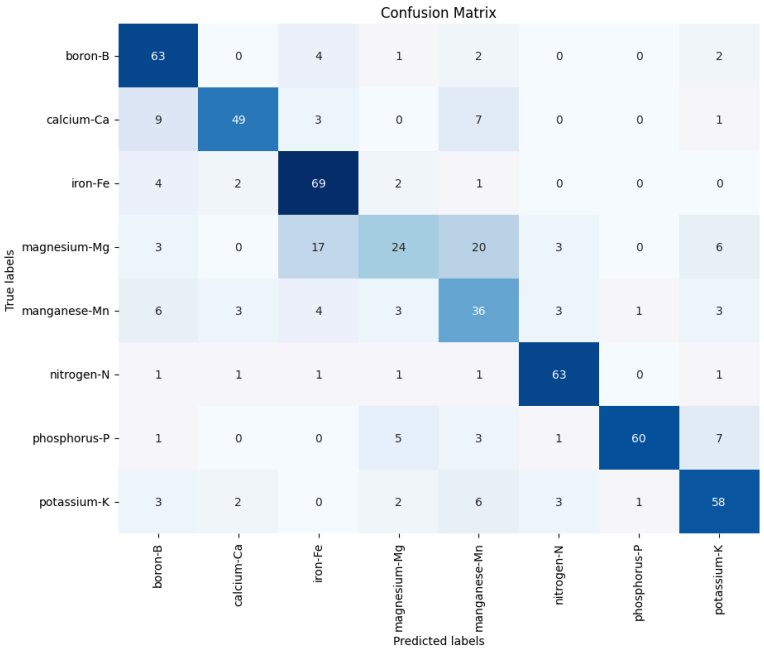




MobileNet V2:

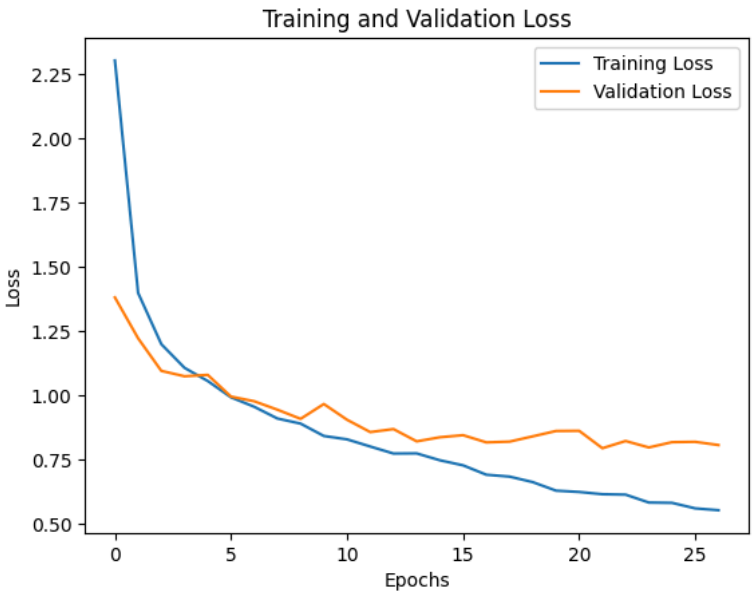
Model	Accuracy	Precision	Recall	F1 score
MobileNet V2	66.25%	65.41%	64.66%	64.16%

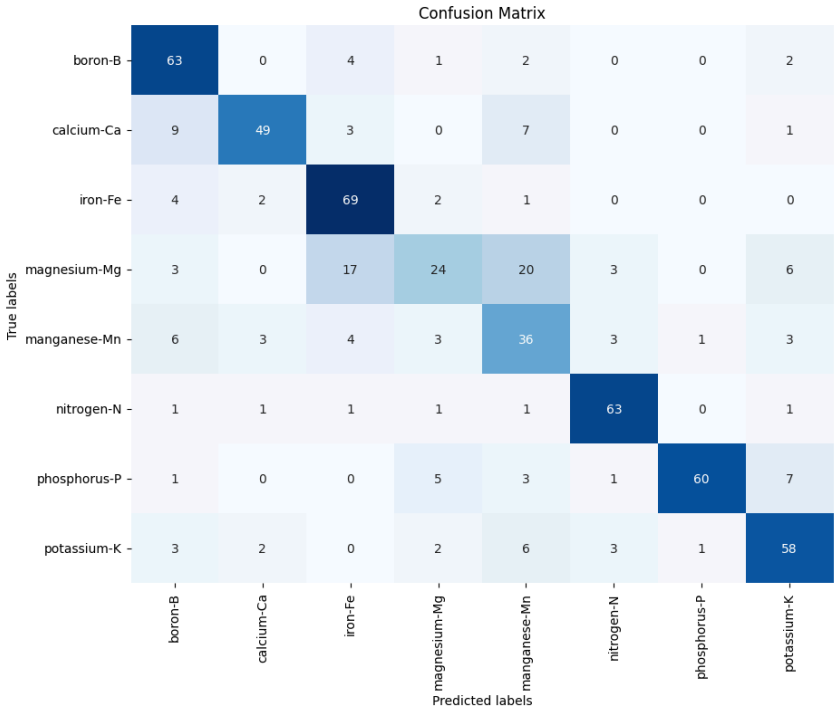




DenseNet 121:

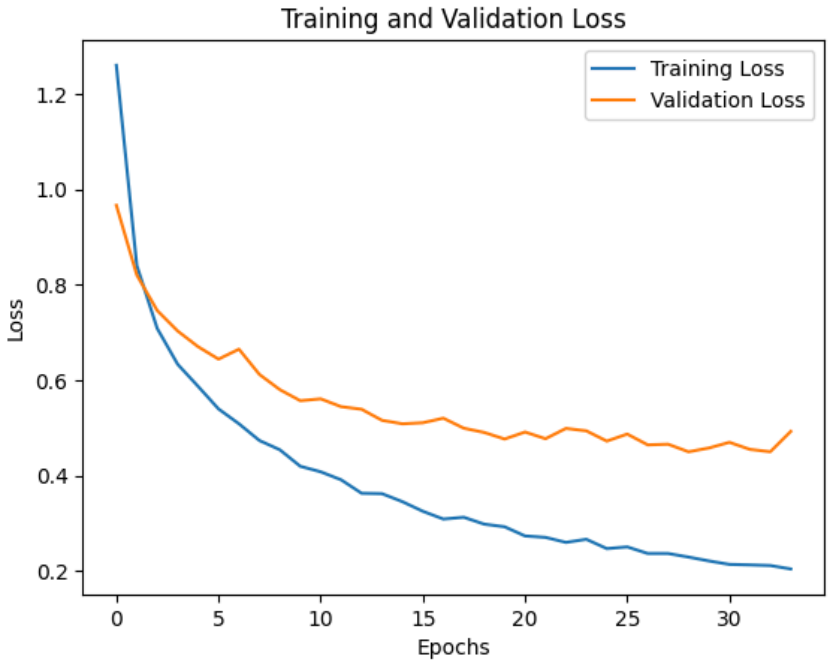
Model	Accuracy	Precision	Recall	F1 score
DenseNet121	73.77%	74.29%	73.42%	72.67%

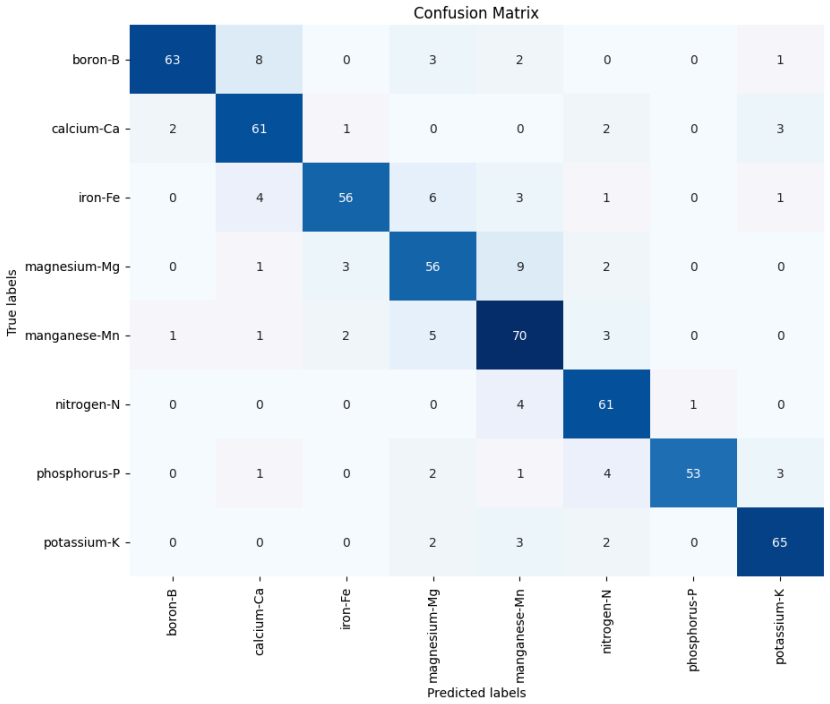




ResNet50:

Model	Accuracy	Precision	Recall	F1 score
ResNet50	84.79%	85.79%	84.85%	85.02%


Training and Validation Loss
Training Loss
Validation Loss
Loss
Epochs
1.2
1.0
0.8
0.6
0.4
0.2
0
5
10
15
20
25
30


Confusion Matrix
True labels
Predicted labels
boron-B
calcium-Ca
iron-Fe
magnesium-Mg
manganese-Mn
nitrogen-N
phosphorus-P
potassium-K
63 8 0 3 2 0 0 1
2 61 1 0 0 2 0 3
0 4 56 6 3 1 0 1
0 1 3 56 9 2 0 0
1 1 2 5 70 3 0 0
0 0 0 0 4 61 1 0
0 1 0 2 1 4 53 3
0 0 0 2 3 2 0 65

Summary:

Model	Accuracy	Precision	Recall	F1 score
EfficientNet B3	86.53%	87.34%	86.77%	86.75%
ResNet50	84.79%	85.79%	84.85%	85.02%
DenseNet121	73.77%	74.29%	73.42%	72.67%
Traditional CNN	71.85%	73.16%	71.89%	71.16%
MobileNet V2	66.25%	65.41%	64.66%	64.16%