CoverSheet

ProjectTitle : **Maize leaf disease classification using deep convolutional neural networks**

	ID	Name	Grade
1	202000498	عبدالرحمن احمد سنوسي حافظ	
2	202000557	عصام احمد محمود بشير	
3	202000248	حازم طارق رجب محمد	
4	201900481	علاء الدين عبدالله محمد حسن	
5	20150017	احمد اشرف احمد ابوهيبة	
6	20150017	على خالد على	

Paper Details

- Paper 's Name : **Maize leaf disease classification using deep convolutional neural networks.**
- paper's link : https://link.springer.com/article/10.1007/s00521-019-04228-3
- Author's Name : **Ramar Ahila Priyadharshini, Selvaraj Arivazhagan, Annamalai Mirnalini.**
- Publication Date : 17 May 2019
- The implemented algorithm : **convolutional neural networks.**

  With three hidden layers and two convolutional process and two Maxpooling and 2 stride.

Paper's Dataset details

- The dataset used : **Plant Village dataset.**
- Dataset link : https://github.com/spMohanty/PlantVillage-Dataset
- *Table 1 Details of maize leaf images in Plant Village dataset*

Class	No. of images
Common rust	1192
Gray leaf spot	513
Northern leaf blight	985
Healthy	1162

Experimental results and discussion:

The proposed CNN model is applied to maize leaf disease recognition problem. The experimentation is carried out using Plant Village dataset . The dataset consists of four different classes. Among them, one class consists of:
A: Common rust
B: Gray leaf spot
C: Northern leaf blight
D: Healthy.

Classification accuracy using modified LetNet architecture

Train–test ratio (%)	**Classification accuracy (%)**	
	500 epochs	**1000 epochs**
50–50	**84.91**	**85.85**
75–25	**86.53**	**87.46**
80–20	**88.06**	**89.20**

Table 4
Classwise classification accuracy using modified LetNet architecture

Train–test ratio (%)	Classes	Class wise classification	Average classification
50–50	Common rust	96.69	85.85
	Gray leaf spot	57.48	

	Northern leaf blight Healthy	90.57 98.36	
75–25	Common rust Gray leaf spot Northern leaf blight Healthy	98.32 60.86 92.01 98.69	87.46
80–20	Common rust Gray leaf spot Northern leaf blight Healthy	99.49 64.48 93.77 99.06	89.20

From Table 4,
it is observed that, when comparing the overall performance of all four classes, the class gray leaf spot showed less accuracy which affects the overall accuracy of the maize disease classification model. This is due to class imbalance of the class gray leaf spot which has comparatively less number of images. To make the dataset as a balanced one, we have performed data augmentation using horizontal flip for the class gray leaf spot. So, this class now contains 1026 images (513 original ? 513 horizontal flip). From Table 3, it is evident that the classification accuracy is high for 1000 epochs. So, further experimentation is carried out with the balanced dataset for 1000 epochs. The performance measure with the balanced dataset for 1000 epochs using different train and test ratios is depicted in Table 5.

Table 5
Performance measure for the balanced dataset

Train–test ratio (%)	Classes	Class wise classification	Average classification
50–50	Common rust Gray leaf spot Northern leaf blight Healthy	99.04 74.67 94.99 99.21	91.97
75–25	Common rust	99.53	94.66

	Gray leaf spot Northern leaf blight Healthy	81.78 97.82 99.53	
80–20	Common rust Gray leaf spot Northern leaf blight Healthy	99.87 84.58 98.14 99.70	95.57

From Table 5, it is observed that classification accuracy is improved for the balanced dataset. So far, the experimentation is done using the depth and the kernel size as mentioned in Table 1. For improving the classification accuracy, once again the proposed architecture is modified by varying the depth and kernel size. Huge hike in depth value leads to over-fitting. Thus, the depths are varied slightly. The performance measure for the balanced dataset with different kernel sizes and depths is shown in Table 6. From Table 6, it is clear that kernel size 3 9 3 outperforms the other kernel sizes irrespective of the variation in the depth. Also slight increase in the depth gives more accurate results.

Table 6
Performance measure for the balanced dataset with different depths and kernel sizes

Table 6 Performance measure for the balanced dataset with different depths and kernel sizes

Train–test ratio (%)	Classwise classification accuracy (%)					
	Depth: C1@6,C2@16			Depth: C1@10,C2@20		
	Kernel: 3 × 3	Kernel: 5 × 5	Kernel: 7 × 7	Kernel: 3 × 3	Kernel: 5 × 5	Kernel: 7 × 7
50–50	92.71	91.97	90.91	94.19	93.21	92.22
75–25	95.44	94.66	93.02	96.83	95.99	94.68
80–20	96.81	95.57	94.15	97.89	96.75	95.26

Project Description Document

General Information on the selected dataset:

Name of dataset : **Corn or Maize Leaf Disease Dataset.**

Dataset's Link : https://www.kaggle.com/datasets/smaranjitghose/corn-or-maize-leaf-disease-dataset

The total number of samples in dataset : **4188.**

The dimension of images :

(256, 256, 3) 1323

(768, 1024, 3) 8

(1200, 675, 3) 7

(2448, 3264, 3) 7

(900, 1200, 3) 5

(1024, 650, 3) 1

(640, 360, 3) 1

(371, 788, 3) 1

(200, 250, 3) 1

(378, 420, 3) 1

Number of classes : 4.

Their labels : **['Blight', 'Common_Rust', 'Gray_Leaf_Spot', 'Healthy'].**

Implementation details:

Ratio used for training: **80%,**

Number of images: **3350.**

Ratio used for vlidation: **10,**%

Number of images: **418.**

Ratio used for testing: **.1,**
Number of images: **420.**

Block Diagram :