

Web App for Cassava Leaves' Diseases Detection

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Introduction

- There are more than 70 million people in Eastern, Central and Southern Africa depend on cassava as a primary source of food [1].
- But cassava, like many other crops, is vulnerable to viruses and other plant diseases.
- These diseases can affect cassava yields, cost farmers money, and threaten food security in sub-Saharan Africa
- In order to protect the crops from poor production and post harvest losses, we developed a deep learning model to classify the Cassava leafs disease among four common diseases and deployed the model on the web.

Data and Diseases

The data is from Cassava Disease Classification Competition hosted by Kaggle 2019.

- The data set consists [5] of unlabelled and labelled images of cassava leaves.
- annotated in five categories: (a) healthy leaf and; the four categories of the diseased leaves are: (b) Cassava Mosaic Disease (CMD), (c) Cassava Brown Streak Disease (CBSD), (d) Cassava Bacterial Blight (CBB), (e) and Cassava Green Mite (CGM).

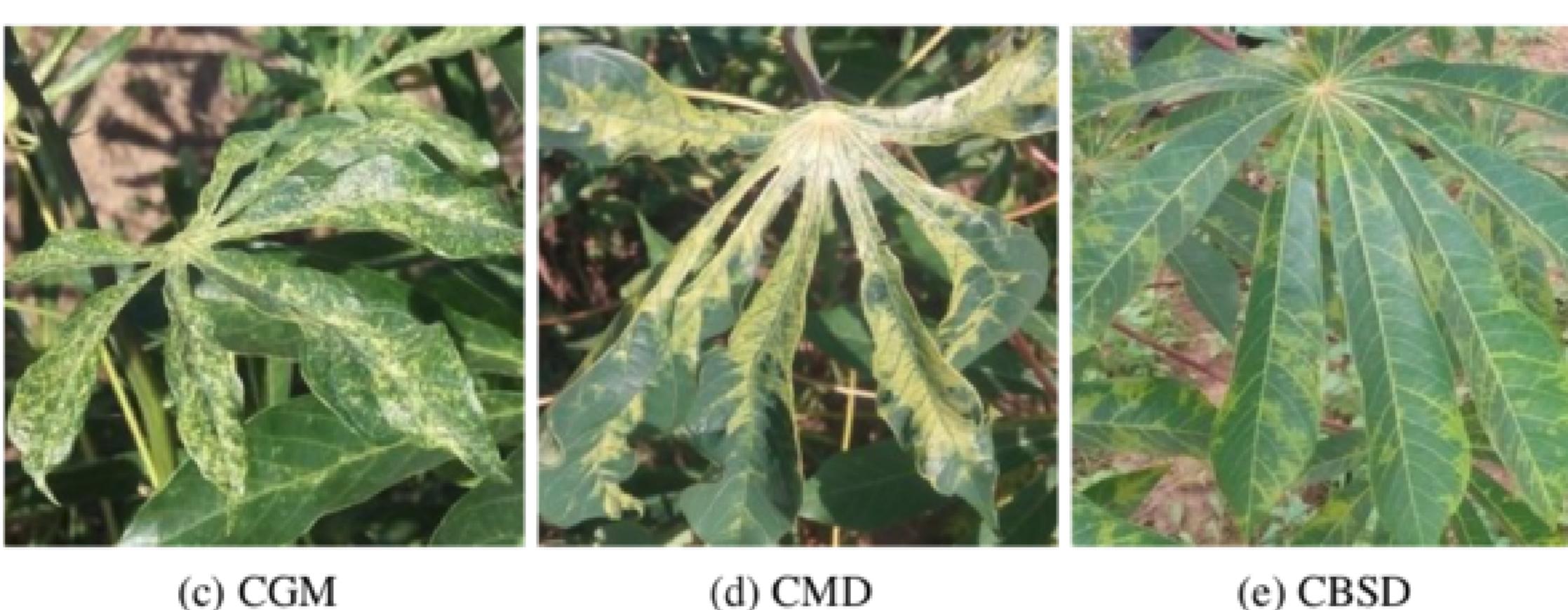
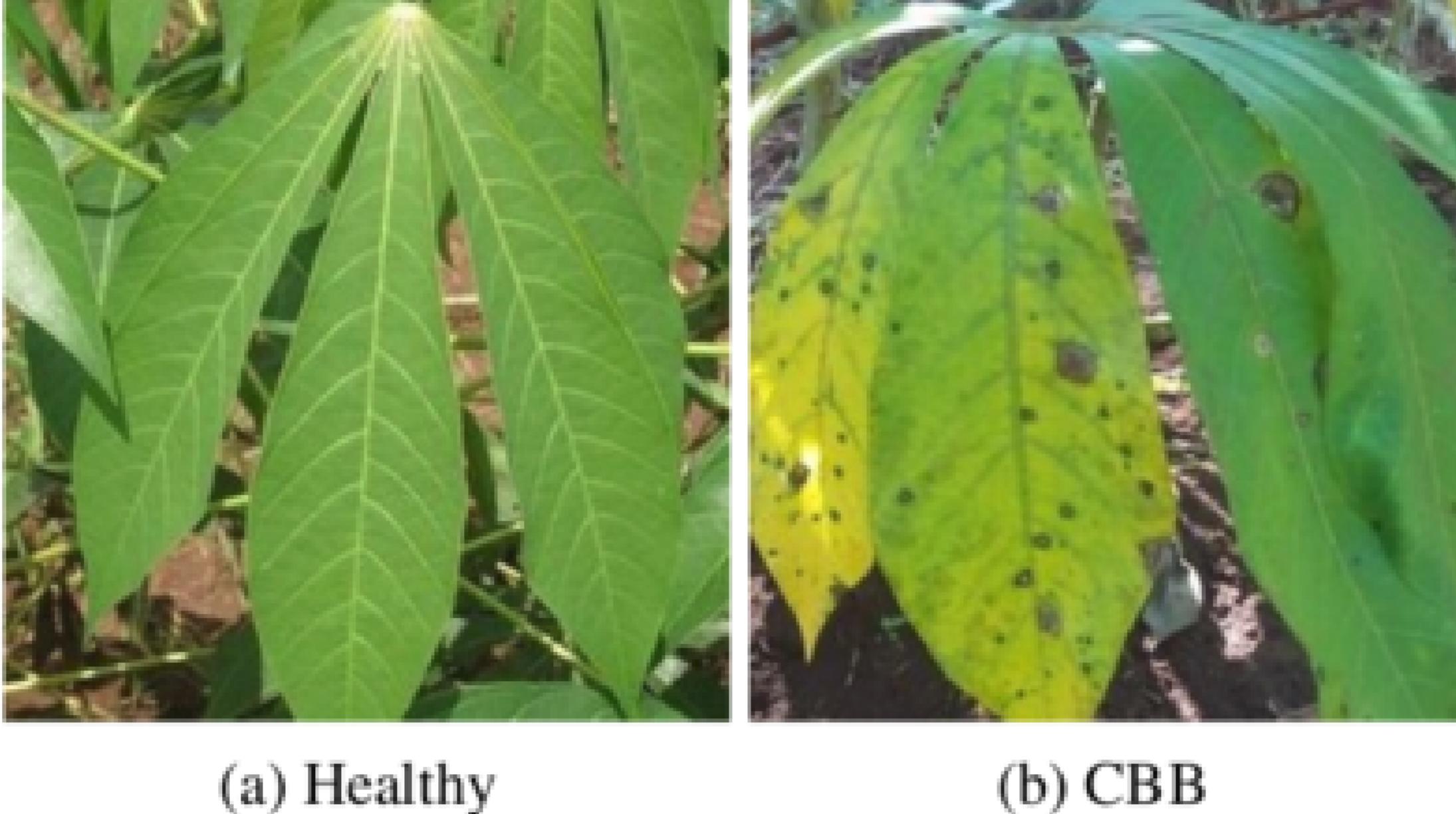


Challenges!!

Only agriculture experts can identify a Cassava disease as:

- different diseases may have similar symptoms, and each leaf can have more than one disease.
- model should generalize over different views and angles of images because they will be taken by different farmers with various camera types.
- different backgrounds in the images (i.e. different farms), images quality, the time the image was captured

Sample



Deep Learning Model and Web Application Description

We experimented with Fastai [2], The reason for using Fastai is quoted from their documentation: Fastai simplifies training fast and accurate neural nets using modern best practices ”.

```
In [ ]: model_name = 'se_resnext101' # 'vgg_16_2'

_base_arch = lambda arg: pm.se_resnext101_32x4d(num_classes=5, pretrained=None)
learner = vision.cnn_learner(data,
                             base_arch = _base_arch,
                             pretrained = False,
                             metrics = vision.accuracy)

batch_size = 64
arch_name = 'resnetxt101_32x46'
experiment.log_parameter("batch size", batch_size)
experiment.log_parameter("architecture", arch_name)

In [ ]: model_name = 'vgg_16_2'
used_model = models.vgg16_bn #lambda arg: pm.se_resnext101_32x4d(num_classes=5, pretrained=False)
# other models: PNASNet-5-Large, NASNet-A-Large, SENet154, ResNet152, ResNet101, Densenet
learner = cnn_learner(data, base_arch = used_model,
                      pretrained = True, metrics = accuracy)
model_dir="/content/models/se-resnext101-32x4d").mixup()

best model so far ... model_name = vgg_16_2
learner.load('/content/gdrive/My Drive/cassava_fastai_'+model_name+'_stage-7')
learner.data = data
```

Result

- We applied another trick to enhance the accuracy of the classification which is progressive resizing; starting with 224*224 size and batch size of 64, then 256*256 with batch size 32 and finally 512*512 with batch size 8.
- we were able to make a public web.
- we recorded a score of 0.93021 on the private leader board and 0.91655 on the public leader board which comes in the top five teams.

Classify Cassava Leaves Diseases 

Use images of healthy or un-healthy Cassava leaves



Limitations and Future Work

Pictures were taken with the same type of phone which can constitute a limitation in terms of the model robustness. Also, we had limitation in term of computation resources we needed to try different experiments. We plan to do enhancements so that it can be used by the farmers themselves, such as:

- Add to the interface the African dialects where the Cassava is planted.
- Display automated feedback for the predicted class (i.e. explain the prediction with one of the deep learning interpretability methods).
- Extend to a mobile application.

References

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