INTEGRATION OF DEEP LEARNING TECHNIQUES WITH FARMING

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Abstract

Deep Learning is becoming applied in new fields day by day. Many conventional methods are being replaced by deep learning techniques. One of the examples is finding the structure of protein molecule. Deep Brain published a model which can predict protein molecule in seconds after inputting the parameters whereas it used to be a researchers PhD work before. Here we try to integrate some of the farming practice with deep learning techniques so that productivity gets maximized

Introduction

Farming is one of the important occupation of our country. Lot of our population depend on farming for their living and it is one the occupation necessary for our survival. We feel by integrating Deep Learning techniques we can maximize the productivity of farmers. We have chosen three important categories, Disease detection, Fertilizer class prediction and predicting whether we can get the expected output.

Disease Detection Using CNN

We feel this is one the most important aspect for farming. We feel using Deep Learning if the disease is detected quickly then we can find remedy quickly. This would be much faster than the lab tests etc. Here we got a dataset where each folder says which fruit and which disease. When we pass the whole data without any modification then we get around 95% accuracy. To achieve better accuracy we consolidated all the plants of a particular type into one category and if we pass this data and train we were able to get more than 99% accuracy. We used pretrained MobileNet_V2 from torchdivision models. We also decreased the learning rate by 10 whenever model starts to overfit. We used MobileNet_V2 as the model is very light but also gives very good performance.

Yield Expectation and Fertilizer Class Prediction

Using the parameters like rainfall, Average Humidity, Mean Temp, Max Temp, Min Temp, Alkaline, Sandy, Chalky, Clay we predict whether the farmer can get the expected yield or not. Here using simple NN we were able to achieve 100 percent accuracy. Model is as follows

nn.Linear(9, 6)

nn.Linear(6, 3)

nn.Linear(3, output_dim)

The model is very light and can be easily applied to edge devices.

We applied similar logic to Fertilizer prediction also. Using the Ca, Mg, K , S, N, Lime, C, P, Moisture content we get the fertilizer class. The model is as follows

x = layers.Dense(10, activation='relu')(inputs)

x = layers.Dense(15, activation='relu')(x)

x = layers.Dense(10, activation='relu')(x)

x = layers.Dense(4, activation='sigmoid')(x)

RESULTS

Disease Detection

Model without Consolidation	Train Accuracy ≈ 95
Model with Consolidation	Train Accuracy ≈ 100

Fertilizer Class Prediction

Train and Validation accuracy = 100%

Yield Prediction

Train and Validation accuracy = 100%

CONCLUSION

We can see that using Deep Learning techniques we can achieve really good accuracy and we can extend this Deep Learning techniques to other Farming process if data is available and this techniques if applied then we can definitely do farming more efficiently and prevent many mishaps. We have to encourage farmers collect their data so that we can improve the existing model for the future research puposes

LINKS FOR DATASET

https://github.com/spMohanty/PlantVillage-Dataset/tree/master/raw/color

https://drive.google.com/file/d/1j2IkM_Vp-7dvHqRkvxEXVuYXarf6Vb_Y/view?usp=sharing

https://github.com/suvam14das/Smart-Farming-Fertilizer-Prediction