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SOYBEAN INSECT CLASSIFICATION USING CONVOLUTION NEURAL NETWORK

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Abstract: Farming is perhaps the main financial movement. India's economy is intensely founded on horticulture, with around 75% of the provincial populace relying on agribusiness as their essential pay, 84% of which are little and peripheral ranchers. Soybean crop is among principle business crop. Creepy crawly irritations are one of the fundamental elements influencing rural item yield. Exact acknowledgment of bug bothers works with convenient preventive measures to stay away from financial losses. Pest discovery is a significant test in the field of horticulture. In any case, an inordinate utilization of pesticide is hurtful to plants, creatures and individuals. We utilize different methods of Computer Vision and Deep Learning to take care of this issue. Pictures of the yield influenced by these nuisances and creepy crawlies are gained and utilized as a preparation dataset for the convolution neural network model for highlight extraction, since the current strategies depend on manual grouping by the ranchers, which is a monotonous, tedious and debilitating cycle. This can be computerized utilizing the innovation of deep learning, which is favorable as it is reasonable and moderate as far as arrangement and force utilization.

Index Terms - Insect identification, Convolution Neural Network, deep learning, Soybean Insect

I. INTRODUCTION

India is fundamentally an agrarian country. Agribusiness is the main occupation for most Indian families [1]. Agribusiness represented 23% of GDP, and utilized 59% of the nation's absolute labor force in 2016. As far as absolute arable land, it has become the biggest country in over 60% of the land space of India. Soybean seed [2] is wealthy in protein and oil content and giving high energy food to developing populace. Assortments of results from soybean are utilized in numerous businesses and creature farming across the world. It is otherwise called wonder been, brilliant been, cow of the field and meat of the field and so on. Soybean was primarily used as a pulse by the local population.

Plant disease and insects are main cause in crop loss [3]. To stay away from the misfortunes brought about by the bugs, different control measures have been planned. These incorporate social, mechanical ,organic and synthetic techniques. In any case, more significance was given to compound control measures to control explicit creepy crawly bug. It included booked use of synthetics. The entrance utilization of insect poisons [4] additionally produce soil contamination and the nature of harvest in likewise diminish. It is additionally perilous for human.

Many exploration works had been done over the acknowledgment of bugs by various techniques. We will apply convolution neural organization strategies to early identification of bug on soybean crop by which the nature of soybean crop increment and furthermore access utilization of pesticide is lessen.

II. METHODOLOGY

To order soybean plant creepy crawlies an enormous assortment of the plant's leaf pictures is required. To construct an incredible profound learning model, there need to investigate and comprehend the creepy crawly dataset prior to characterizing a prescient errand and tackle it. Supposedly, there were not tracked down any prepared to utilize freely accessible objective creepy crawly information thus need to produce in its nearby climate. So to gather information we use camera, versatile with great goal camera to catch picture of soybean leaf.

As we all aware that for good generation of model from deep learning method we need a big dataset [5] so that the generated model works well in all condition. To achieve this we apply different augmentations techniques on captured images. By

augmentations our database size increases. We basically considering four insects of soybean namely Eocanthecona Bug, Tobacco Caterpillar, Red Hairy Caterpillar, Larva Spodoptera .

			
Eocanthecona Bug	Tobacco Caterpillar	Red Hairy Caterpillar	Larva Spodoptera

Artificial neural networks [6] freely look like natural neural organizations found in the cerebrums of creatures. They have various layers with a specific number of neurons in every one of these layers. Profound learning is a subfield of AI which depends on counterfeit neural organizations. They are roused by and freely take after the construction of natural minds. They have numerous layers handling the info information. The layers of the organizations remove different highlights from the information. For the most part, the lower layers remove highlights of low intricacy, while the higher layers extricate more unpredictable highlights. Profound learning models are equipped for settling complex errands with no earlier information or unequivocal component designing. They for the most part require a lot of information for this.

Deep Learning [7]has found applications in many domains - computer vision, natural language processing, audio recognition, video recognition etc.

Computer vision [8] is an interdisciplinary field that arrangements with removing data from pictures and recordings utilizing PCs. In a more unique sense, it manages permitting computer to "see", and mechanizing errands that require human vision. A few uses of computer vision are picture arrangement, movement following and expectation, object identification, optical person acknowledgment, facial and biometric acknowledgment and so on.

The most widely recognized kind of organization utilized for Computer vision assignments in profound learning in a convolution neural organization [9], or CNN. CNNs [10] are multi-facet directed organizations which can gain includes consequently from datasets. It can perform both component extraction and characterization under a similar design. These require almost no preparing of the pictures and are equipped for separating highlights all alone. The Convolution Neural Network is made out of different convolution and pooling layers, in conclusion finishes with the completely associated layers. Figure 1 shows basic CNN architecture

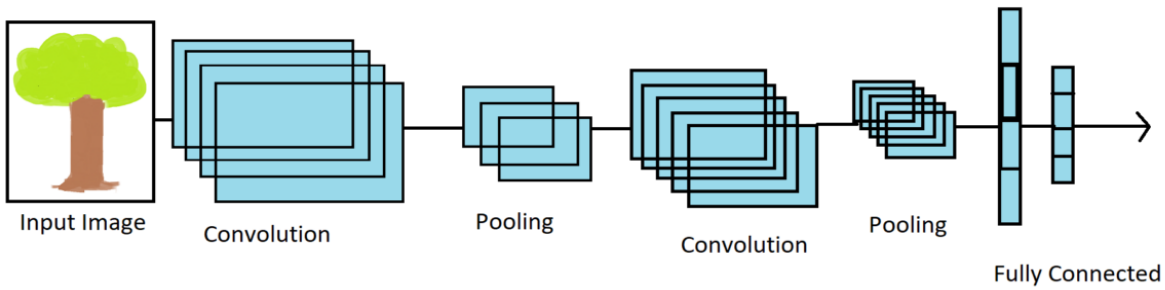

Figure 1 : Basic CNN architecture

III. EXPERIMENTAL SETUP AND RESULT

To make a model, we need preparing information for setting boundaries for the model and approval information to approve the model. To develop a good model the database is also need to divide in training and testing set[5]. We need to divide this data in such a way that it is distributed randomly. We basically work on four type of soybean insects.

We use Python language with Keras [11] and Tensorflow [12] deep learning library to implement the CNN [13] model. We used an CNN Model with four convolution layer , two max pooling layer with some padding layers and lastly a fully connected dense layer with four output parameter. Stochastic gradient descent (SGD) is used as optimizer. The below table 1 shows the accuracy of model with selection of different epoch on the same CNN network.

Epoch	Accuracy
5	38 %
10	68 %
15	78 %
20	82 %
25	81 %
30	93 %

Table 1 : Accuracy of CNN model with respect to number of Epoch

The figure 2 shows the diagram between training and validation accuracy of generated model with different epoch.

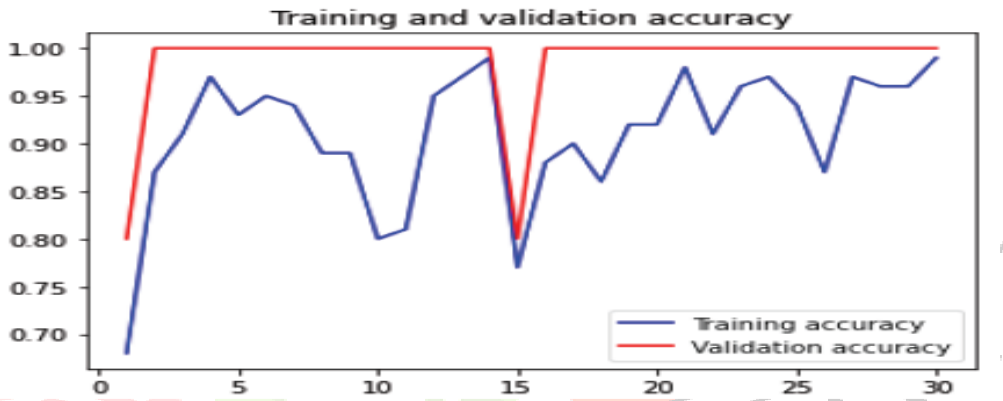

Figure 2 : Training and validation Accuracy and loss for 30 epoch

CONCLUSION

The Experiment result shows the accuracy is achieved around 93 % with 30 epoch. As farmers are confronting misfortunes by a few harvest bugs. The most ideal approach to think about the bug assault on the harvest is ideal assessment of the yield field. In the event that nuisances are identified on the leaf's, proper measures can be taken to shield the yield from a major creation misfortune toward the end. Diminishing the utilization of pesticides in case bugs are recognized early and furthermore supportive in utilizing of specific pesticides. The goal of this paper is to expand the usefulness of the yield by early location of bugs.

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