**An End-to-End Deep Learning Approach for Large-Scale Multi-Class Pest Detection and Classification**

**Alternative title**:

 Pest Net for large-scale multi-class pest detection and classification based on deep learning.

**Aim:** To detect and classify large-scale multi-class pest using Convolution Neural Network.

**Synopsis:**

 Regarding the growth of crops, one of the important factors affecting crop yield is insect disasters. Since most insect species are extremely similar, insect detection on field crops, such as rice, soybean and other crops, is more challenging than generic object detection. Presently, distinguishing insects in crop fields mainly relies on manual classification, but this is an extremely time-consuming and expensive process. This work proposes a convolution neural network model to solve the problem of multi-classification of crop insects. The model can make full use of the advantages of the neural network to comprehensively extract multifaceted insect features.

**Existing System:**

 Presently, distinguishing insects in crop fields mainly relies on manual classification, but this is an extremely time-consuming and expensive process. Compared with previous classifiers such as k-nearest neighbors and linear discriminate analysis (LDA), support vector machine (SVM) was proposed with Haar-like features to classify insects and obtained a poor performance than the Convolutional Neural Network.

**Proposed System:**

 Our PestNet consists of three stages: pest feature extraction, pest regions search and pest prediction. In PestNet, the input image is firstly fed into a CNN backbone to extract feature maps, where CSA module is proposed for feature enhancement. Then we fuse RPN and PSSM for providing pest regions and pest prediction respectively. During the prediction phase, Contextual RoIs are presented as contextual information to improve detection accuracy.

**Module Description:**

* Multi Class Pests Dataset
* Convolutional Neural Network
* Channel Spatial Attention
* Classification and Detection

**Multi Class Pests Dataset:**

 For agriculture pest identification, there exist a few open datasets released such as Butterfly Dataset [31]. However, to our best knowledge, few open datasets suitable for multi-class pest detection task are released while our purpose is to detect different kinds of pests simultaneously in one image. As a result, we build a dataset for our large-scale multi-class pest detection task.

**Convolutional Neural Network:**

 Conventional computer vision employed hand-crafted features to describe the images. Instead, we adopt CNN for automatic feature extraction which is basically composed of 3 parts: convolutional layer, activation function, and pooling layer.

**Software Requirements:**

* Operating System : Windows 7 , 8, 10 (64 bit)
* Software : Python
* Tools : Python 3.7 IDLE, jupyter Note Book and Spyder

**Hardware Requirements:**

* Hard Disk : 500GB and Above
* RAM : 4GB and Above
* Processor : I3 and Above

**Architecture Diagram:**

Input Image

Convolutional neural network

Feature map

Channel spatial attention

Classification

And detection

Result