Project Proposal on Weed Recognition

Submitted for Partial Fulfillment of the
Requirement of
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ENSE 817-AAI

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Introduction:

Saskatchewan is an agriculture based state. It is known to be one of the world's largest exporters of flaxseeds, canola, durum wheat, lentils, peas, and oats. It also happens to be the second largest cattle producing province in Canada.

As a result, having a good land to farm on is an advantage. However, the quality of land gets degraded by a variety of factors such as erosion, fertility depletion, etc. One major phenomena contributing to fertility depletion is presence of weeds. In Indonesia, a survey conducted on palm oil plantations concluded that weeds can deplete up to 20% of the plantation required soil fertility.

Weeds are unwanted plants that grown around crops or anywhere on the land. They absorb a significant amount of nutrition which was originally meant for the plants or crops. This might result in the plant not growing or other such issues.

Scope and ideation of the project:

Weeds are easily identifiable to human eyes. Almost everything that grows around a plant without the seeds being needed to sown could be classified as weed. However, to implement this for an algorithm, that too in real-time, would be a challenge.

Computer Vision is a part of the AI domain, which is suited best for identification of images, components, and then predicting based on those images. Hence I aim to design an algorithm that uses Convolutional Neural Networks (CNN), which is a popular AI technique. CNN is used in several applications such as weather prediction, signal processing and such. Also, I had studied a few papers in the assignment that used CNN to identify plant species.

Using CNN, I aim to identify the components of an image. For example, a RGB image is a matrix, in which the values are the intensity, ranging from 0-255. Further on, CNN can be used to perform deconvolution. This can merge several similar features from an image matrix, and those can be used for training, testing, and finally, recognizing the image components.
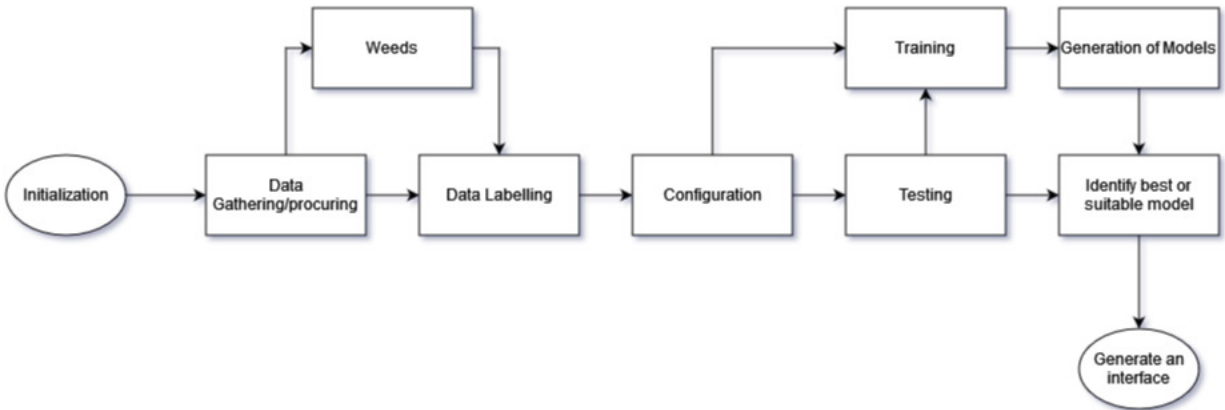
This first step for this would be to gather a dataset. This can be done by either physically gathering the images or it can be done by procuring some dataset available online. I prefer to use the second option however, since there would be a huge variety, and thus, it would be good for training the algorithm.

Following this, I aim to design an algorithm, and train it using the available dataset.

From the literature review, I was able to make out a process that would suit my needs, since most of the literature on this subject was in a significant detail, i.e.the scope of the literature review study was too vast to implement for this project.

As mentioned, a label map is also required. It will consist a list of all the identified weed species. When called, this will return the name, or if not identified, it'll return accordingly.

My aim is to use 70% of the images from a particular dataset for training, and the rest for testing. The model can then be tested on other datasets, or on real-world images. For this project, I aim to use only JPEG images due to time constraints, hence my model might not work on other types of images such as GIF, PNG, or videos. However, I'd try to incorporate it with the model as well. I do not plan to

make it such that it can detect weeds directly from the camera input. It'll be left for a future update.

References:

Firmansyah, Suparyanto, T., Ahmad Hidayat, A., & Pardamean, B. (2022). Real-time Weed Identification Using Machine Learning and Image Processing in Oil Palm Plantations. IOP Conference Series. Earth and Environmental Science, 998(1). https://doi.org/10.1088/1755-1315/998/1/012046

Erkan, Toktas, A., & Ustun, D. (2022). Hyperparameter optimization of deep CNN classifier for plant species identification using artificial bee colony algorithm. Journal of Ambient Intelligence and Humanized Computing. https://doi.org/10.1007/s12652-021-03631-w

Da Cruz. (2020). Plant Species Identification Through Leaf Venation Extraction and CNNs. ProQuest Dissertations Publishing.

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