



Team Veloce

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Abstract

- ◆ Robotic weed control has seen increased research of late with its potential for boosting productivity in agriculture. Majority of works focus on developing robotics for croplands, ignoring the weed management problems facing rangeland stock farmers.
- ◆ Due to lack of knowledge, farmers face many problems regarding weed control like stock injury, poisoning, unwanted growth etc. These problems can be dealt with if farmers can be provided with relevant information on the query plant.
- ◆ Solution to the problem, our project is aimed to create a Convolutional Neural Network based deep-learning model to identify weed plants instantly by just using one picture of the plant. Ready to use, the whole system will be integrated into a simple-to-use app. By simply pointing your phone at the plant and a snap, the app will tell you whether the pointed plant is a weed or not along with name of the plant if it's a weed to help farmers deal with it.

Lets modernize our agricultural sector.



Weeds have always been a problem to farmers .

Here is an efficient solution to it
Using deep learning to find the
type of weed so that the info can
get us to the relevant pesticide
to eradicate weed.



Why focus on Weeds?

Farmers generally focus on improving crop yield by using hybrid seeds and expensive fertilizers often ignoring the fact that weeds also compete for the water, nutrients and light with those crops.

Being hardy and vigorous in growth habits, weeds grow faster than crops and consume large amount of water and nutrients, thus causing heavy losses in yields.

Farmers decide to pluck them off only when these plants grow dominant and around 30% of the total crop expenditure is used up here. This is all because they could not identify if that plant they thought was flower was actually a weed.

Furthermore, weeds harbour insects and pests thus demand the deployment of Pesticides in the field.

Why there is need to identify the weed type ???

Classifying a plant as weed can sometimes be subjective.

A flowery plant which grew in an agricultural field may be a weed for a farmer but if the same plant grows in your garden then you might not want to remove it.

Therefore to tackle this problem we've classified weeds into 8 plant species commonly considered weeds.

And then we provide relevant information about the species of weed letting the user decide whether to remove the plant or not.

Implementation

- ◆ We started off by looking for a suitable dataset for differentiating weeds and plants.
- ◆ After acquiring data, we moved on to train a CNN model most suitable for the job.
- ◆ After successfully training the model, we combined the whole pipeline with android API.
- ◆ Finally, we linked the internal findings of the model to Wikipedia so the user gets to know relevant information about the plant directly.

Project Timeline

- ◆ Searched for the Dataset.
- ◆ Coded colab kernel.
- ◆ Tuned Hyperparameters and started experimentation with our models.
- ◆ Chose our best model.
- ◆ Optimized model architecture for reducing app size.
- ◆ Created Back-end of the app.
- ◆ Linked the model with the app.
- ◆ Designed front-end.

Deep Learning Technicalities

- ◆ Our dataset had a total of 17k images which we divided into 3 subsets namely Train, Validation and Test set in 60-20-20 ratio.
- ◆ We tuned hyperparameters and did experimentations on:
 - Optimisers
 - CNN architectures
 - Input image sizes
 - Different sets of augmentations
- ◆ To further reduce the size of our we decided to change the model architecture to MobileNet_v2 for better mobile-centric optimisation.
- ◆ We managed to achieve an accuracy of 96.77% on the test set.

App Development

- ◆ We built a app for ease of usability and ease of access.
- ◆ It is based on using Java as the primary language.
- ◆ The app has a simple interface with consisting of a single button to take pictures.
- ◆ The app takes the pictures using an Camera API and feed it to the model used which then outputs the string values of the identified object(weed).

Future Aspects/Improvs

- ◆ Deploy the model on server.
- ◆ Increase the size of our database.
- ◆ Add class specific details so that after being classified we can get direct info on the weed.
- ◆ We can feed our model other useful data as well like location of the place, seasonal info, weather conditions and soil info, as model meta-features for more precise and reliable results.

