Plant soil segmentation in precision agriculture

Vibot

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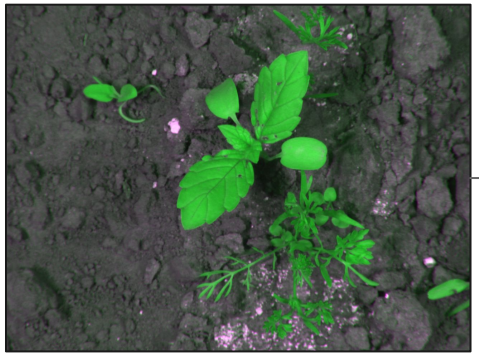
INTRODUCTION

Plant segmentation is a crucial task in computer vision applications for identification/classification and quantification of plant phenotypic features. Robust segmentation of plants is challenged by a variety of factors such as unstructured background, variable illumination, biological variations, and weak plant-background contrast.

DATASET USED:

Crop Weed Field Image Data-set (CWFID) contains 60 on-field images of carrot crop alongside some weeds



INPUT

TARGET OUTPUT

MOTIVATION FOR THE PROJECT:

- **Farming is the primary source of food supply in the world.** **37.6%** of the land area of the world is involved in agriculture therefore it is very important to minimize risk and maximize production with the help of AI and automation.

- Precision agriculture (PA) is **an approach to farm management that uses information technology (IT) to ensure that crops and soil receive exactly what they need for optimum health and productivity**. The goal of PA is to ensure profitability, sustainability and protection of the environment.

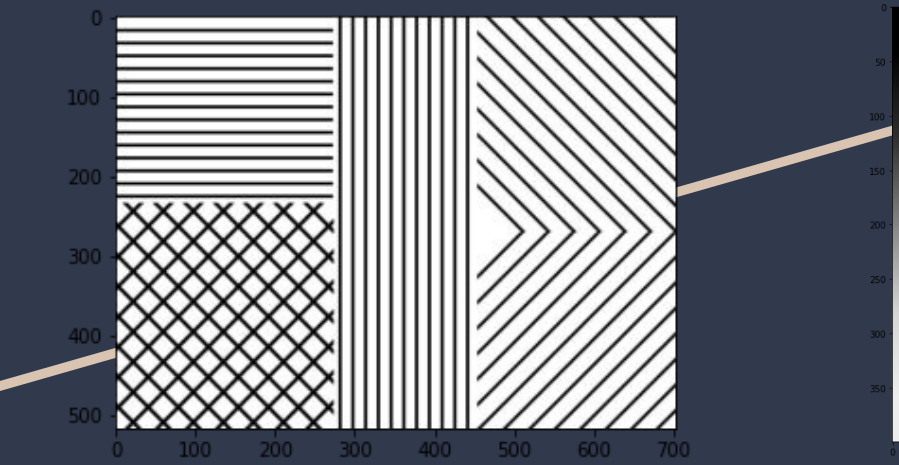
METHODOLOGY:

- Read Images and extract featured for training
- Read masks and create another dataframe
- Get data ready for any classifier(here we use random forest classifier)
- Define the classifier and fit the model using training data
- Check accuracy of the model
- Save model for future use
- Make prediction on new images

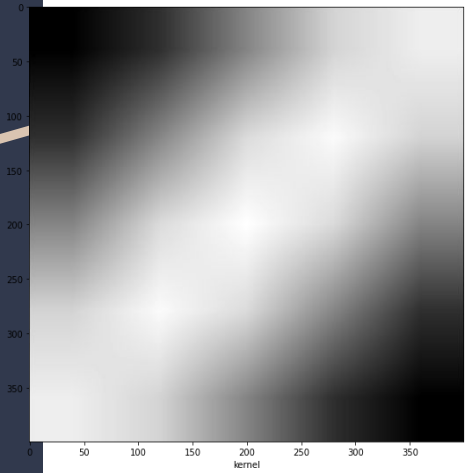
Creating Gabor Kernels to extract features

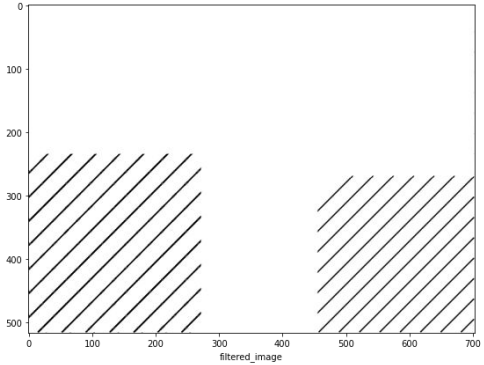
Gabor filter, is a linear filter used for **texture analysis**, which essentially means that it analyzes whether there is any specific frequency content in the image in specific directions in a localized region around the point or region of analysis.

INPUT



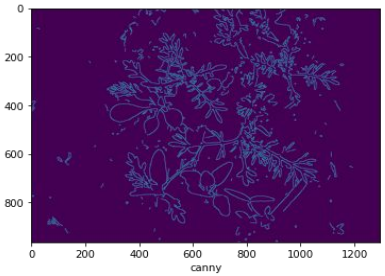
FILTER AND OUTPUT

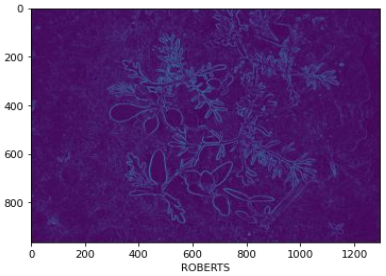


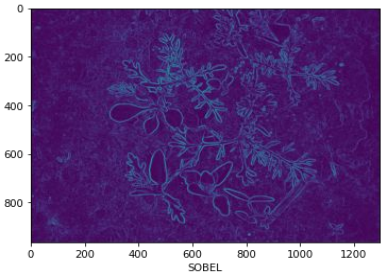


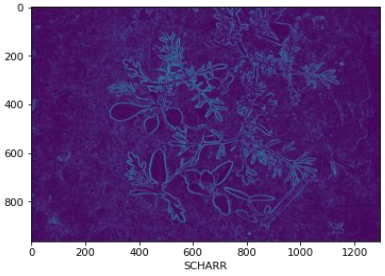
Extracting other features by using edge extraction methods:

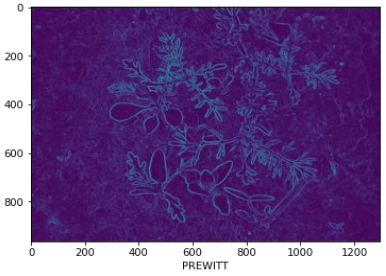
- #CANNY EDGE
- #ROBERTS EDGE
- #SOBEL
- #SCHARR
- #PREWITT
- #GAUSSIAN with sigma=3
- #GAUSSIAN with sigma=7
- #MEDIAN with sigma=3
- #VARIANCE with size=3

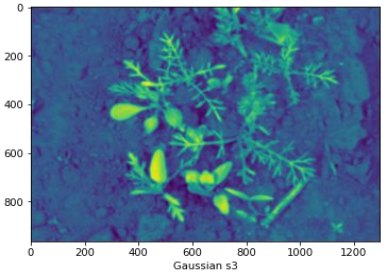


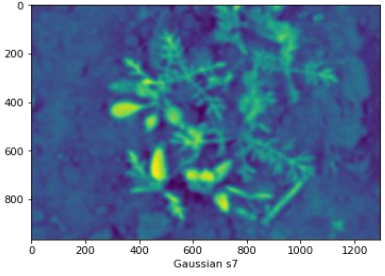


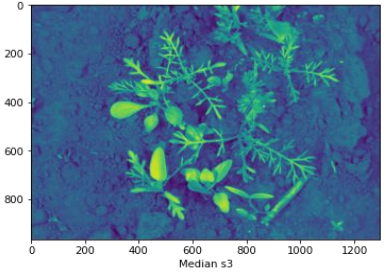


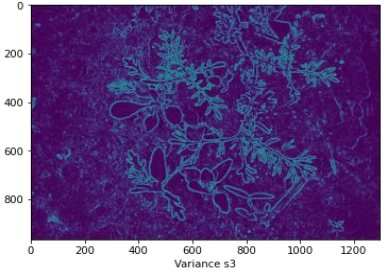








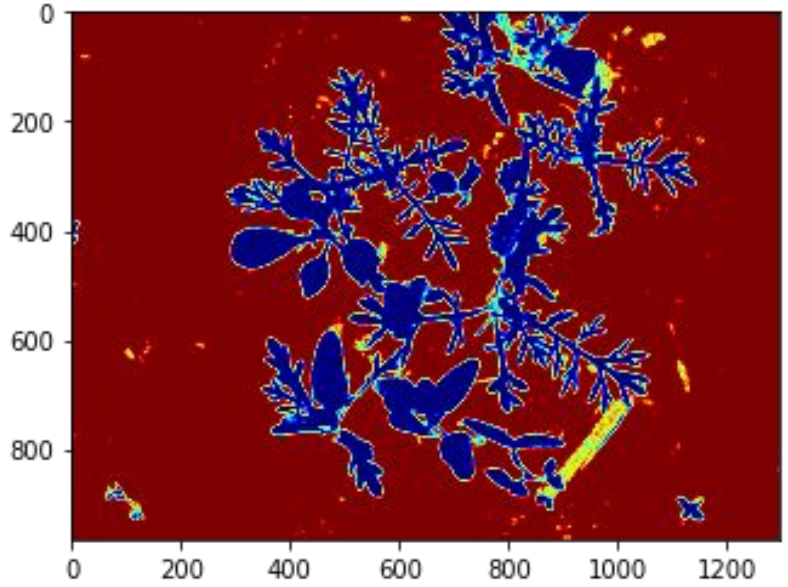




These are all the features extracted and stored for training purposes

Applying Random forest classifier for classification:

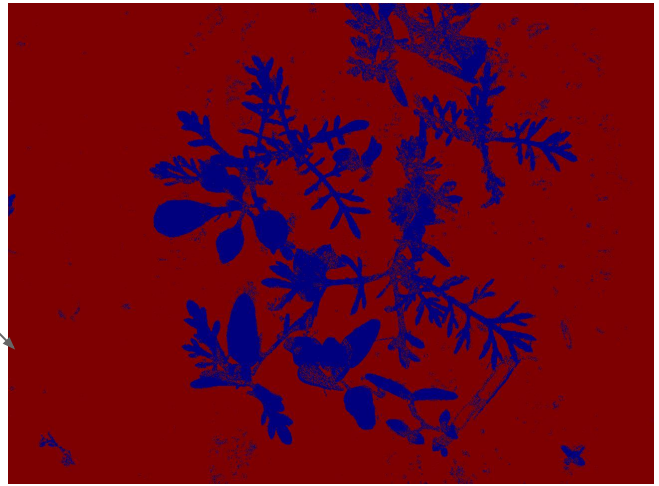
As you can see that the model was able to segment the plant and soil respectively.



Conclusion

TARGET

ACHIEVED



Reference:

- Petra Bosilj, Tom Duckett, Grzegorz Cielniak, Connected attribute morphology for unified vegetation segmentation and classification in precision agriculture, Computers in Industry, Volume 98, 2018, Pages 226-240, ISSN 0166-3615, https://doi.org/10.1016/j.compind.2018.02.003.
- J. Praveen Kumar, S. Domnic, Image based leaf segmentation and counting in rosette plants, Information Processing in Agriculture, Volume 6, Issue 2, 2019, Pages 233-246, ISSN 2214-3173, https://doi.org/10.1016/j.inpa.2018.09.005.
- https://github.com/Anki0909/CWFID-Image-Segmentation


Thank you