

INTRODUCTION

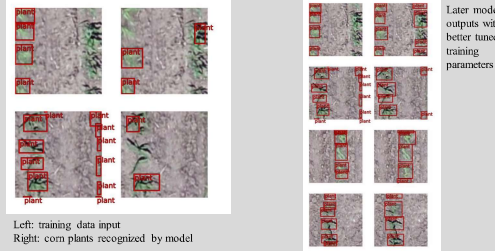
- Beck's Hybrids is the largest family-owned retail seed company and the third-largest seed brand in the United States.
- To get an accurate estimate of corn production, Beck's currently counts each corn plant manually, and they want a way to automate the process.
- To start the process, Beck's had drones fly over and take pictures of different fields.
- Once all the pictures are taken, the pictures are stitched together to create a large orthomosaic.
- Our goal is to create an automated model to count the total amount of plants in a plot with minimal error.

Research and Methodology



- Looked into whether it was better to make use of premade model or make one ourselves
- Beck's wanted everything to be able to run in house so using Google's AI or Open CV to run image processing was not possible
- Beck's used ArcGIS pro which had a labeling software and the ability to train a Deep learning Model, so we chose to run everything in ArcGIS pro
- Found out some similar tasks and try using their model as a pre-trained model.
- U-Net Image Segmentation Model
- Image Segmentation is a Computer Vision technique that classifies each pixel of the image
- U-Net uses deep convolutional networks
- Previously implemented in similar plant counting problems (Corn Plant Counting Using Deep Learning and UAV Images)

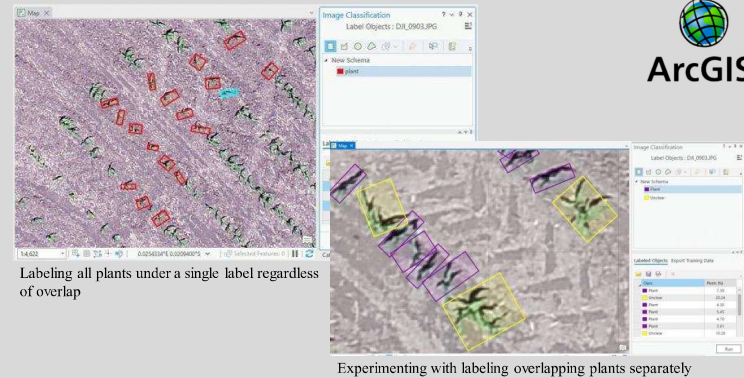
Initial Model Outputs



FUTURE GOALS

- Continue training models with larger datasets
- Evaluate the model training at different drone imagery resolutions
- Expand the model to handle later stages of growth
- Compare different Computer Vision tasks (Object Detection, Image Segmentation, Instance Segmentation)
- Experiment with more computationally intensive, advanced models

Corn Plant Labeling



CONCLUSION

- Through our initial research, we have found pros and cons of computer vision tasks
- Instance segmentation is more capable of differentiating among overlapping instances (for example, humans), although its performance has not been proven with corn plants yet.
- Object detection is advantageous because of the ease of labeling which is done through the process of bounding boxes, compared to image segmentation which requires annotation of the pixels at a more fine-grained level.

REFERENCES

- <https://github.com/svishwa/crowdcount-cascaded-ml>
- <https://www.nature.com/articles/s41598-021-02387-9>
- <https://arxiv.org/abs/1506.01497>
- <https://www.esri.com/arcgis-blog/author/khess/>
- <https://www.v7labs.com/blog/labelimg-guide>



ACKNOWLEDGEMENTS

- Thank you to Will Hirschfeld, Steve Becker, Chris Tallman, Doug Abney, and everyone else at Beck's
- Thank you to David Glass, Kevin Amstutz, Emily Hoeing, and the rest of the Data Mine staff