Team Plant City Reflection

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Introduction

In this project, we hope to implement the method described in Wolny et. al's paper "Accurate and versatile 3D segmentation of plant tissues at cellular resolution." While the research application of this network may, to the untrained eye, seem superficial and narrow, it in fact addresses a pressing need bottlenecking much of plant biology, a field vital in addressing many of the problems posed by the looming threat of climate change and global warming. Much of the field of plant biology relies on image based phenotyping, which currently is manually done. This is expensive in terms of cost and time, and pulls energy away from other research efforts. Therefore, deep learning techniques that can analyze biological images and provide phenotypic data are of great value to biologists and global agricultural efforts.

This paper aims to quantitatively segment images of plant cells into strictly delineated cells. It is applicable even beyond fixed plant cells and has been used for in vivo samples and animal cells. We chose this paper because of alignment with both group interests and with work accomplished in the class in that it applies a convolutional neural network, as well as because the architecture presented was novel and interesting.

The model in this paper is a convolutional neural network that accomplishes segmentation, which is a form of structured prediction.

Challenges

The hardest part of the project so far has been correctly processing the files as they were in a format that none of us had worked with before. Additionally, deciphering the 'labels' was initially difficult as their structure and layout was not defined in the paper or where the data was made available.

Insights

While we have not made any concrete breakthroughs at this point, we have successfully come to grips with the data formats necessary for this project and developed an understanding of the model architecture and loss functions implemented in the paper.

We are comfortable with the progress we've made on the project but need to dedicate more time to model optimization and performing a comprehensive suite of ablation studies. At the moment, we aren't thinking of changing anything.