



Automatic Evaluation of Wheat Resistance to Fusarium Head Blight Using Dual Mask

A method that enables the rapid recognition of wheat spikes and the fungus Fusarium Head Blight diseased areas in wheat.

Technology No. 2021-285

IP Status: Provisional Patent Application Filed

Applications

- Rapid detection of fungus Fusarium Head Blight (FHB) in wheat

Key Benefits & Differentiators

- **Higher yield:** Rapid detection of FHB infection would lead to reduced losses of wheat yield.
- **Better quality:** Early detection of FHB would also lead to better quality of wheat.

Technology Overview

Wheat (*Triticum aestivum* L.) is a globally significant crop for human and animal consumption. In many regions of the world, wheat is vulnerable to severe yield and quality losses from the fungal disease of Fusarium head blight (FHB). The development of resistant cultivars is one means of reducing the devastating effects of this fungus, but the breeding process requires the evaluation of hundreds of lines each year for a reaction to the disease. These field evaluations are laborious, expensive, time-consuming, and prone to error. A method that can easily determine the level of FHB infection from images of wheat would greatly benefit the wheat breeding programs.

Researchers at the University of Minnesota have developed a high-throughput framework of deep-learning-based disease detection algorithms established to automatically assess wheat resistance to FHB under field conditions. This technique provides reliable identification of the symptom location and the disease severity of wheat spikes. It uses a mask region

convolutional neural network (Mask-RCNN) model which was trained with annotated images with labeled diseased areas. The Mask-RCNN was used to predict diseased areas on each individual spike. This method enabled the rapid recognition of wheat spikes and diseased areas with detection rates of 77.76% and 98.81%, respectively with a prediction accuracy of 77.19%. This will contribute to the development of resistant wheat cultivars that will reduce the losses due to FHB, thereby contributing to global food security and sustainable agricultural development

Phase of Development

TRL: 5-6

Software has been developed and ready to use.

Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

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Researchers

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References

Su, Wen-Hao, Jiajing Zhang, Ce Yang, Rae Page, Tamas Szinyei, Cory D. Hirsch, and Brian J. Steffenson, <https://www.mdpi.com/2072-4292/13/1/26>, Remote sensing

<https://license.umn.edu/product/automatic-evaluation-of-wheat-resistance-to-fusarium-head-blight-using-dual-mask>