

## Building a Globally Optimized Computational Intelligent Image Processing Algorithm for On-Site Inference of Nitrogen in Plants

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<b>Abstract</b>	<p>Estimating nutrient content in plants is a crucial task in the application of precision farming. This work will be more challenging if it is conducted nondestructively based on plant images captured in the field due to the variation of lighting conditions. This paper proposes a computational intelligence image processing to analyze nitrogen status in wheat plants. We developed an ensemble of deep learning multilayer perceptron-using committee machines for color normalization and image segmentation. This paper also focuses on building a genetic-algorithm-based global optimization to fine tune the color normalization and nitrogen estimation results. We discovered that the proposed method can successfully normalize plant images by reducing color variabilities compared to other color normalization techniques. Furthermore, this algorithm is able to enhance the nitrogen estimation results compared to other non-global optimization methods as well as the most renowned SPAD meter based nitrogen measurement.</p>
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