

## Computational Deep Intelligence Vision Sensing for Nutrient Content Estimation in Agricultural Automation

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| <b>Abstract</b>     | <p>This paper presents a novel computational intelligence vision sensing approach to estimate nutrient content in wheat leaves by analyzing color features of the leaves images captured on field with various lighting conditions. We propose the development of deep sparse extreme learning machines (DSELM) fusion and genetic algorithm (GA) to normalize plant images as well as to reduce color variability due to a variation of sunlight intensities. We also apply the DSELM in image segmentation to differentiate wheat leaves from a complex background. In this paper, four moments of color distribution of the leaves images (mean, variance, skewness, and kurtosis) are extracted and utilized as predictors in the nutrient estimation. We combine a number of DSELMs with committee machine and optimize them using the GA to estimate nitrogen content in wheat leaves. The results have shown the superiority of the proposed method in the term of quality and processing speed in all steps, i.e., color normalization, image segmentation, and nutrient prediction, as compared with other existing methods.</p> |
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