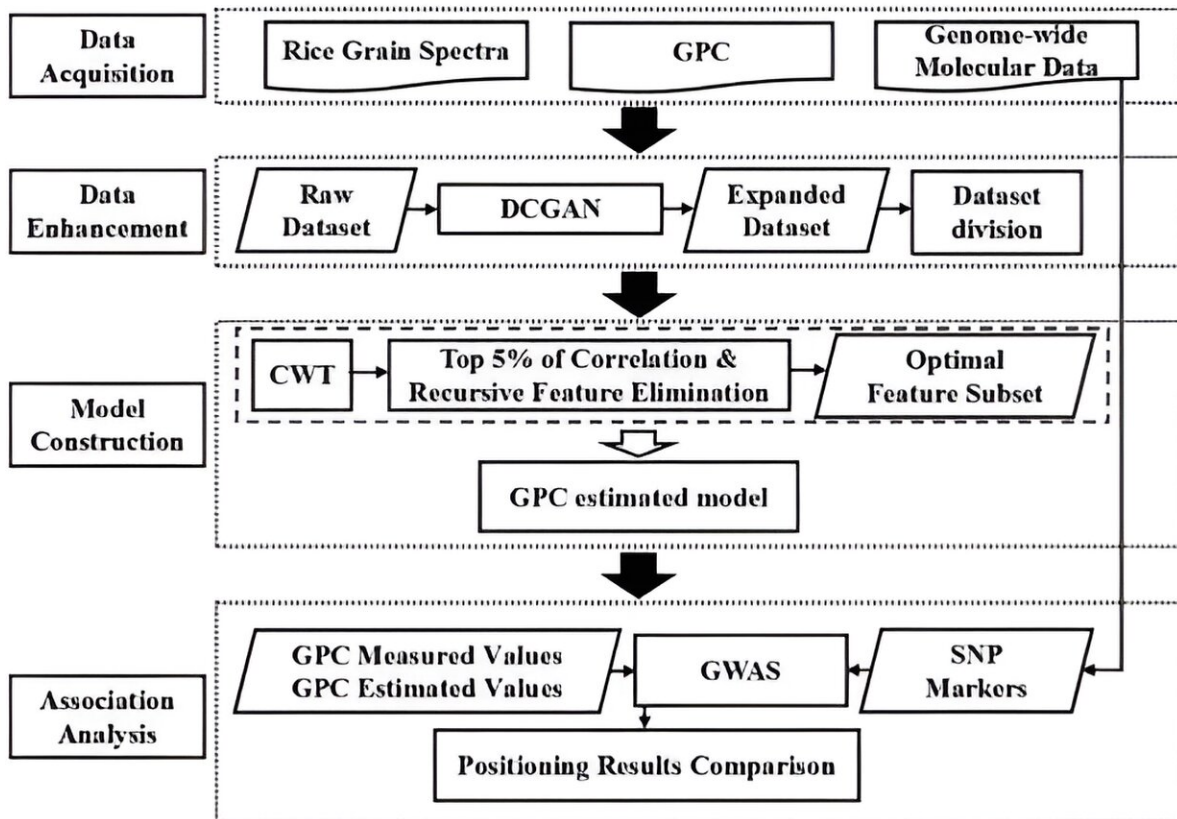


Innovative use of hyperspectral data and DCGANs enhances rice protein content estimation

July 8 2024



Workflow of GPC estimation and GWAS. Credit: *Plant Phenomics* (2024). DOI: 10.34133/plantphenomics.0200

Rice (*Oryza sativa* L.) is a crucial crop feeding over half of the global population. The demand for high-quality, protein-rich rice is rising, making accurate grain protein content (GPC) estimation vital for breeding superior varieties.

Despite advances in genomic tools like GWAS, conventional phenotyping remains labor-intensive and costly, creating a bottleneck. Recent developments in optical and spectral imaging offer high-throughput phenotyping solutions. However, small and unbalanced datasets limit [model](#) performance and generalization.

A study [published](#) in *Plant Phenomics* aims to address these issues by using a DCGAN to generate simulated data, enhance GPC model accuracy, and explore gene dissection potential.

The research employed hyperspectral data and DCGANs to improve the estimation of rice GPC. Raw and normalized spectral data revealed distinct absorption features crucial for GPC analysis. Simulated data generated by DCGANs after 8,000 epochs closely matched measured data, enhancing model accuracy.

The partial least squares regression (PLSR) model using these features achieved high validation accuracy ($R^2 = 0.58$, RRMSE = 6.70%).

Additionally, [genome-wide association study](#) (GWAS) analysis with simulated data identified significant SNPs, including the *OsmtSSB1L* gene linked to grain storage protein.

This approach demonstrates the potential for high-generalization GPC models, facilitating advanced [genetic analysis](#) and breeding of rice varieties.

According to the study's lead researcher, Hengbiao Zheng, "This study

provides a new technique for the efficient genetic study of phenotypic traits in rice based on hyperspectral technology."

Looking ahead, further refinement and validation across diverse ecological sites and more extensive datasets will enhance the robustness and applicability of this method, paving the way for more precise and efficient breeding of high-quality [rice](#) varieties.

More information: Hengbiao Zheng et al, Grain Protein Content Phenotyping in Rice via Hyperspectral Imaging Technology and a Genome-Wide Association Study, *Plant Phenomics* (2024). [DOI: 10.34133/plantphenomics.0200](#)

Provided by Chinese Academy of Sciences

Citation: Innovative use of hyperspectral data and DCGANs enhances rice protein content estimation (2024, July 8) retrieved 22 July 2024 from <https://phys.org/news/2024-07-hyperspectral-dcgans-rice-protein-content.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.