

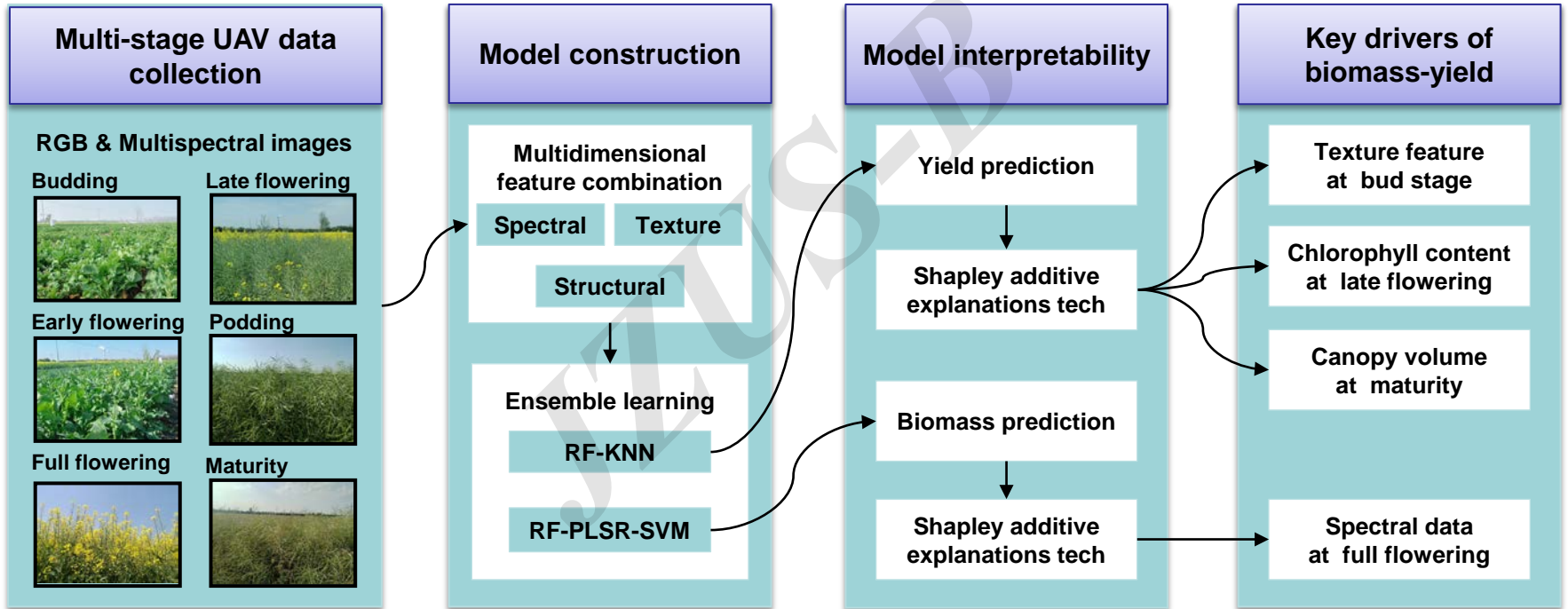
Cite this as: Yanni ZHANG, Xiaoyu CHAI, Jinpeng HU, Yaxiao NIU, Lizhang XU, 2026. Enhancing rapeseed biomass and yield estimation with ensemble learning and synergistic multidimensional features. *Journal of Zhejiang University-SCIENCE B*, 27(5):499-516.
<https://doi.org/10.1631/jzus.B2500830>

Enhancing rapeseed biomass and yield estimation with ensemble learning and synergistic multidimensional features

Key words: Ensemble learning; Decision-making; Feature synergy; Temporal fit; Planting pattern

Graphical Abstract

Enhancing Rapeseed Biomass and Yield Estimation with Ensemble Learning and Synergistic Multidimensional Features



Significance

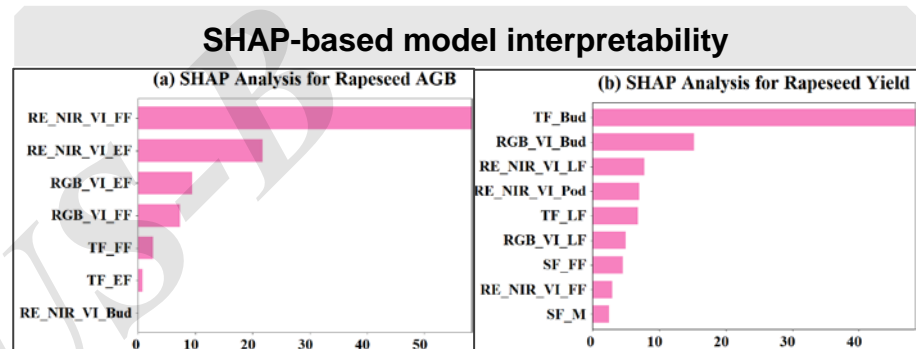
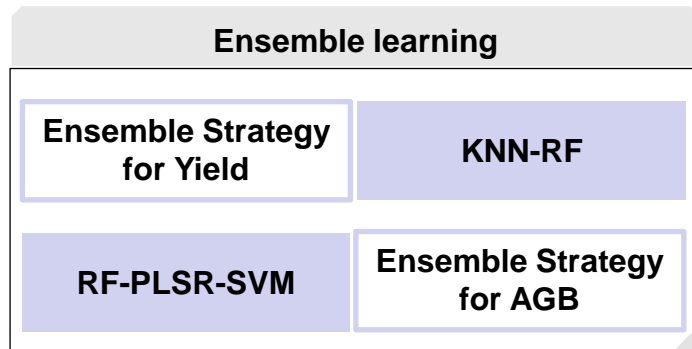
The generated biomass and yield meter-scale maps offer critical spatial data for precision agriculture and intelligent harvesting

Research Summary

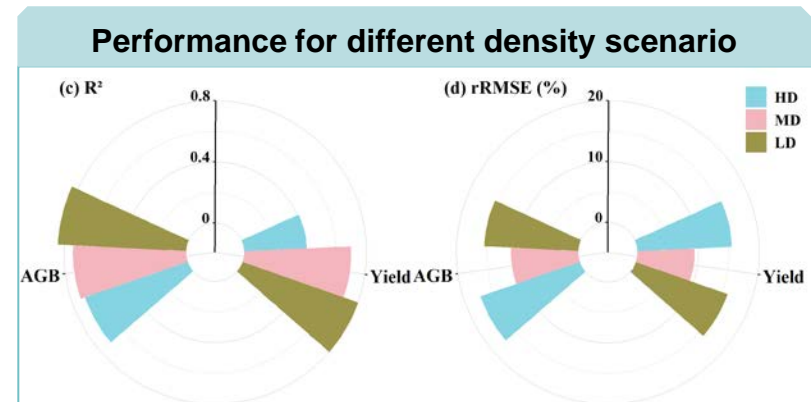
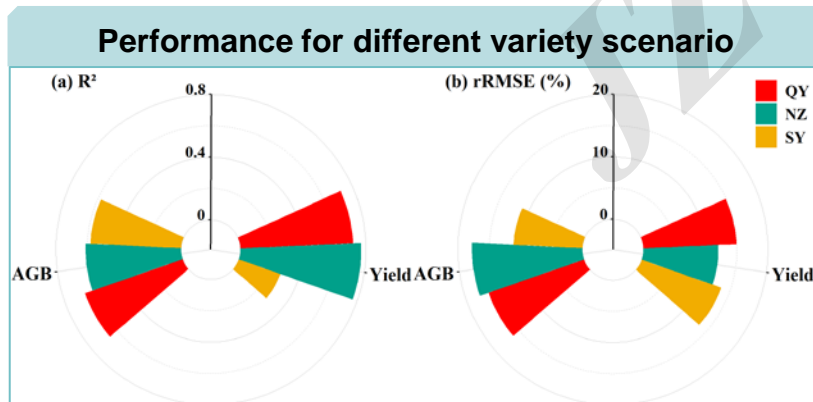
Context:

Accurate rapeseed yield and biomass estimation at the meter scale prior to harvest is crucial for precision harvesting.

High-techs:



Results:



Significance:

The generated meter-scale maps offer critical spatial data for precision agriculture and intelligent harvesting.

Innovation points

Innovation 1

The **spatiotemporal variability of spectra** and the **dataset dependence** of machine learning limit the model's generality. To address these issues, this study utilized the **synergy** of multidimensional features and **ensemble** learning strategies to improve model **stability and generality** across different planting scenarios.

Innovation 2

This study employed **Shapley additive explanations** (SHAP) analysis to evaluate feature importance across different planting scenarios, enhancing **model transparency** and **identifying key drivers** of biomass accumulation and yield formation.

Significance

The generated meter-scale maps offer critical data for **precision agriculture and intelligent harvesting**.