Science Societies

A smartphone can count your citrus crop

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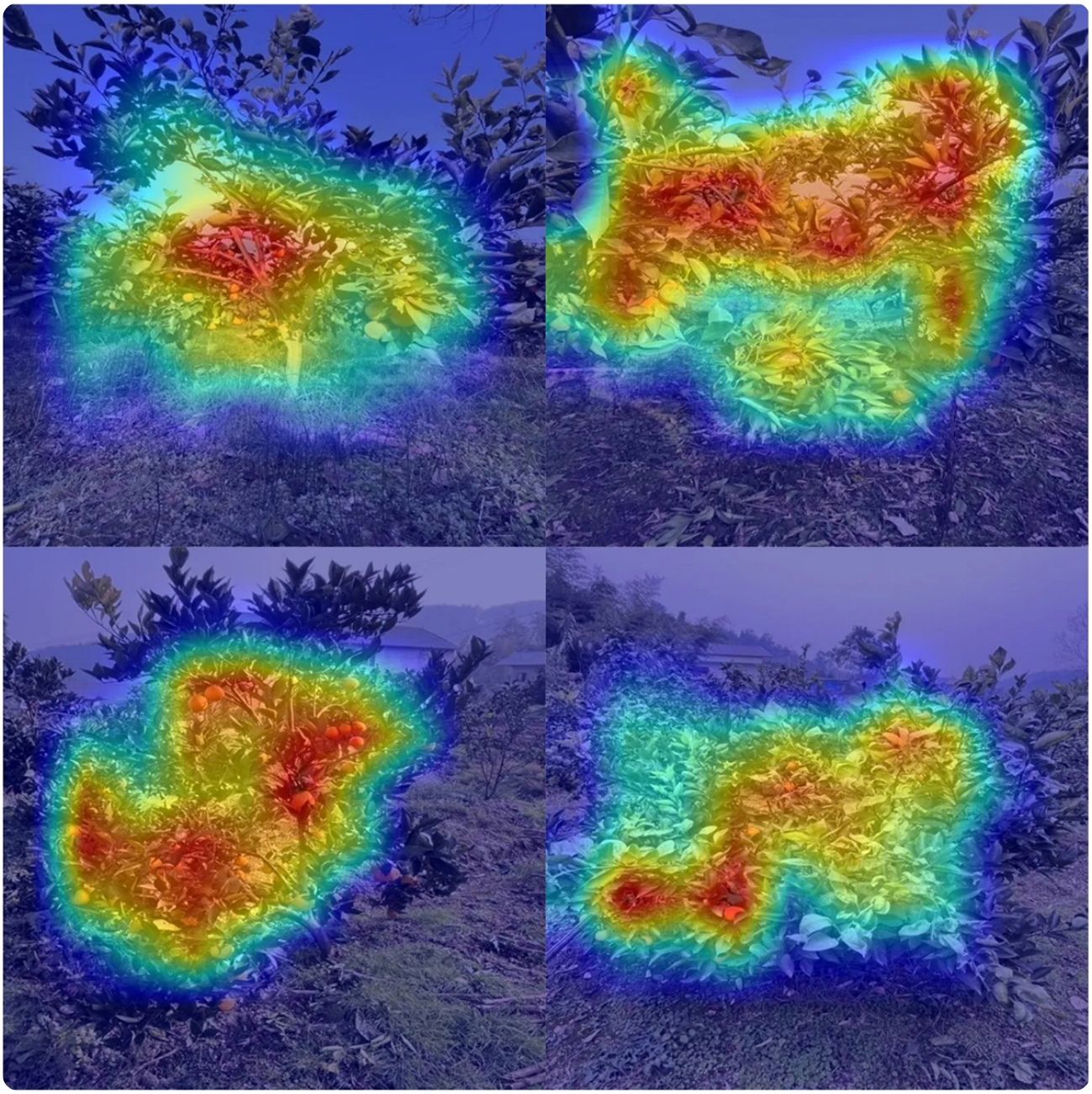

From one photo to fruit count: How a model sees citrus trees of different complexity. Each image shows a real orchard photo overlaid with an AI attention map, where warmer colors indicate regions that the model weighted most heavily to estimate total fruit count. The model reads both visible fruits and overall canopy structure, arriving at a reliable count from a single smartphone photo. Photo courtesy of Hongchun Qu, first author on the study.

Walk through any citrus orchard at harvest time and you'll quickly appreciate the challenge: Thousands of fruits tucked behind leaves, lit unevenly by the sun, viewed from whatever angle you happen to be standing. For growers everywhere, knowing how many fruits are on each tree before picking begins is essential for planning harvests and balancing supply with demand. Yet the tools that do this well have long required multiple images, expensive sensors, or computing power that most farms simply don't have.

Researchers from Chongqing University of Posts and Telecommunications sought to change this by building a lightweight, yet accurate, method to predict fruit yields with artificial intelligence and a single photo. The team evaluated various deep learning models in real orchard settings; the most well-balanced model could explain 51% of the variance in true fruit yields while consuming less resources than the other models.

The key insight driving this work is that you don't need to find every single fruit to estimate how many are actually there. A well-trained model can read a tree the way an experienced grower does, taking in canopy density, spatial spread, and patterns of color and shadow, and arrive at a reliable count from just one smartphone photo. And, smart training strategies ensured that the model held up across the realities of real orchards: shifting light, hidden fruits, and changing angles.

The result is a yield estimation tool that fits in a farmer's pocket, making per-tree harvest planning genuinely accessible to orchards of all sizes.

Dig deeper

Qu, H., & Zhang, Z. (2026). Per-tree citrus count regression from single-view images via lightweight deep learning. *Agronomy Journal*, *118*, e70400. https://doi.org/10.1002/agj2.70400

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