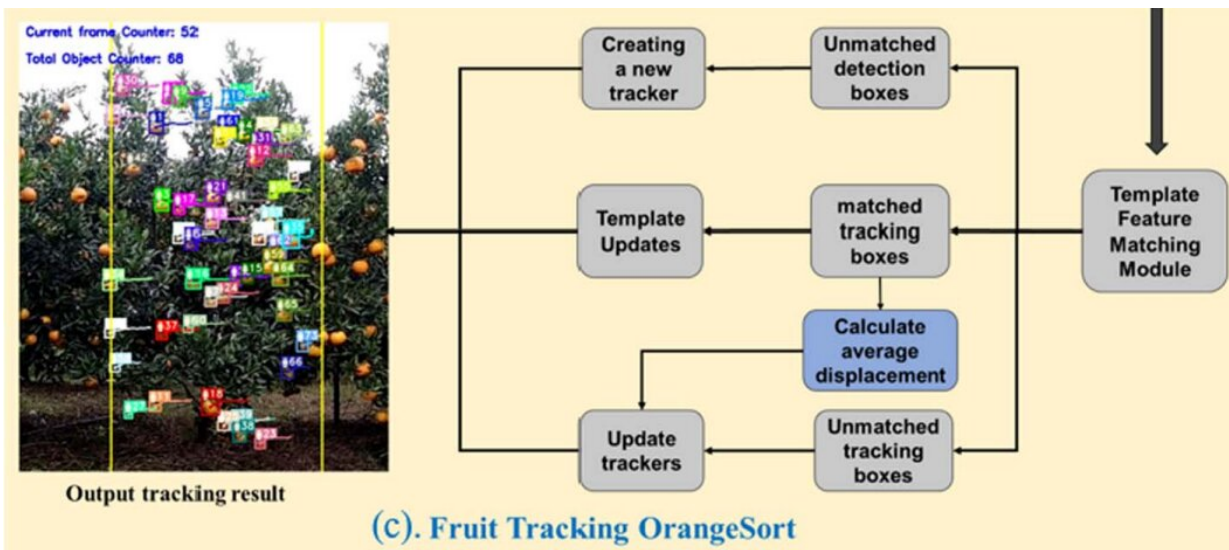


# In-field citrus fruit detection and tracking based on deep learning

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Detail of the OrangeSort module (right) and the tracking result (left). Credit: Nanjing Agricultural University The Academy of Science

Recently, an article published in *Horticulture Research* proposed an in-field fruit counting method based on deep learning. The experiment was performed in two orange orchards in Meishan city in the Sichuan Province of China. The methods included the fruit detection algorithm OrangeYolo and the fruit tracking algorithm OrangeSort, which effectively enhanced the accuracy of citrus fruit counting.

OrangeYolo uses Darknet53 as an [algorithm](#) backbone network and was

modified to improve the detection [accuracy](#) for small targets at multiple scales. The researchers also introduced a channel attention and spatial attention multiscale fusion module to fuse semantic features of the deep network with shallow textural detail features, further increasing the target detection accuracy.

OrangeSort, a type of fruit tracking module in the tracking algorithm, can be used to address the double-counting problem caused by occluded fruits. The researchers developed an algorithm for tracking motion displacement and a strategy for counting specific tracking regions to overcome the double-counting problem.

"Using six video sequences taken from two fields containing 22 trees as the validation dataset, the proposed method showed the best performance relative to video-based manual counting," said the authors, demonstrating that the proposed method has practical value compared with other existing algorithms.

The authors also offered a glimpse into the future of the technology: "Future work can be aimed at using 3D technology to locate [fruit](#) spatial coordinates to enable more accurate counting, and line tail turns will be explored further in subsequent research work."

**More information:** Wenli Zhang et al, Deep-learning-based in-field citrus fruit detection and tracking, *Horticulture Research* (2022). [DOI: 10.1093/hr/uhac003](https://doi.org/10.1093/hr/uhac003)

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