



Toward the integration of ML in agriculture

An automated pipeline for Orange –in-the-field detection and maturity prediction



Participants:

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Orange-in-the-field: a novel dataset for orange detection under different conditions

Data collection

Weather conditions : R, C, S

Time of the day : M, A, E

Several resolutions

In the fields

Two data batches :

245 images

620 images

STAGE 1

63

All Roboflow

49

Labelstudio Roboflow

24

111

Train 1

YOLO Label Studio

Data annotation

STAGE 2

620

Roboflow check

Train 2,3,4

Data pre-processing

CLIP check

5,025 images

Final bounding boxes

CUT-IMG

865 : 5,742 images

YOLO resolution:

640x640



Orange-in-the-field: a novel dataset for orange detection under different conditions

Data capture in the field -> Annotated via



The screenshot illustrates the Label Studio interface for annotation. On the left, a large image of an orange tree with several oranges highlighted by red bounding boxes is shown. To its right is a vertical list of smaller thumbnail images of the same scene from different angles. Below these is a main image of an orange grove with some oranges highlighted. At the bottom, there are buttons for 'Auto-Annotation' and 'Auto-Accept Suggestions'. A red bracket labeled 'List of images' points to the vertical stack of thumbnails. Another red bracket labeled 'Control the labeling robot' points to the bottom buttons. A blue arrow points from the main image towards a detailed view on the right. This detailed view shows a table of annotated regions with columns for 'Info', 'History', 'Selection Details', 'Regions', and 'Relations'. The 'Regions' column lists 12 instances of 'orange' with confidence scores ranging from 0.33 to 0.81. A red bracket labeled 'Annotating tool bar' points to the toolbar on the left of this panel. A green bracket labeled 'Confidence threshold' points to the confidence score '0.33' in the table. A black bracket labeled 'Bounding box list' groups the 'Regions' and 'Relations' sections.

List of images

Annotating tool bar

Confidence threshold

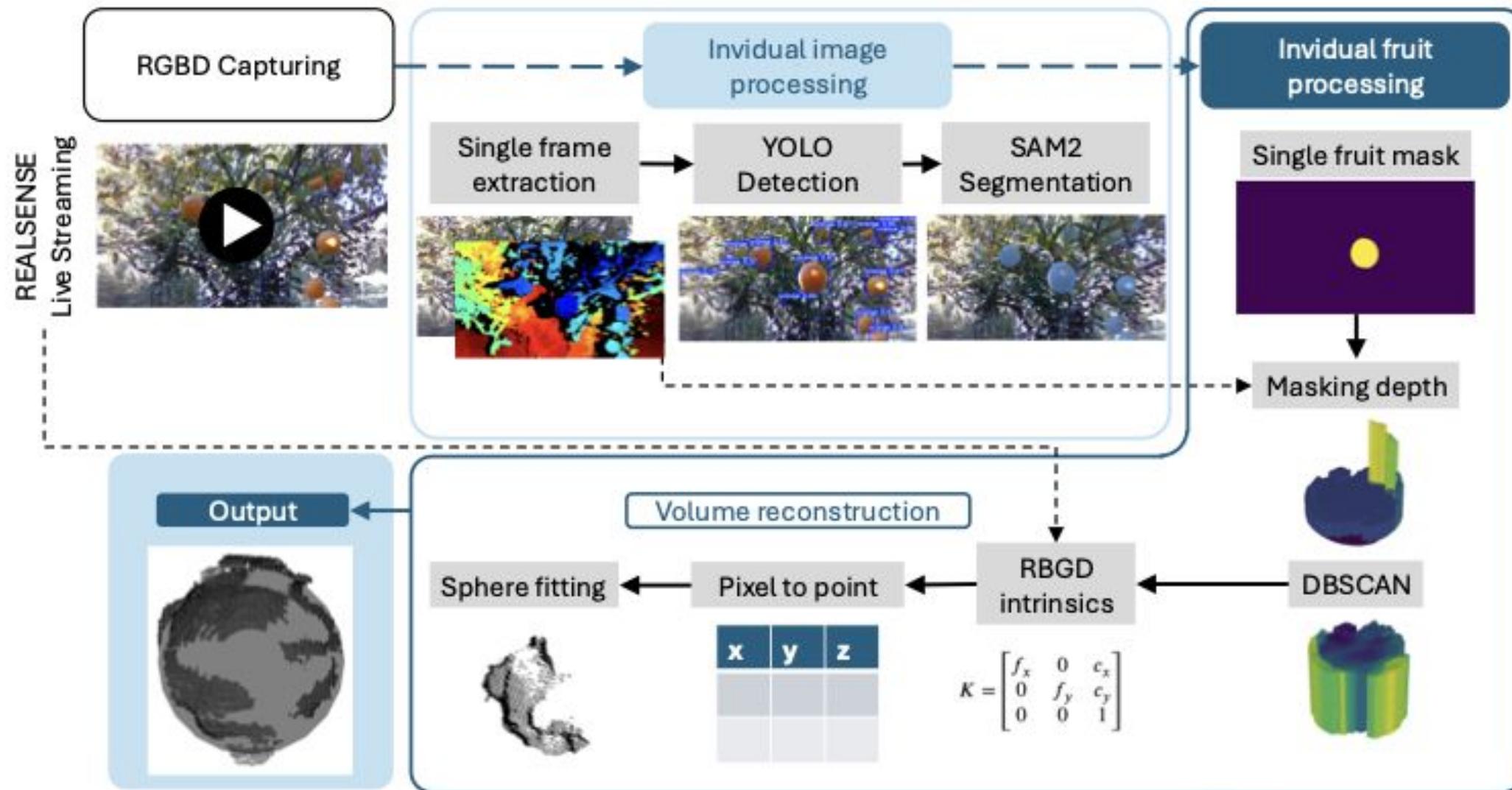
Bounding box list

Control the labeling robot



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FruitVision: RGBD-based pipeline for orange detection and size prediction



FruitVision: RGBD-based pipeline for orange detection and size prediction

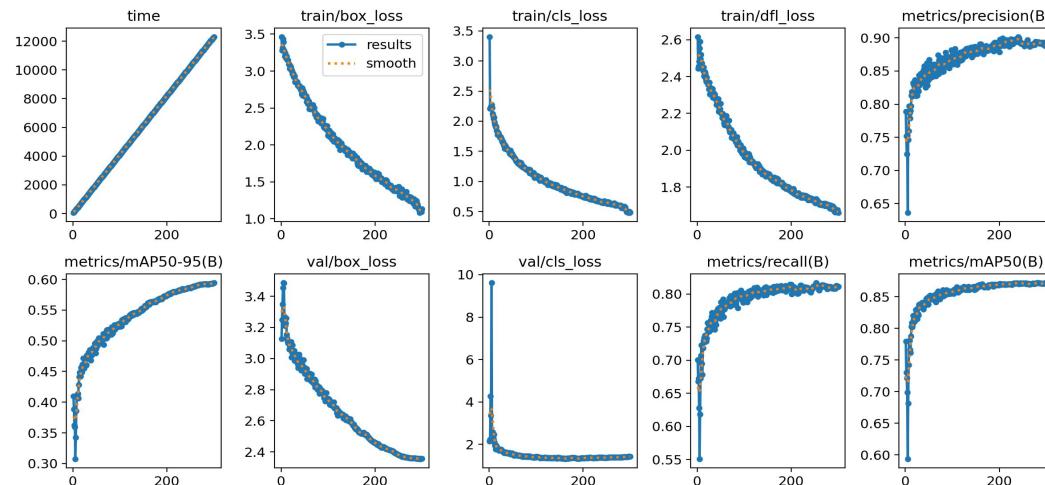
STEP 1: Train the model on orange class



Train Yolov10 Model



Infer the model on real-world images



FruitVision: RGBD-based pipeline for orange detection and size prediction

STEP 2: Predict mask and translate to Depth channel



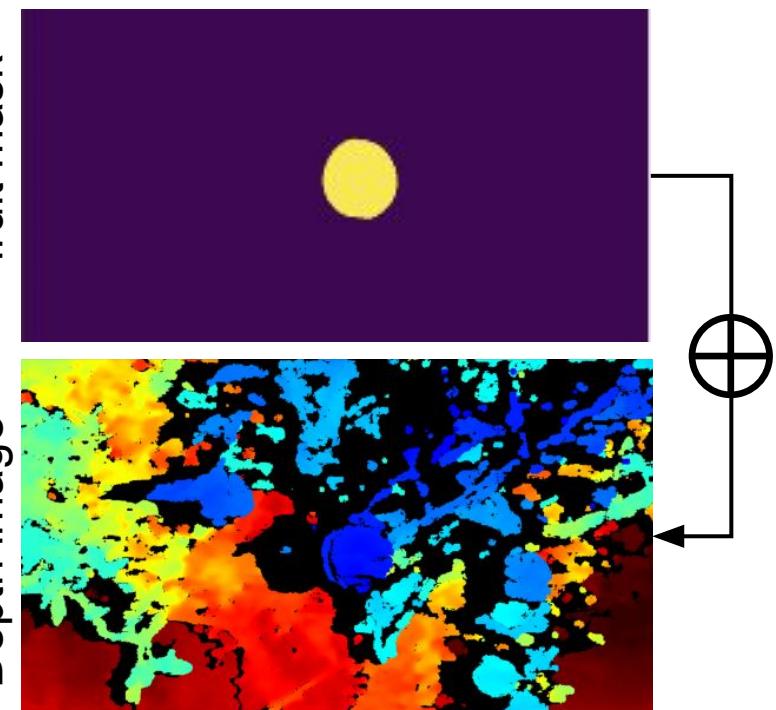
RGB - YOLO



RGB –SAM 2

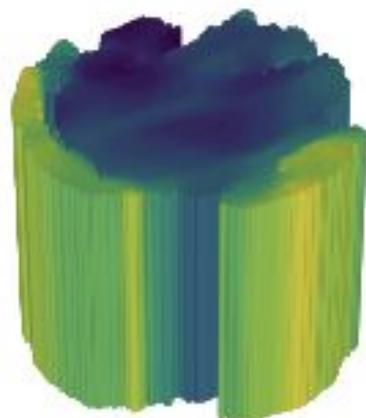
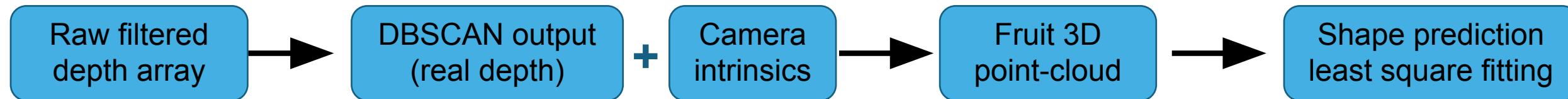


fruit mask
Depth image



FruitVision: RGBD-based pipeline for orange detection and size prediction

STEP 3: Single orange shape prediction



$$K = \begin{bmatrix} f_x & 0 & c_x \\ 0 & f_y & c_y \\ 0 & 0 & 1 \end{bmatrix}$$

