CropPilot

AI Group

Task 1

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CropPilot

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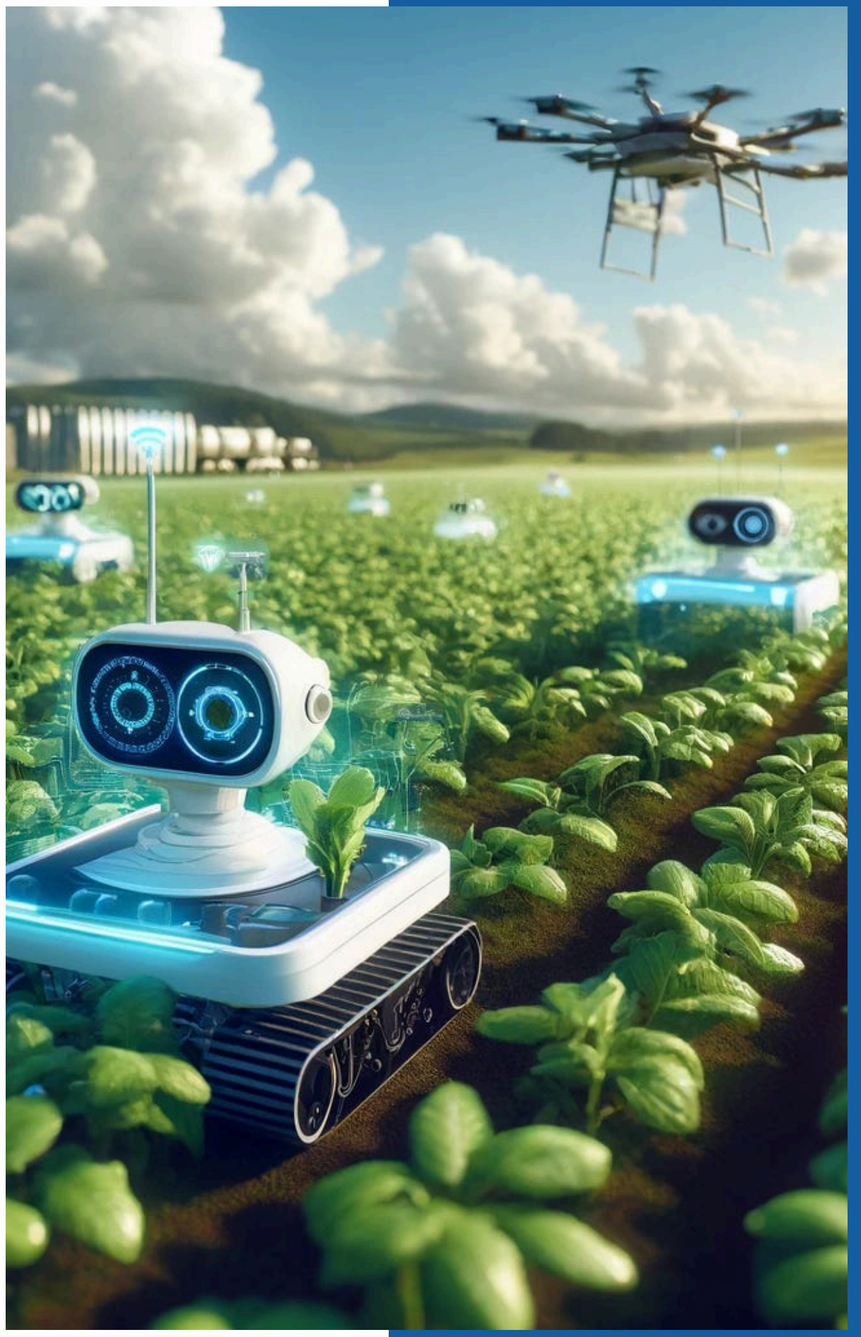

Introduction

Firstly, we have images with one plant per image, and we'll use these images to train the model. In reality, however, we'll receive images containing multiple plants, so we need to figure out how to identify each plant in the image.

We might also deal with videos, where a live feed shows the crops as a drone flies over them, and we'll need a way to handle this while training the model only on images.

Lastly, to solve the challenges above, we may need to gather more images with plants that are not labeled as healthy or diseased or not categorized by type. So we'll need to label (annotate) these images ourselves.

This outlines the issue.

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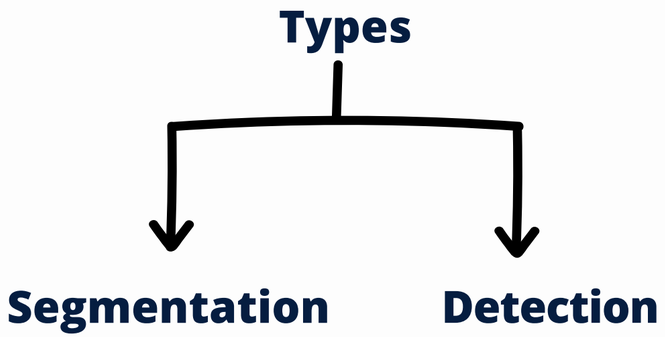
Detect multiple Objects

The purpose of this part is to determine if we can train a model on images containing a single object, then use it to detect the same object in images with multiple instances.
After researching, it turns out that this approach is indeed possible.

Use an object detection model like YOLO, SSD, or Faster R-CNN instead of a standard image classifier. These models can detect and locate multiple instances of the same object within one image, even if trained on single-object images.



Segmentation

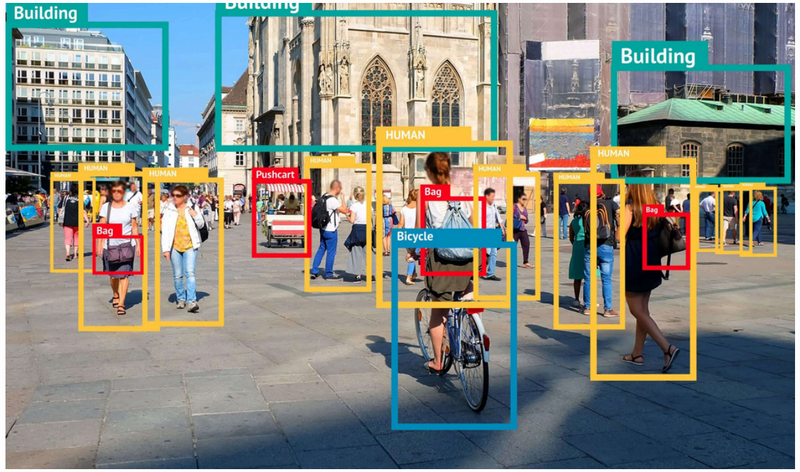
VS

Detection

This involves identifying each instance of the object at the pixel level, which helps distinguish overlapping or closely positioned objects.

Slow
More Accurate

Here, the model draws bounding boxes around each instance of the object in the image. While it doesn't capture object details as precisely as segmentation, it's faster and works well for simpler applications.



Fast
Moderate Accurate

It's better to use segmentation since it identifies objects at the pixel level. This is especially useful because the plant may not always fit into a simple box shape, and handling all possible shapes and variations with bounding boxes would be challenging. if we use Detetction

So My Opinion Using Segmentation

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Dealing With a Real-Time video

Videos are essentially sequences of images (frames). You can apply the trained model to each frame of the video individually to detect or segment objects in real-time or in post-processing

Steps :

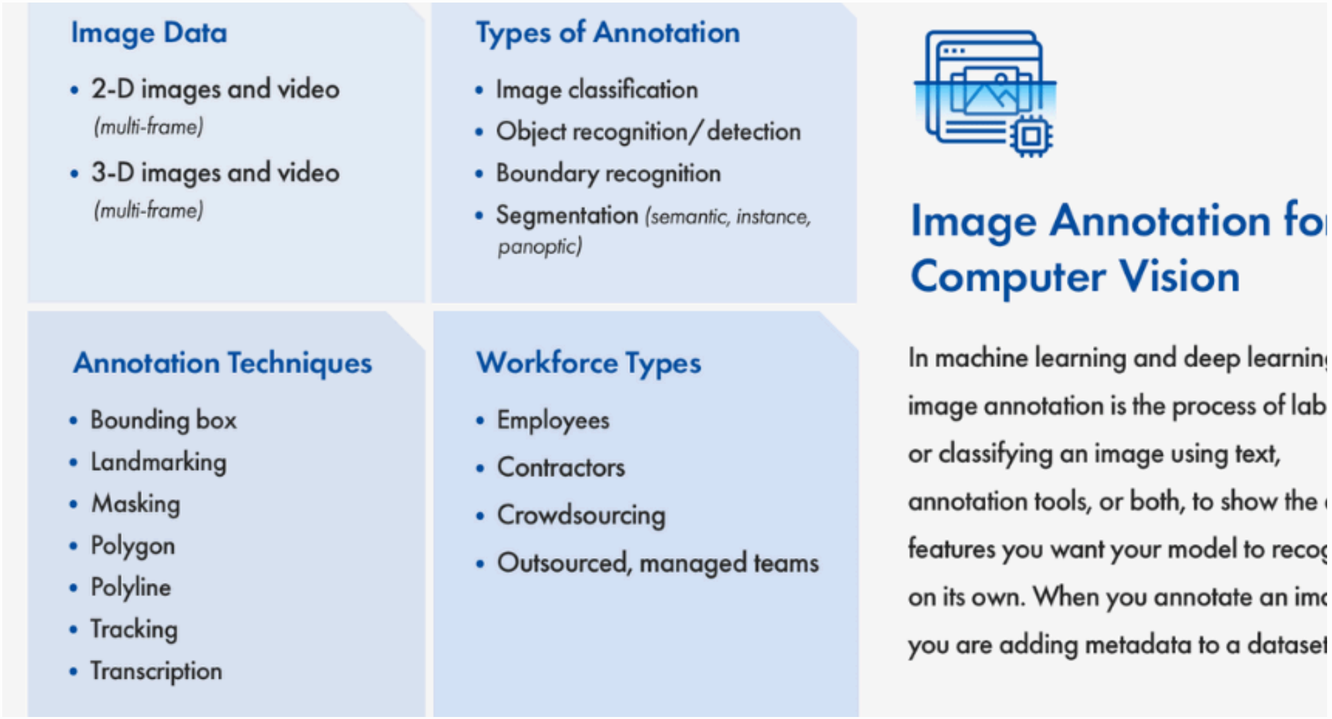
- Load the Trained Model On Images
- Open and Read the Video File
- Select Frames for Processing
- Process Selected Frames with the Model
- Display or Save the Results
- Release Resources

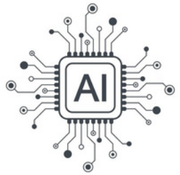
Annotating

Image Annotation is the process of labeling images to provide context for machine learning models, enabling them to understand and interpret visual data. This is crucial for tasks like object detection, image segmentation, and classification

We need to do annotation for everything we've talked about. This is important because the images we have only show one plant and whether it has a pest or not.

We want the model to find multiple plants in one image, draw boxes around them, and show where the pests are. To do this, we need to train the model with images that have these details. That's why we need to focus on annotation.





Types of Image Annotation

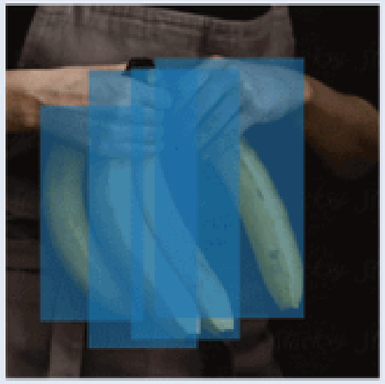
Classification

- ✓ Presence
- ✗ Location
- ✗ Count
- ✗ Size
- ✗ Shape

OUTPUT

Banana exists:
Yes / No

Object Detection



- ✓ Presence
- ✓ Location
- ✓ Count
- ✗ Size
- ✗ Shape

OUTPUT

There are 4 bananas

Semantic Segmentation

- ✓ Presence
- ✓ Location
- ✗ Count
- ! Size
- ! Shape

OUTPUT

There is banana in
these pixels

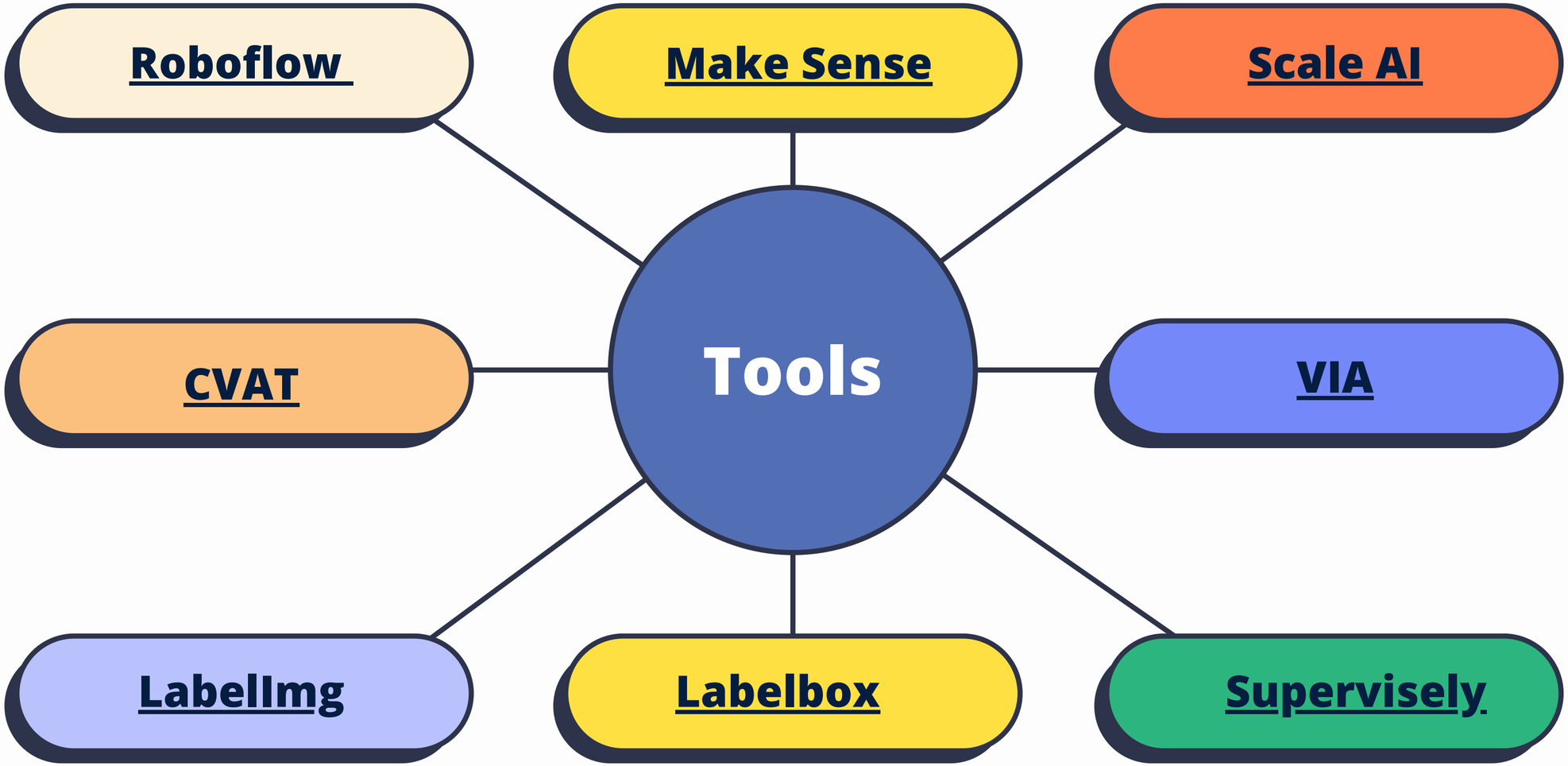
Instance Segmentation

- ✓ Presence
- ✓ Location
- ✓ Count
- ✓ Size
- ✓ Shape

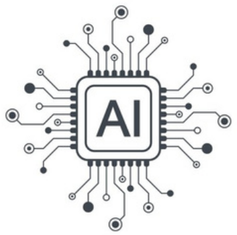
OUTPUT

There are 4 bananas
of this shape, size
and grade

Image Annotation Tools



Reference



https://shorturl.at/XWJ3s

https://shorturl.at/KmTPp

https://shorturl.at/RBP8r

https://blog.roboflow.com/best-image-annotation-tools/

https://influencermarketinghub.com/ai-image-segmentation/

https://keymakr.com/blog/advanced-image-annotation-techniques-explained/