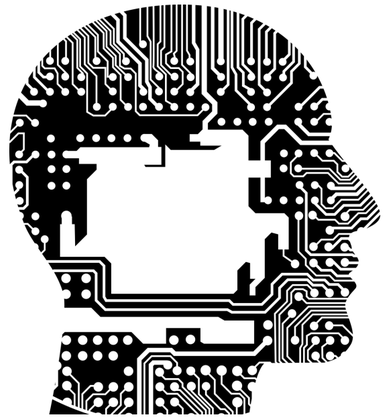
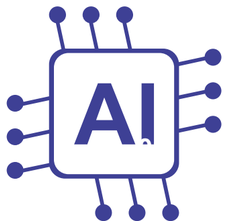
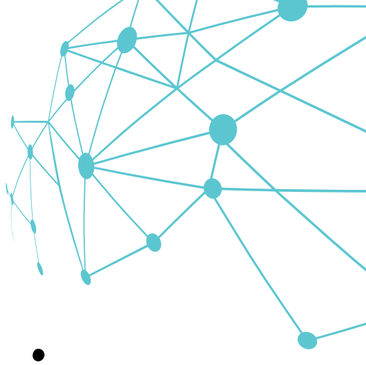


Task1

- Detect multiple Objects
- Dealing With a Real-Time video
- Methods Used for Annotating images and creating masks



1 Detect Multiuple Objects



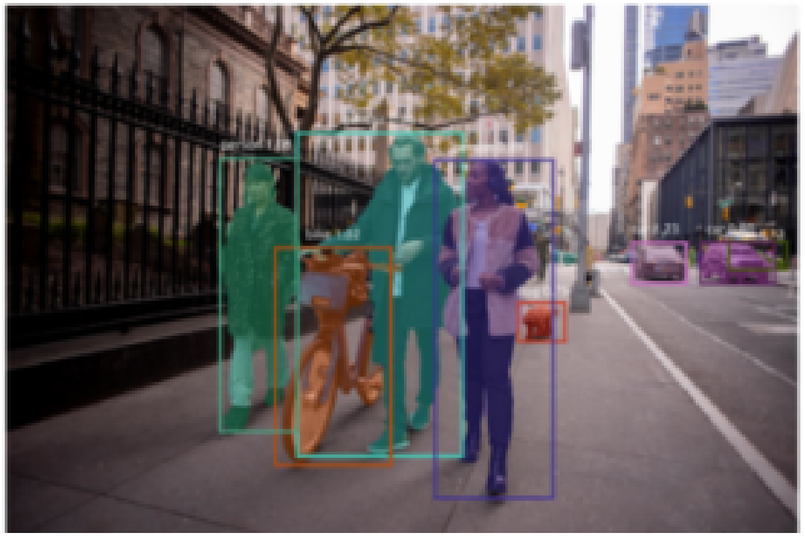
Our Problem : we Need to spilit each object in image and make model make Prediction in each one as he was trained

So we Will Use **Segmentation** or **Object Detection** Like YOLO or Mask R-CNN

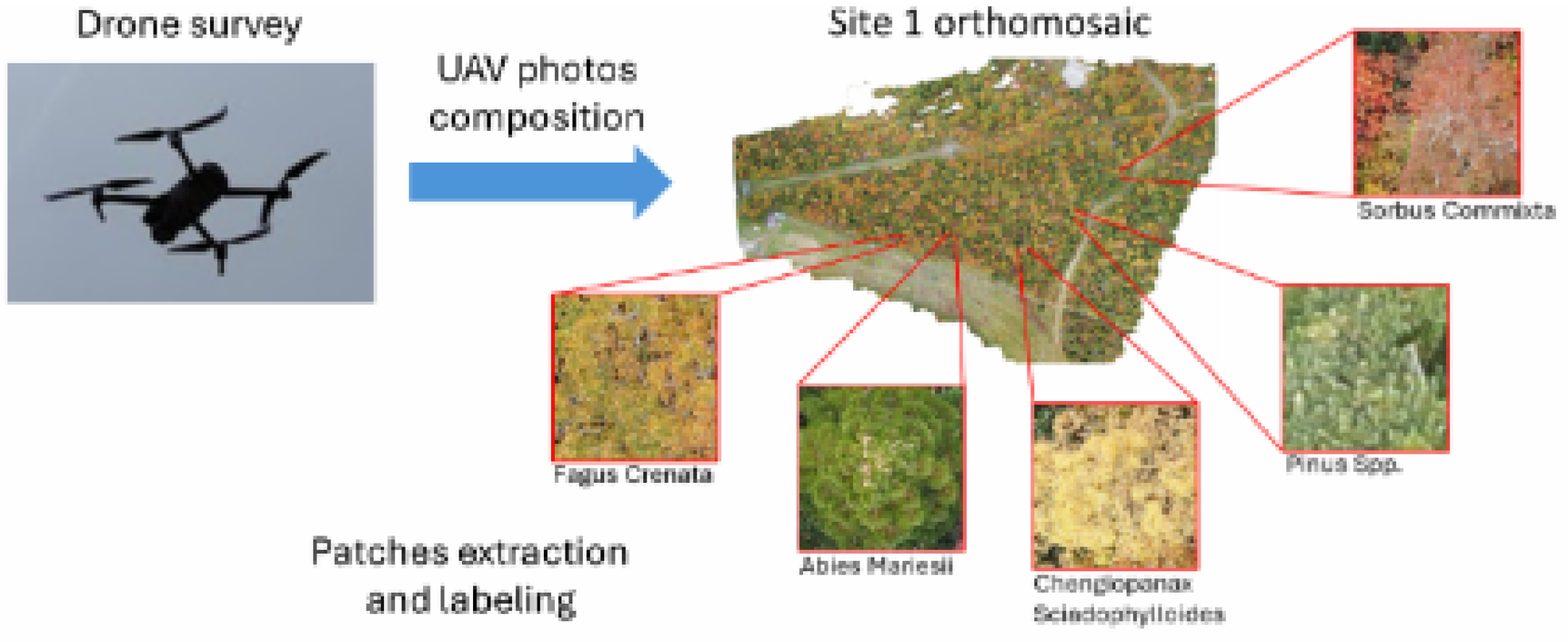
R-CNN is More Accurate than YOLO But i slow from It

What is image segmentation?

Image segmentation is a computer vision technique that partitions a digital image into discrete groups of pixels—image segments—to inform object detection and related tasks. By parsing an image's complex visual data into specifically shaped segments, image segmentation enables faster, more advanced image processing .



- It takes image inputs and produces a segmented output.
- Output is made of a mask or a grid with different parts showing which object category, for example, each pixel in the image belongs to.
- Image segmentation may be done using a range of models for neural networks and algorithms. They usually have three main components : **Encoder - Decoder - Skip Connection**



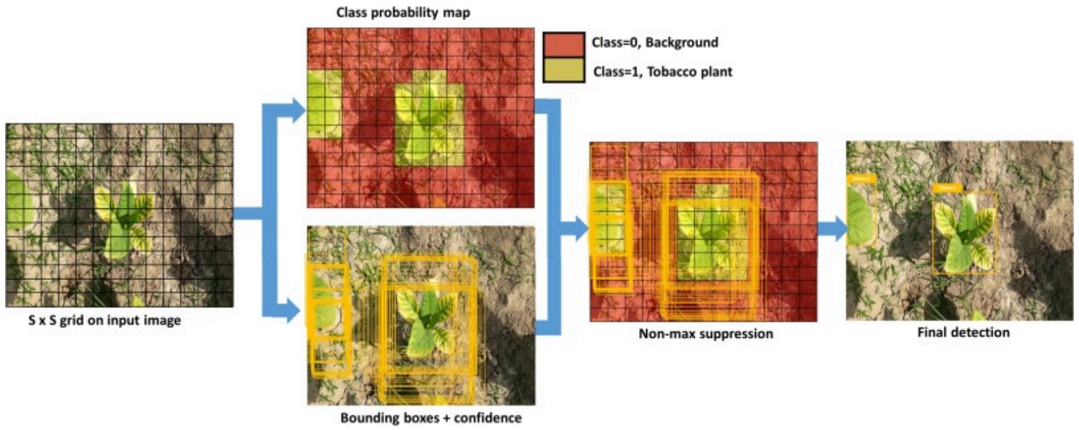
2 Deal with Real Time Video

1. Capture Frames from Video

You need to capture frames from the video in real time to feed them into your model. using libraries like **OpenCV** to capture and preprocess the frames.

2. Preprocessing the Frames

Once we've captured frames, you will likely need to preprocess them to fit our model's requirements, which may include resizing, normalization, or color conversion.



2 Deal with Real Time Video

3. Feed Frames into the Model

After preprocessing the frame, we can feed it into your trained model. Assuming our model is built with TensorFlow or PyTorch, you can pass the processed frame for inference.

4. Real-time Object Detection or Segmentation

we will apply Object Detection or Segmentation as in last slides, we will also need to apply these in real time to each frame. For example, using YOLO or Mask R-CNN as I said

2 Deal with Real Time Video

5. Optimizations for Real-time Processing

To ensure smooth real-time processing, especially with video streams, consider:

- **Using a GPU**: If model is computationally expensive
- Reducing frame size: Resize frames to a smaller size to reduce computational load.
- **Frame skipping**: You don't need to process every frame. You can process every nth frame to reduce the load on the model.

3 Methods Used for Annotating

What is image recognition labeling?

Image recognition labeling is about finding and marking things in pictures. This helps machines understand what they see. By adding labels to pictures, computer programs can sort and recognize them better.

1. Bounding Box Annotation (for Object Detection)

- What it does: This method involves drawing rectangular bounding boxes around objects of interest in an image. It is commonly used in object detection models, such as YOLO
- Tools:LabelImg
-

2. Pixel-wise Annotation (for Semantic Segmentation)

- What it does: Pixel-wise annotation assigns a class label to each pixel in the image. This method is critical for Semantic Segmentation, where every pixel is classified as part of a specific object or background.
- Tools:
  - Supervisely
  - Photoshop or GIMP
  - Labelbox:

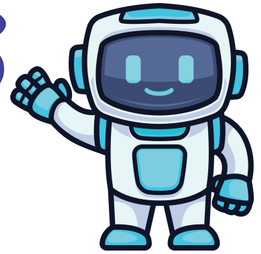
3 Methods Used for Annotating

TECHNIQUE	USE CASE	ADVANTAGES	LIMITATIONS
Bounding Box	Object Localization in Autonomous Vehicles	Easy to apply, Efficient	May include excess background, Not suitable for non-rectangular objects
Polygon	Detailed Object Recognition in E-commerce	High precision for complex shapes	Time-consuming, Complex to apply
Semantic Segmentation	Medical Imaging	Highest level of precision, Label each pixel	Extremely labor-intensive

3 Methods Used for Annotating

ANNOTATION SHAPE	APPLICATIONS	ADVANTAGE
Bounding Box	Initial Object Detection	Simple and Quick
Polygon	Complex Object Outlines	High Precision
Semantic Segmentation	Medical Imaging, Autonomous Vehicles	Pixel-Level Accuracy
Custom Shapes	Advanced AI Applications	Custom Fit for Specific Needs

Resources



- https://www.researchgate.net/publication/384465465_Plant_Species_Classification_and_Biodiversity_Estimation_from_UAV_Images_with_Deep_Learning
- https://www.ibm.com/topics/image--segmentation#:~:text=Image%20segmentation%20is%20a%20computer,faster%2C%20more%20advanced%20image%20processing.
- https://influencermarketinghub.com/ai-image-segmentation/
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- https://keymakr.com/blog/advanced-image-annotation-techniques-explained/