Note: For the sake of simplicity, it is assumed that the detector is being trained on a system that has a NVIDIA GPU, has GPU drivers installed and CUDA (version 11.8 preferably) already installed. Instructions on installing the above mentioned pre-requisites are out of the scope of this guide.

Following steps must have been performed already:

Pre-requisite step 1: Install Python 3.11

Pre-requisite step 2: Create and activate a virtual environment in the project directory and install requirements/packages.

- For Windows (with NVIDIA GPU):

  ```
  python -m venv venv
  venv\Scripts\activate
  pip install torch torchvision --index-url
  https://download.pytorch.org/whl/cu118
  pip install -r requirements-gpu.txt
  ```

- For macOS/Linux (with NVIDIA GPU):

  ```
  python3 -m venv venv
  source venv/bin/activate
  pip install torch torchvision --index-url
  https://download.pytorch.org/whl/cu118
  pip install -r requirements-gpu.txt
  ```

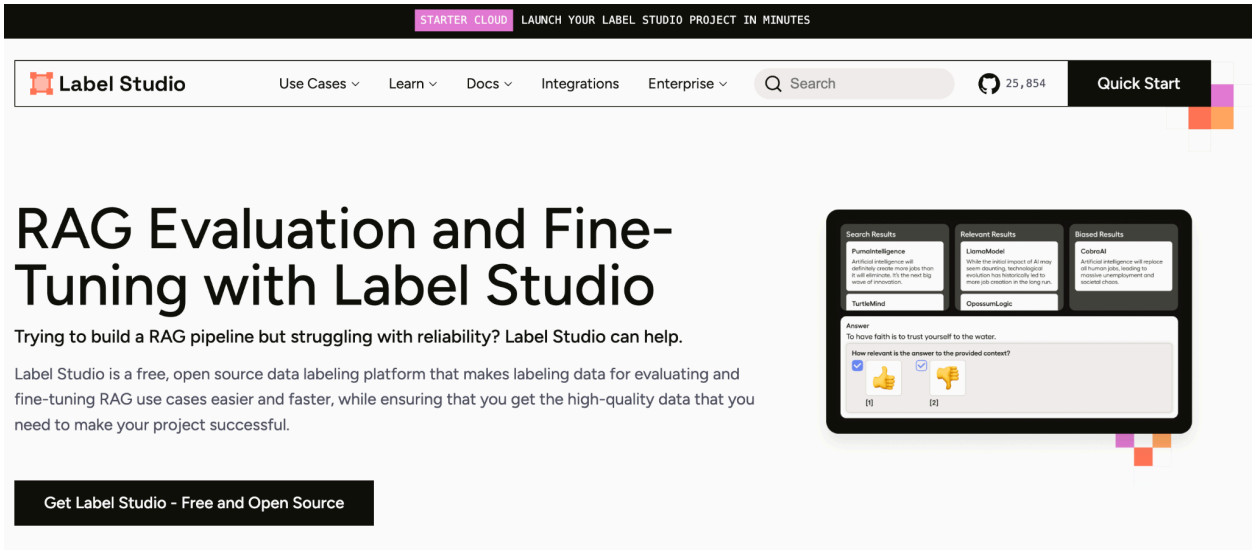
Step 1: Create Dataset

First, we have to extract frames from videos as the detector (Yolo) is trained on frames. Run the following command in the project directory.

```
python utils/extract_frames.py --video your_video.mp4 --output
dataset/images --interval 30
```

Next, we have to annotate the extracted frames, follow the below mentioned steps.

1. Go to labelstud.io and install Label Studio (how to work with Label Studio is out of scope, please refer the Label Studio documentation for the same)

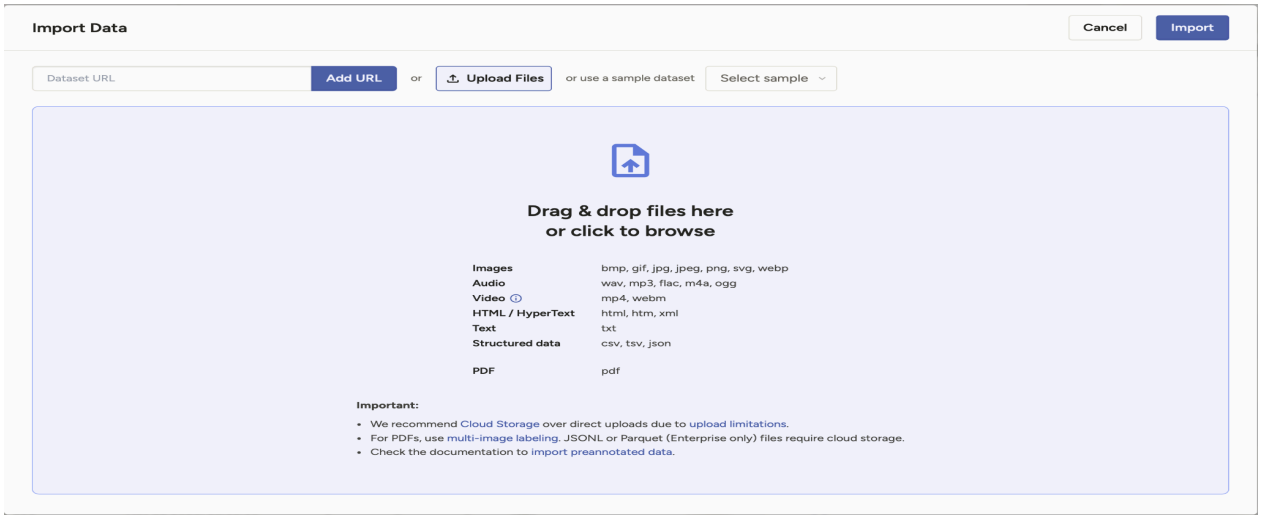


2. Launch Label Studio from the terminal by running the following command and sign in/log in to your account.

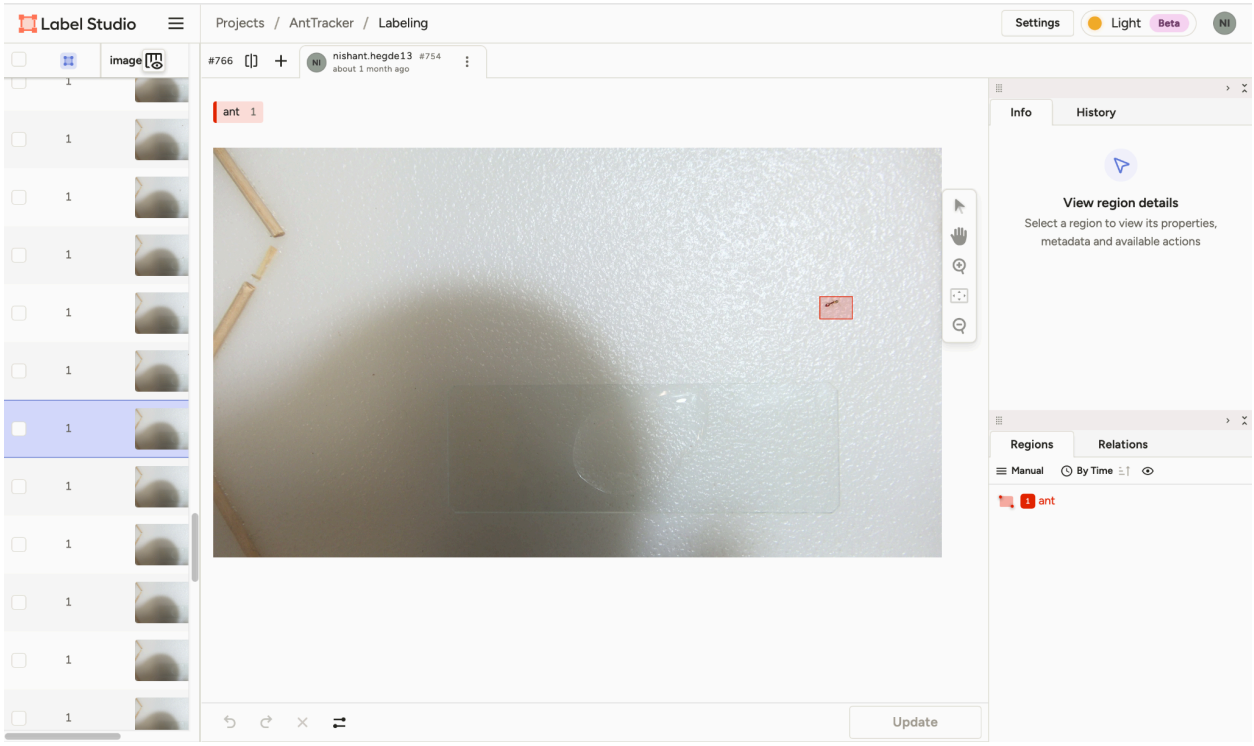
   ```
   label-studio start
   ```

3. Follow the Label Studio project creation guide - https://labelstud.io/guide/setup_project
4. Once the project is created and labeling rules are understood, upload your extracted frames by clicking on “Import”.

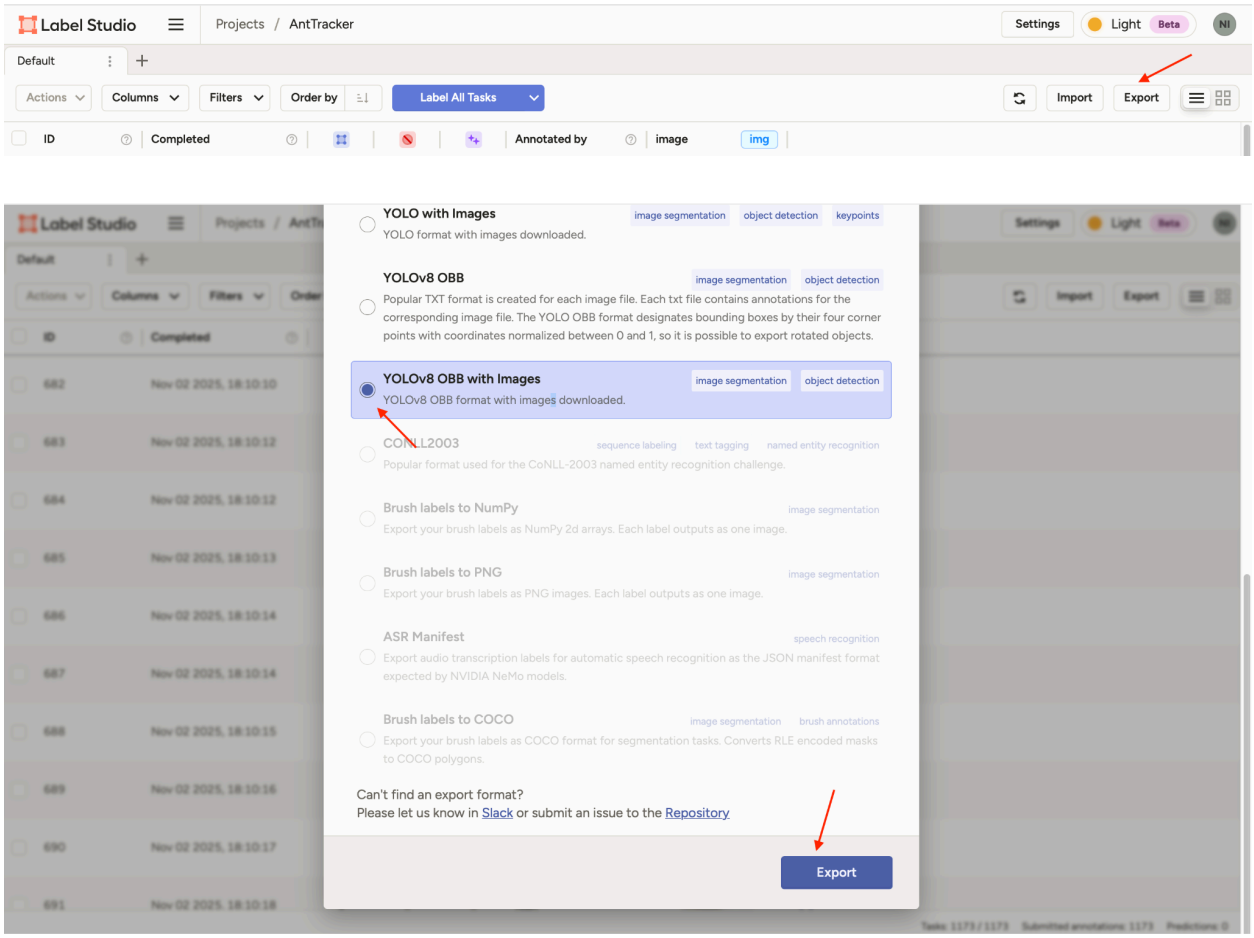
Upload the extracted frames.



5. Draw bounding boxes around each ant on all desired frames. Check documentation for annotation procedures - https://labelstud.io/guide/labeling



6. Once all annotations are done, export the annotations and the data by clicking on “Export” and then selecting “YOLOv8 OBB with Images” and then clicking “Export” again.



7. Once the annotations and the images are downloaded, place them in some path and note down the path.
8. Next, we have to split the downloaded data and annotations into train/val/test. Run the below command in the ant-tracker/ directory.

```
python -m src.training.prepare_dataset --source
unprepared_dataset --output dataset
```

Where unprepared_dataset is the path to the dataset we previously downloaded.

9. Train the detector model by running the below command in the project directory

```
python -m src.training.train_yolov8_obb
```

Training time:

GPU: 30 minutes to 4 hours

CPU: Several hours to days (not recommended)

The best model is saved at models/trained/best.pt. Use this model checkpoint file for tracking.