

Creating an annotation dataset and training a YOLO model

In this tutorial we use [Roboflow](#) for annotations and
[Ultralytics HUB](#) for training a YOLO model.
However, more solutions exist.

Create an annotation dataset

NEW: RF-DETR: A State-of-the-Art Real-Time Object Detection Model →



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Book a demo

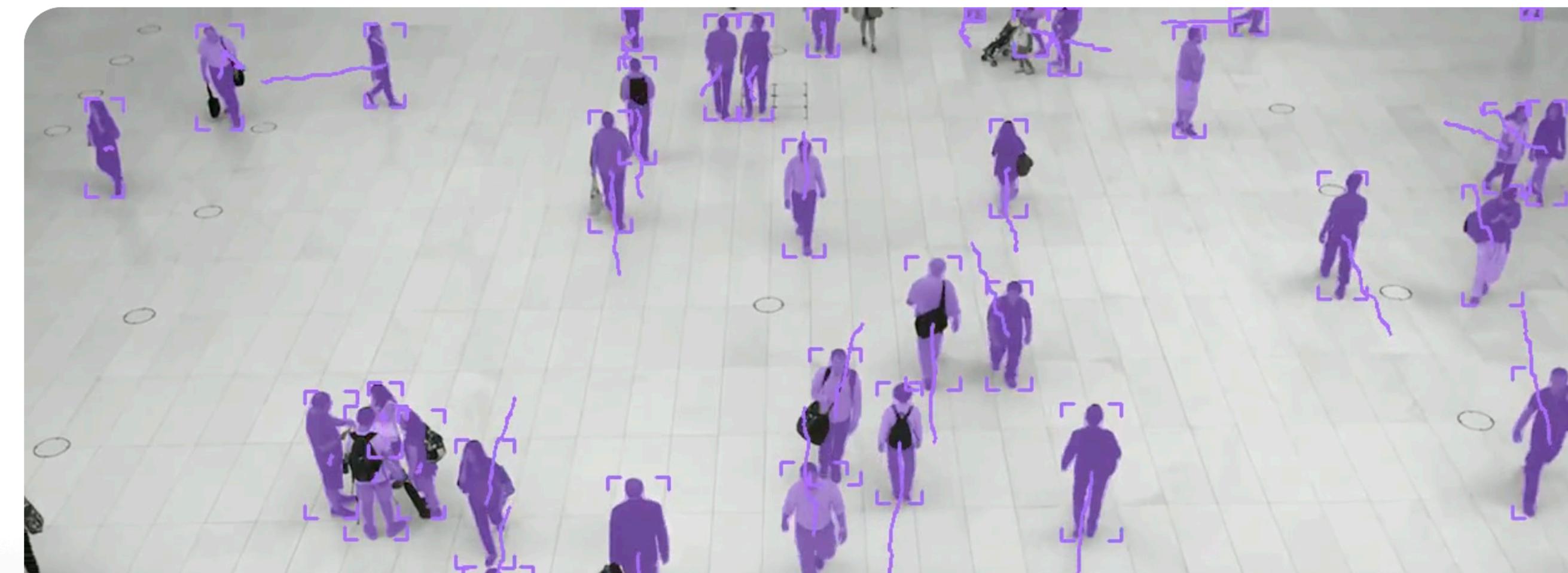
Get Started

Everything you need to build and deploy computer vision applications.

Used by over 1 million engineers to create datasets, train models, and deploy to production.

Get Started

Request a Demo



Create a new workspace

Welcome! Let's get started.

Workspaces house all of your projects and help you collaborate with teammates.

Name Your Workspace

Example project

Select Plan

Growth Subscribe Now

For advanced Machine Learning teams building and deploying to production.

What's included:

- Private Data
- Increased Limits
- Preferred Support

Public Plan Free Forever

For open source projects, personal work, and research.

What's included:

- Public Data
- Standard Limits
- Community Support

Cancel

Continue

roboflow

Example project

Public Plan • 1 Member

Create a new project in the workspace

Projects

Example project >
Public Plan • 1 Member

Projects

Workflows

Monitoring

Deployments

Settings >

Universe

Help & Docs >

Notifications

Angela Albi >

0 credits used
Resets on May 31

Upgrade

<https://app.roboflow.com>

Invite Members



There are no projects in this workspace.

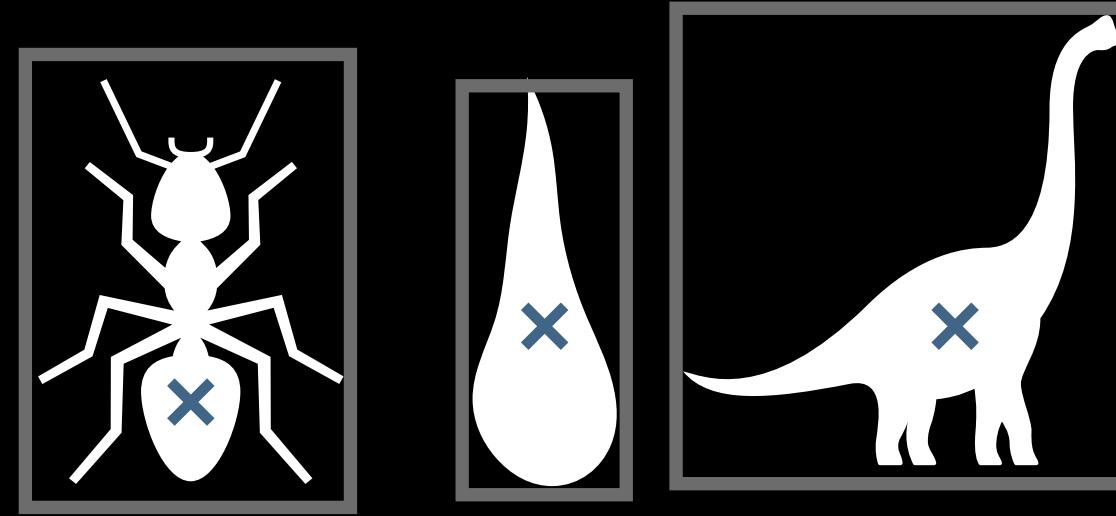
Create a project and upload images to start labeling, training, and deploying your computer vision model.

+ New Project

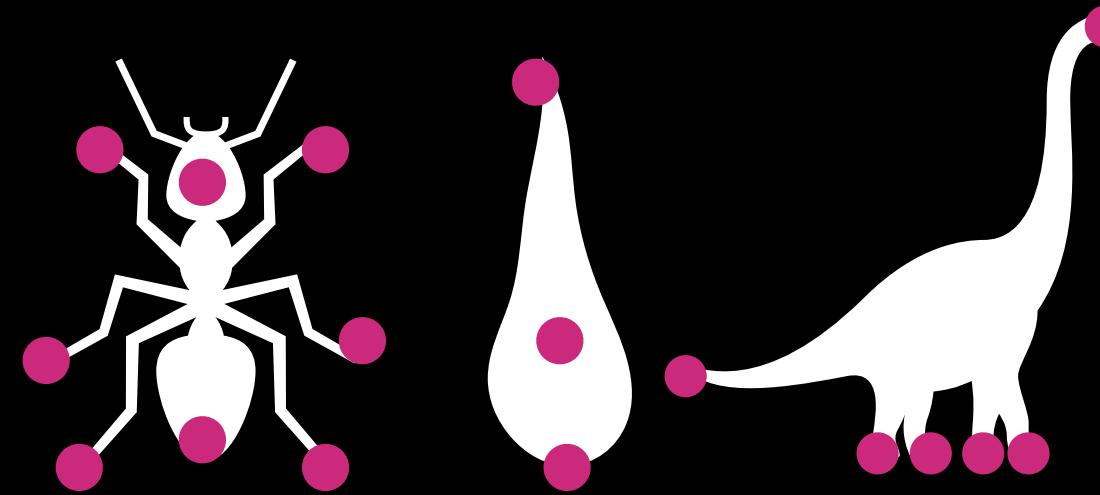
View a Tutorial



Decide on which dataset to create



Bounding box



Keypoint



Segmentation

Let's create your project.

hexbugs > Public hexkey

Project Name
hexkey

Project Type

Object Detection
Identify objects and their positions with bounding boxes.
 Bounding Boxes # Counts Tracking

Classification
Assign labels to the entire image.
 Image Labels Filtering Content Moderation
 Single-Label Multi-Label

Instance Segmentation
Detect multiple objects and their actual shape.
 Polygons Measuring Odd Shapes

Keypoint Detection
Identify keypoints ("skeletons") on subjects.
 Skeleton Structure Pose Estimation

Multimodal
Describe images using text pairs.
 Prompts Visual Question Answering Captions

Show More ↓

Cancel

Let's create your project.

Example project > Public Example Project

Project Name
Example Project

Project Type

Object Detection
Identify objects and their positions with bounding boxes.
 Bounding Boxes # Counts Tracking

Classification
Assign labels to the entire image.
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Multimodal
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 Prompts Visual Question Answering Captions

Show More ↓

Cancel

Upload videos and annotate

You can decide the number of frames to upload (e.g. 30)

The screenshot shows the Roboflow web interface. On the left, a sidebar menu includes sections for EXAMPLE PROJECT (with a thumbnail), DATA (including Upload Data, Annotate, Dataset [0], Versions [Train]), MODELS (Models, Visualize), and DEPLOY (Deployments). The main content area is titled "Upload" and shows a form for a batch named "Video: hexbug_20250129_5.mp4". It features a large central area with a purple "Upload" button and a placeholder text "Drag and drop file(s) to upload, or:". Below this are "Select File(s)" and "Select Folder" buttons. A "Supported Formats" section lists Images (.jpg, .png, .bmp, .webp, .avif), Annotations (in 26 formats), Videos (.mov, .mp4), and PDFs (.pdf). At the bottom, a section titled "Need images to get started? We've got you covered." offers options to search on Roboflow Universe, import YouTube videos, or collect images via the API. A "Import From Cloud Providers" button is also present.

EXAMPLE PROJECT

Batch Name: Video: hexbug_20250129_5.mp4

Tags: Search or add tags for images...

DATA

Upload Data

Annotate

Dataset 0

Versions Train

Analytics

Classes & Tags

MODELS

Models

Visualize

DEPLOY

Deployments

Upload

Batch Name: Video: hexbug_20250129_5.mp4

Tags: Search or add tags for images...

Drag and drop file(s) to upload, or:

Select File(s) Select Folder

Supported Formats

Images (.jpg, .png, .bmp, .webp, .avif) Annotations (in 26 formats) Videos (.mov, .mp4) PDFs (.pdf)

*Max size of 20MB and 16,384 pixels per dimension.

Need images to get started? We've got you covered.

Search on Roboflow Universe: World's Largest Platform for Computer Vision Data

Search images and annotations from 600k datasets and 400 million images (e.g. cars, people)

Import YouTube Video

e.g. <https://www.youtube.com/watch?v=dQw4w9WgXcQ>

</> Collect Images via the Upload API

Import From Cloud Providers

Once uploaded, click on Save and Continue

EXAMPLE PROJECT

Example Proj... : Instance Segmentation

DATA

Upload Data

Annotate

Dataset 0

Versions Train

Analytics

Classes & Tags

MODELS

Models

Visualize

DEPLOY

Deployments

Upload

Batch Name: Video: hexbug_20250129_5.mp4

Tags: Search or add tags for images...

All Images 18 Annotated 0 Not Annotated 18

Drag and drop images, annotations, and videos.

.jpg, .png, .bmp, .webp, .avif in 26 formats .mov, .mp4

*Max size of 20MB and 16,384 pixels per dimension.

Select Files Select Folder Save and Continue →

hexbug_20250129_5_mp4-0017.jpg hexbug_20250129_5_mp4-0016.jpg hexbug_20250129_5_mp4-0015.jpg hexbug_20250129_5_mp4-0014.jpg hexbug_20250129_5_mp4-0013.jpg hexbug_20250129_5_mp4-0012.jpg hexbug_20250129_5_mp4-0011.jpg hexbug_20250129_5_mp4-0010.jpg hexbug_20250129_5_mp4-0009.jpg

hexbug_20250129_5_mp4-0008.jpg hexbug_20250129_5_mp4-0007.jpg hexbug_20250129_5_mp4-0006.jpg hexbug_20250129_5_mp4-0005.jpg hexbug_20250129_5_mp4-0004.jpg hexbug_20250129_5_mp4-0003.jpg hexbug_20250129_5_mp4-0002.jpg hexbug_20250129_5_mp4-0001.jpg hexbug_20250129_5_mp4-0000.jpg

And select the type of labelling you want (e.g. Manual)

EXAMPLE PROJECT

Example Proj... : Instance Segmentation

DATA

Upload Data

Annotate

Dataset 0

Versions Train

Analytics

Classes & Tags

MODELS

Models

Visualize

DEPLOY

Deployments

Batch Name: Video: hexbug_20250129_5.mp4

Uploaded On : May 6, 2025 4:36 PM

hexbug_20250129... hexbug_20250129... hexbug_20250129... hexbug_20250129... hexbug_20250129... hexbug_20250129... hexbug_20250129...
hexbug_20250129... hexbug_20250129... hexbug_20250129... hexbug_20250129... hexbug_20250129... hexbug_20250129... hexbug_20250129...

How do you want to label your images?

Auto Label Beta

Use your custom model or a zero-shot model to label an entire batch.

Manual Labeling

You and your team label your own images with help from our AI labeling tools.

Roboflow Labeling Service

Work with a professional team of human labelers.

In the “Annotate” tab you find the uploaded frames

The screenshot shows the Roboflow Annotate interface for a project titled "EXAMPLE PROJECT". The left sidebar contains navigation links for "DATA" (Upload Data, Annotate, Dataset, Versions, Train, Analytics, Classes & Tags), "MODELS" (Models, Visualize), and "DEPLOY" (Deployments). The main area is titled "Annotate" and includes a "Sort By: Newest" dropdown. It features three cards:

- Unassigned**: 0 Batches. Includes a "Upload More Images" button.
- Annotating**: 1 Job. This card is highlighted with a red box and displays:
 - Video: hexbug_20250129_5.mp4: Job 2
 - Labeler: Angela Albi
 - 17 Images
 - 0 Annotated
 - 17 Unannotated
 - [Start Annotating →](#)
- Dataset**: 1 Job. Includes a "See all 1 images" button.

A purple circular icon with a white speech mark is located at the bottom right of the interface.

Click on the first one to start annotating

EXAMPLE PROJECT

Video: hexbug_20250129_5.mp4: Job 2

Start Annotating Add to Dataset X

Progress

Unannotated 17 Annotated 0

Sort By Newest ▾

∅

17 Images
0 Annotated
17 Unannotated

Instructions No specific instructions were added when this job was assigned

Assignment Angela Albi Labeler

Timeline IFhZZjvNuje7cwo1TJmTYwvC1AS2 created this job by partially accepting another job. 1 image was added to the dataset and the remaining 17 images were added to this job and sent back for annotation.
06/05/2025, 16:38:48

DATA

Upload Data

Annotate

Dataset 1

Versions Train

Analytics

Classes & Tags

MODELS

Models

Visualize

DEPLOY

Deployments

Progress

Unannotated 17 Annotated 0

Sort By Newest ▾

∅

17 Images
0 Annotated
17 Unannotated

Instructions No specific instructions were added when this job was assigned

Assignment Angela Albi Labeler

Timeline IFhZZjvNuje7cwo1TJmTYwvC1AS2 created this job by partially accepting another job. 1 image was added to the dataset and the remaining 17 images were added to this job and sent back for annotation.
06/05/2025, 16:38:48

DATA

Upload Data

Annotate

Dataset 1

Versions Train

Analytics

Classes & Tags

MODELS

Models

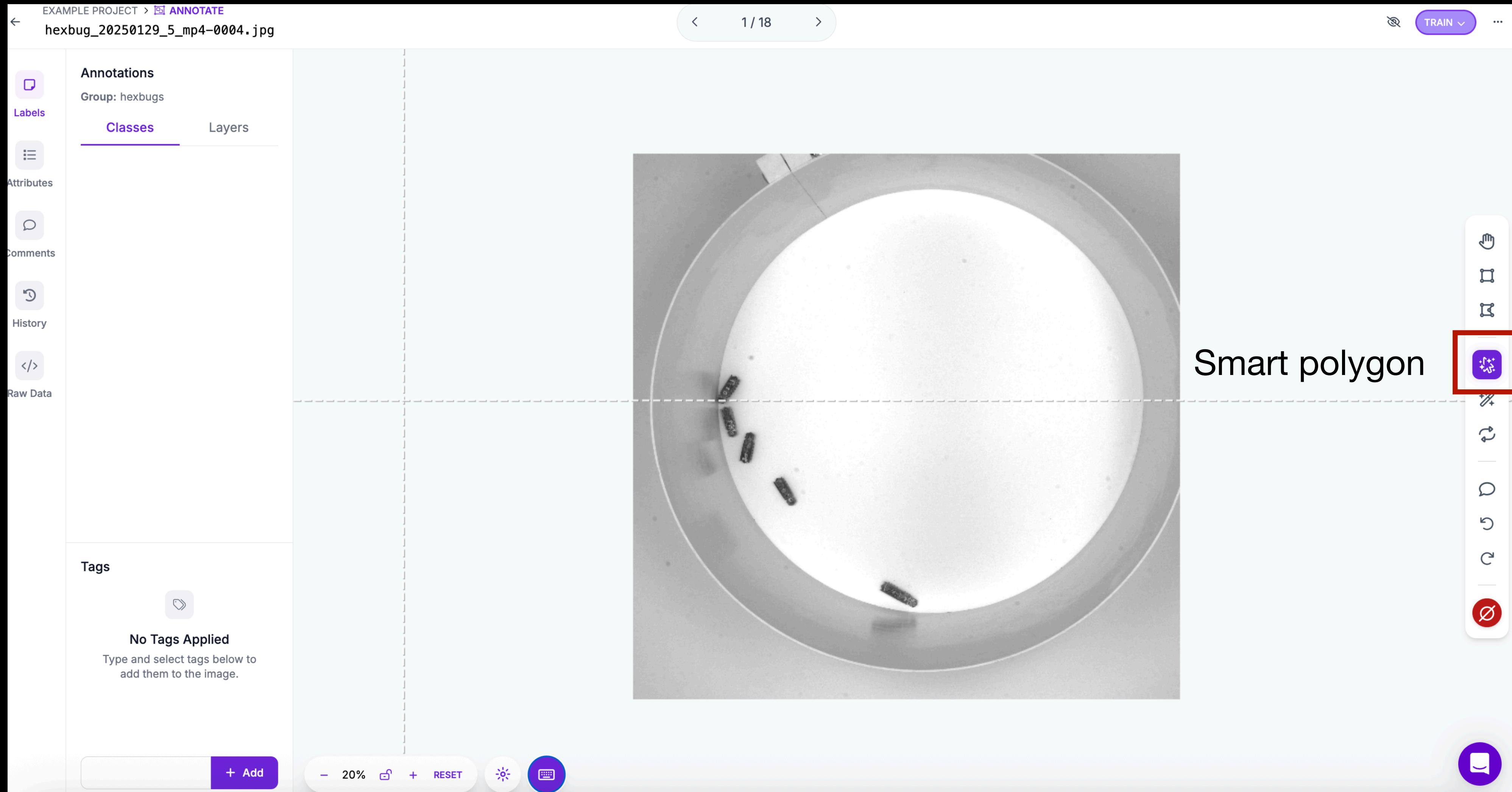
Visualize

DEPLOY

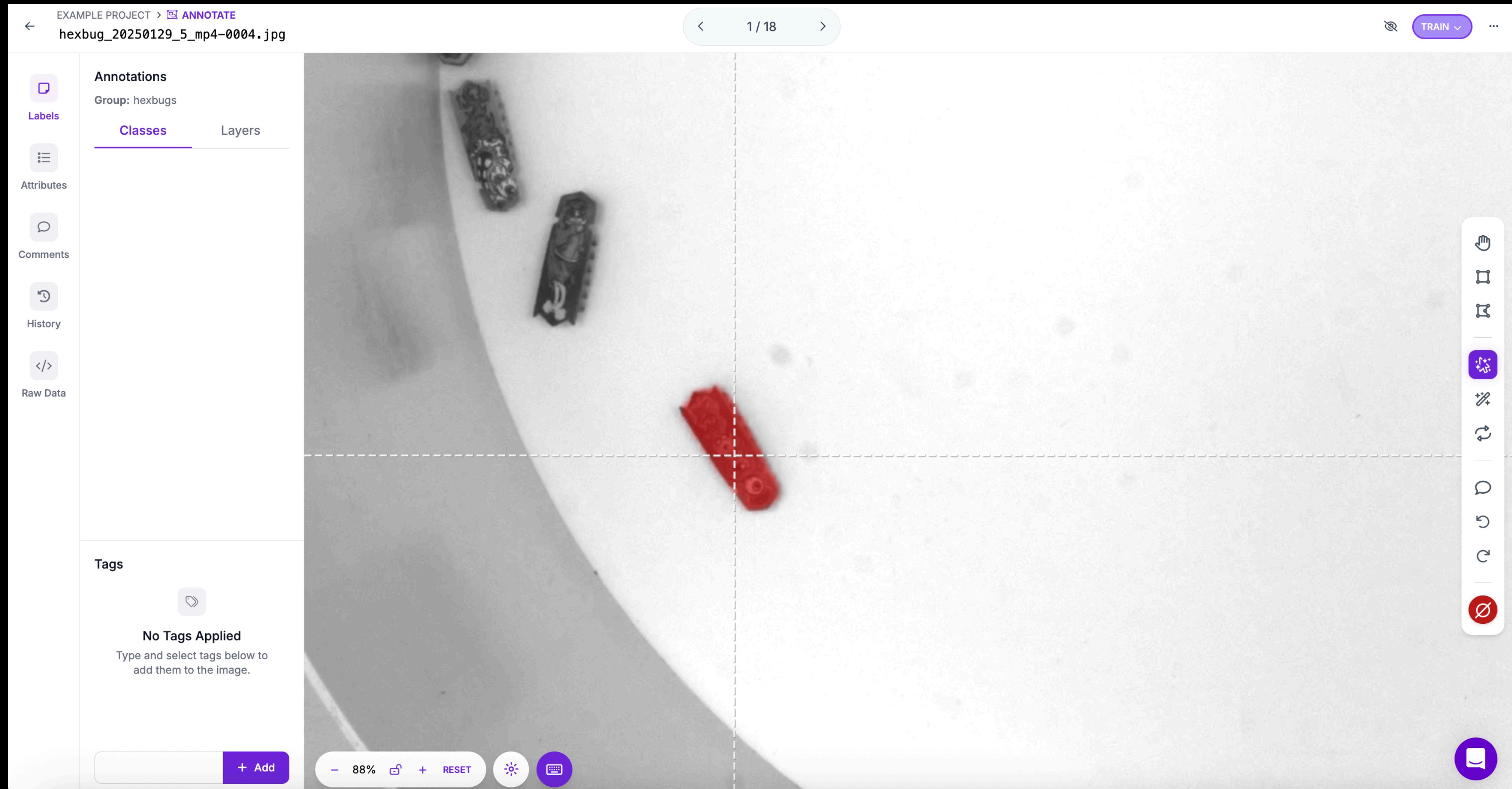
Deployments

Segmentation annotations

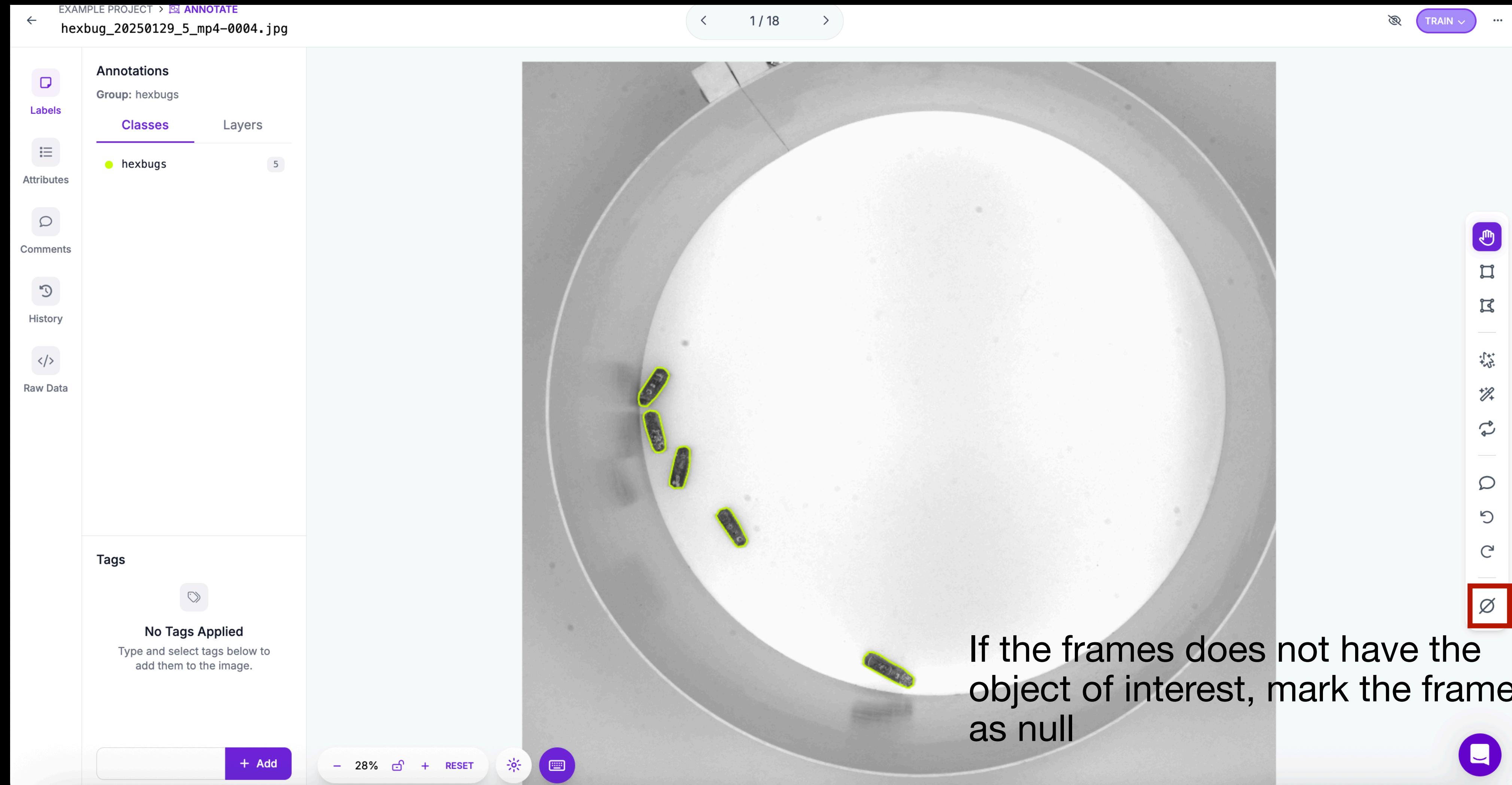
On the right, select the right tool for annotations (box, polygon, smart polygon)



Smart polygon helps to automatically detect the object



Annotate all the objects in the frames



Keypoint annotations

Before starting, click on Classes & Tags to add your objects, number of keypoints and skeleton

HEXBUGS

hexkey : Keypoint Detection

DATA

- Upload Data
- Annotate
- Dataset 0
- Versions Train
- Analytics

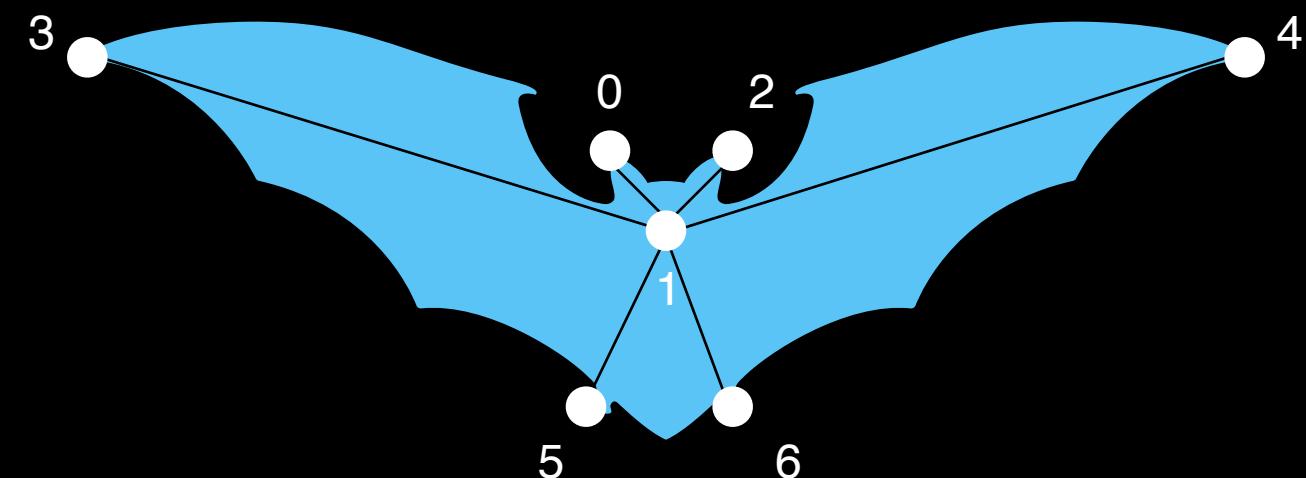
Classes & Tags

Add the class for an object you are detecting. You will be able to add keypoints to your class after creation.

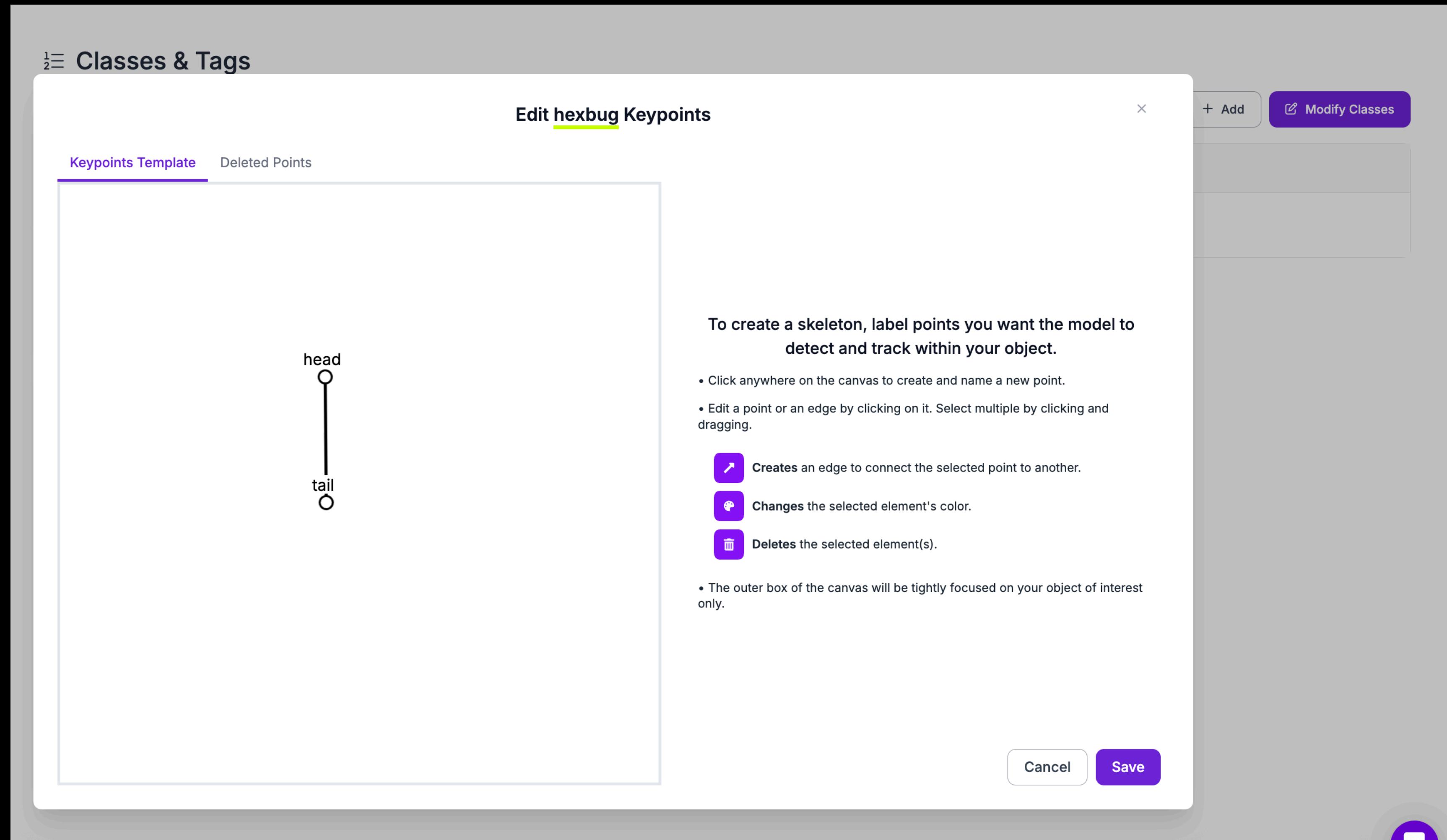
person (the object containing your keypoints)

Fix invalid classes

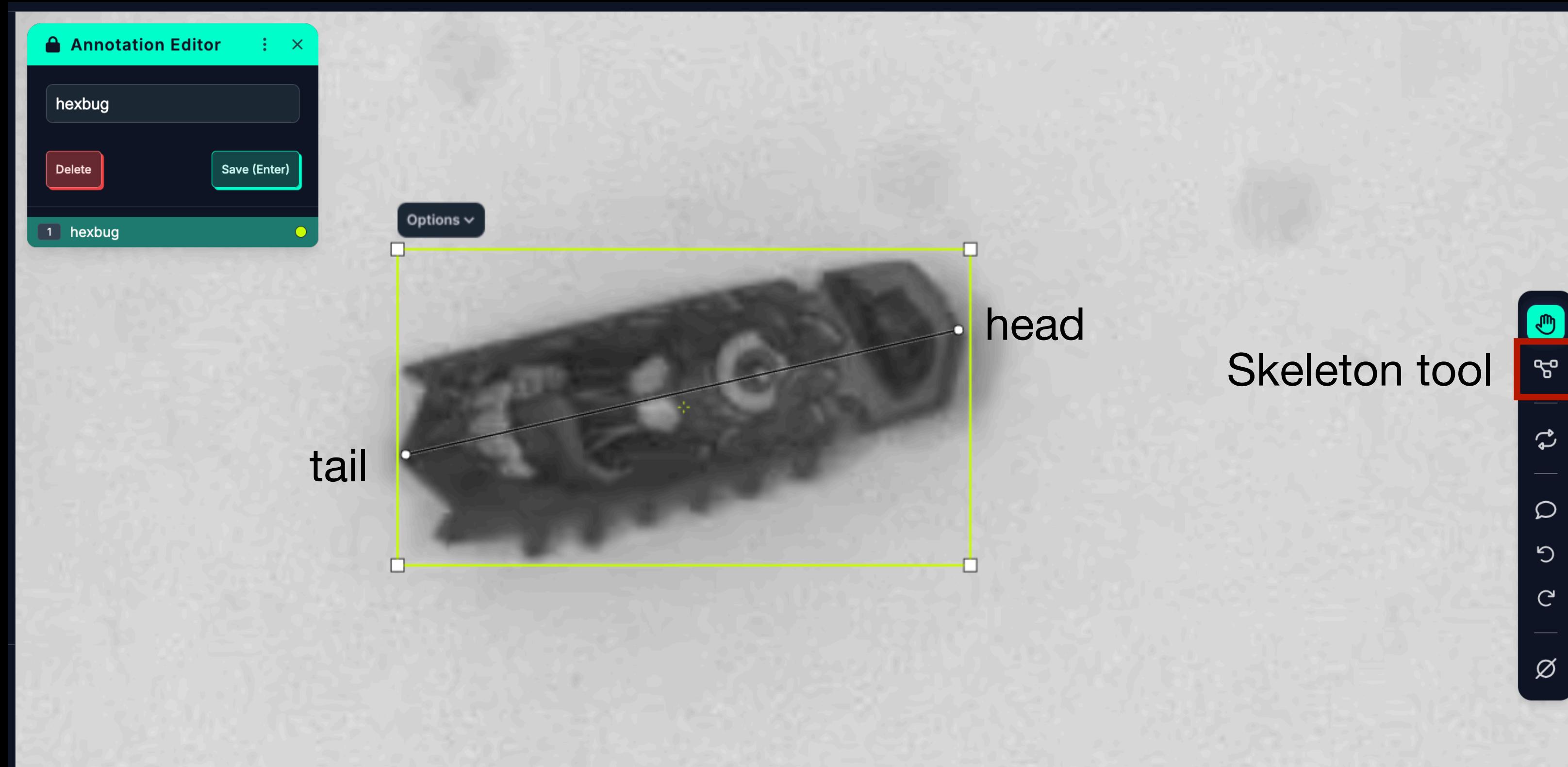
[Upload Classes CSV](#) [Add Class](#)



Define your keypoints ‘skeleton’

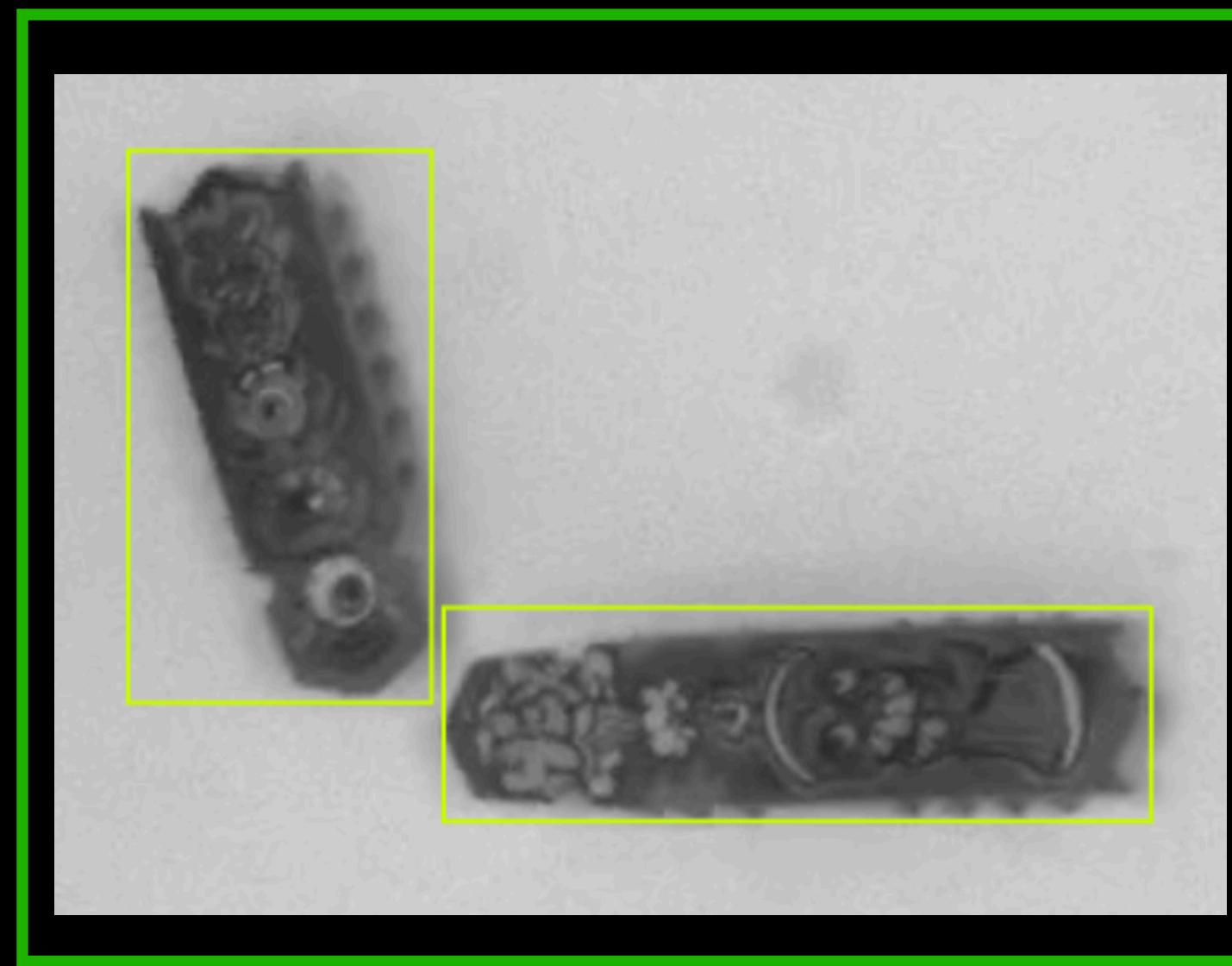


Drag your keypoint skeleton on the object body and make sure the bounding box is including only the object (and not much more)



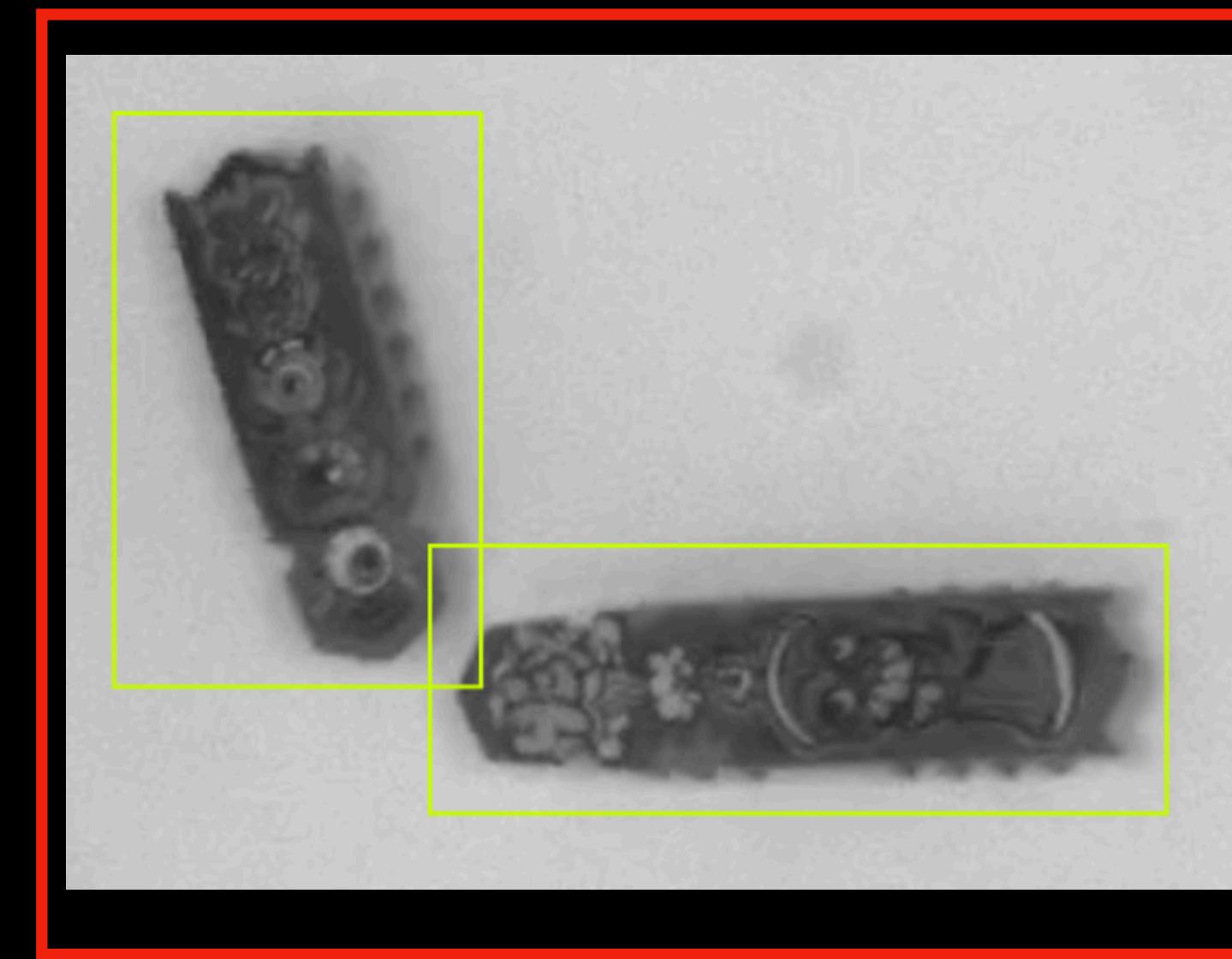
Bounding box annotations

Correct



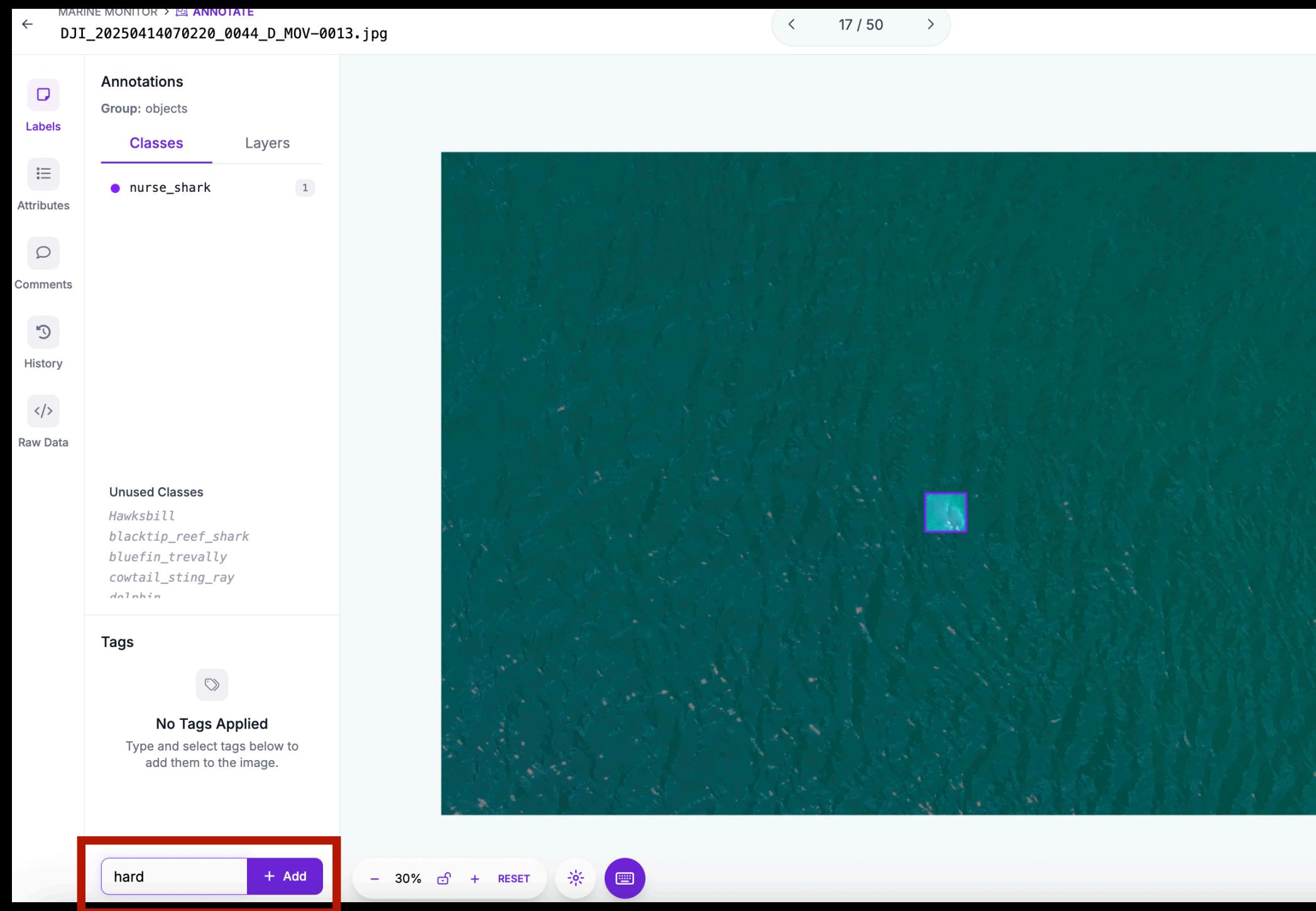
Create the bounding
box in a way to include
the entire object

Wrong

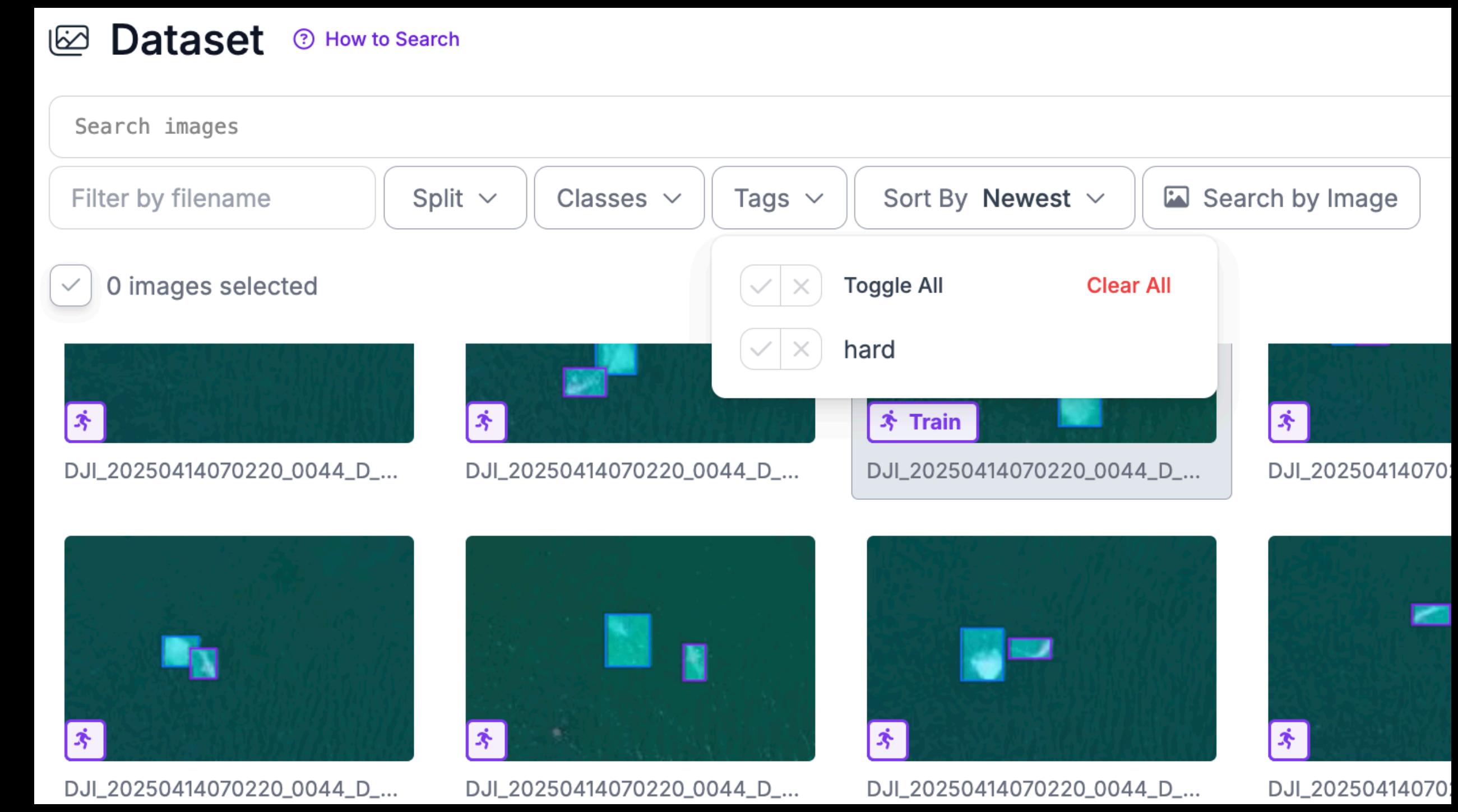


There shouldn't be too
much space around
the annotated object

Tags



If you think that an annotation is particularly ‘odd’ and would not help the training, you can add a ‘tag’ to the image (in the ‘dataset’) tab.



Using the tags the data can be filtered later on

Creating and exporting the dataset

Add images to the dataset

Video: 20250129_hexbug_5_long.mp4 - Auto Label [Edit](#)

Progress
999 Images
15 Annotated
984 Unannotated

Instructions [Edit](#)
No specific instructions were added when this job was assigned

Assignment [Reassign](#)
Tristan Walter
Labeler

Timeline
\$Job created via API and assigned it to twalter@ab.mpg.de.
14/02/2025, 13:01:35

Unannotated 984 Annotated 15 [Sort By Newest](#)

Continue Annotating

Add Images To Dataset

Total Images to Add: 15

Method: [What's Train, Valid, Test?](#)
Split Images Between Train/Valid/Test

Train 70% Valid 20% Test 10%

Image Distribution:
Train: 11 images
Valid: 3 images
Test: 1 images

You are about to add 15 images to the dataset.
984 images will be sent back as part of a new job.

When you are done with the annotations, you can add the annotations to the Dataset

Dataset Preprocessing

The screenshot shows a user interface for dataset preprocessing. On the left, a sidebar lists various dataset management options like 'Upload Data', 'Annotate', and 'Analytics'. The main area is a step-by-step wizard:

- Step 3: Preprocessing**
 - Source Images: Images: 15, Classes: 1, Unannotated: 0
 - Train/Test Split: Training Set: 11 images, Validation Set: 3 images, Testing Set: 1 images
 - Add Preprocessing Step
- Step 4: Augmentation**
- Step 5: Create**

Preprocessing depends on the model you are training. These can also be defined when training.

Dataset Augmentation

4 **Augmentation**

What can augmentation do?

Create new training examples for your model to learn from by generating augmented versions of each image in your training set.

Saturation Between -25% and +25%	Edit	x
Brightness Between -15% and +15%	Edit	x
Exposure Between -10% and +10%	Edit	x
+ Add Augmentation Step		
<input type="checkbox"/> Use Previous Augmentations Use augmentations from a previous version.		

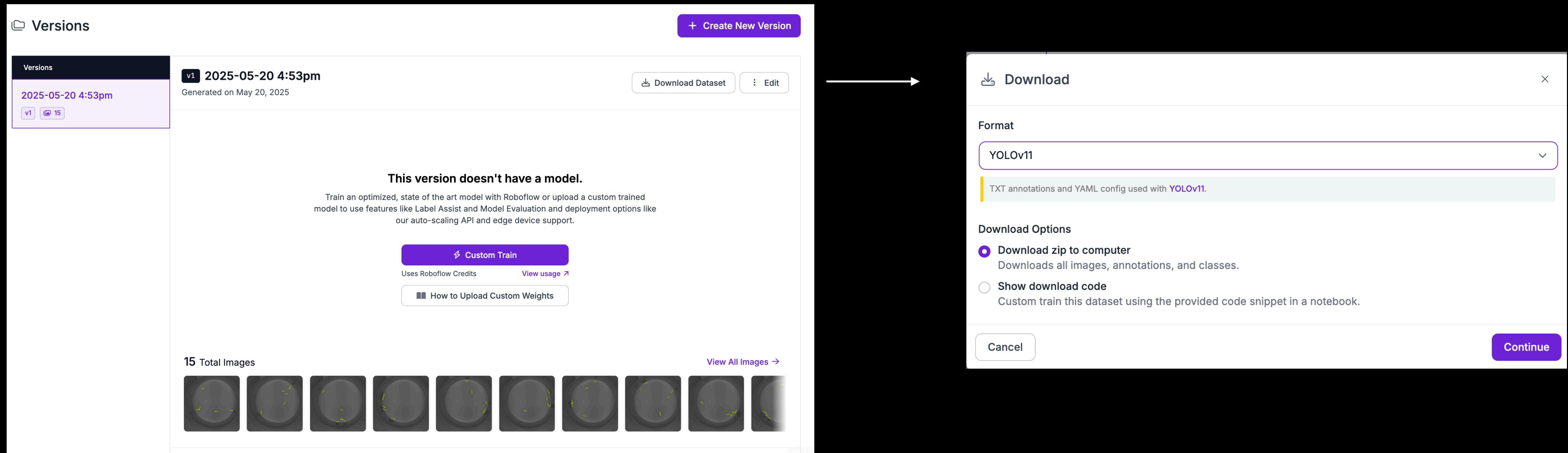
Continue Clear All

5 Create

Image augmentation may help

When you are done, click on 'Create'

Download the dataset



After the dataset version is created, you can download the dataset as a zip folder or use the download code on a [Google Colab](#) notebook for training

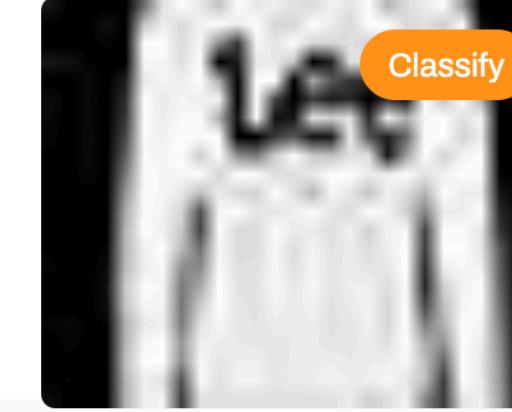
Training a YOLO model

ultralytics
HUB BETA

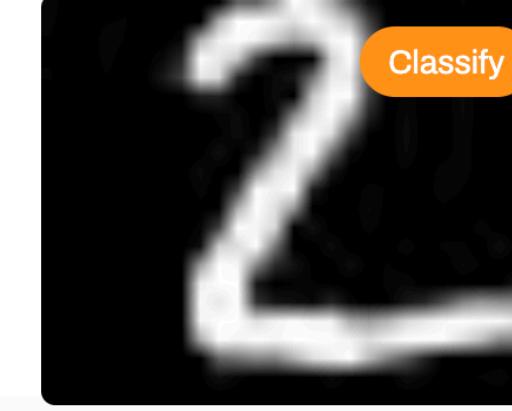
Home > Datasets

Home Datasets Projects Models Integrations Support Trash

Search All Public Unlisted Private

Fashion-MNIST  Classify
Fashion-MNIST: A Vital Dataset for Fashion Image Classification and AI Model Training
10 classes 70000 images 47.0 MB

CIFAR-10  Classify
CIFAR-10: Comprehensive Dataset for Advancing Image Classification and Machine Learning
10 classes 60000 images 139.9 MB

MNIST  Classify
MNIST: Essential Dataset for Image Classification and Deep Learning Model Evaluation
10 classes 70000 images 28.2 MB

Crack-Seg  Segment
Crack Segmentation Dataset: Key to Infrastructure Maintenance and Road Safety
1 class 4029 images 91.1 MB

Package-Seg  Segment
Segment the industrial packages using Ultralytics YOLOv8
1 class 2197 images 75.7 MB

COCO128  Detect
This dataset contains the first 128 images of COCO train 2017. It is used as the tutorial dataset for YOLOv5.
80 classes 256 images 6.7 MB

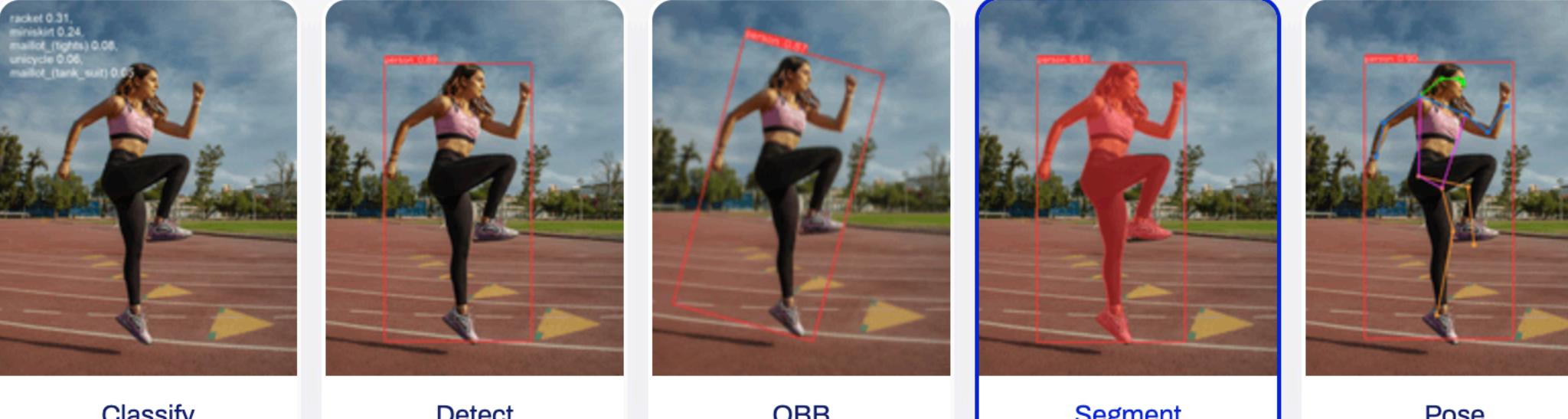
Upload Dataset

We suggest using Ultralytics HUB to train a model. It's possible to upload the dataset downloaded from Roboflow

Upload the dataset and start the training process

Upload Dataset
Upload your custom dataset formatted for Ultralytics HUB

Task



Classify Detect OBB Segment Pose

Dataset name

Description

Hexbugs segmentation model

Dataset .zip file



Cancel Create

Train Model :

Task Segment Classes 1 Images 15 Size 7.6 MB

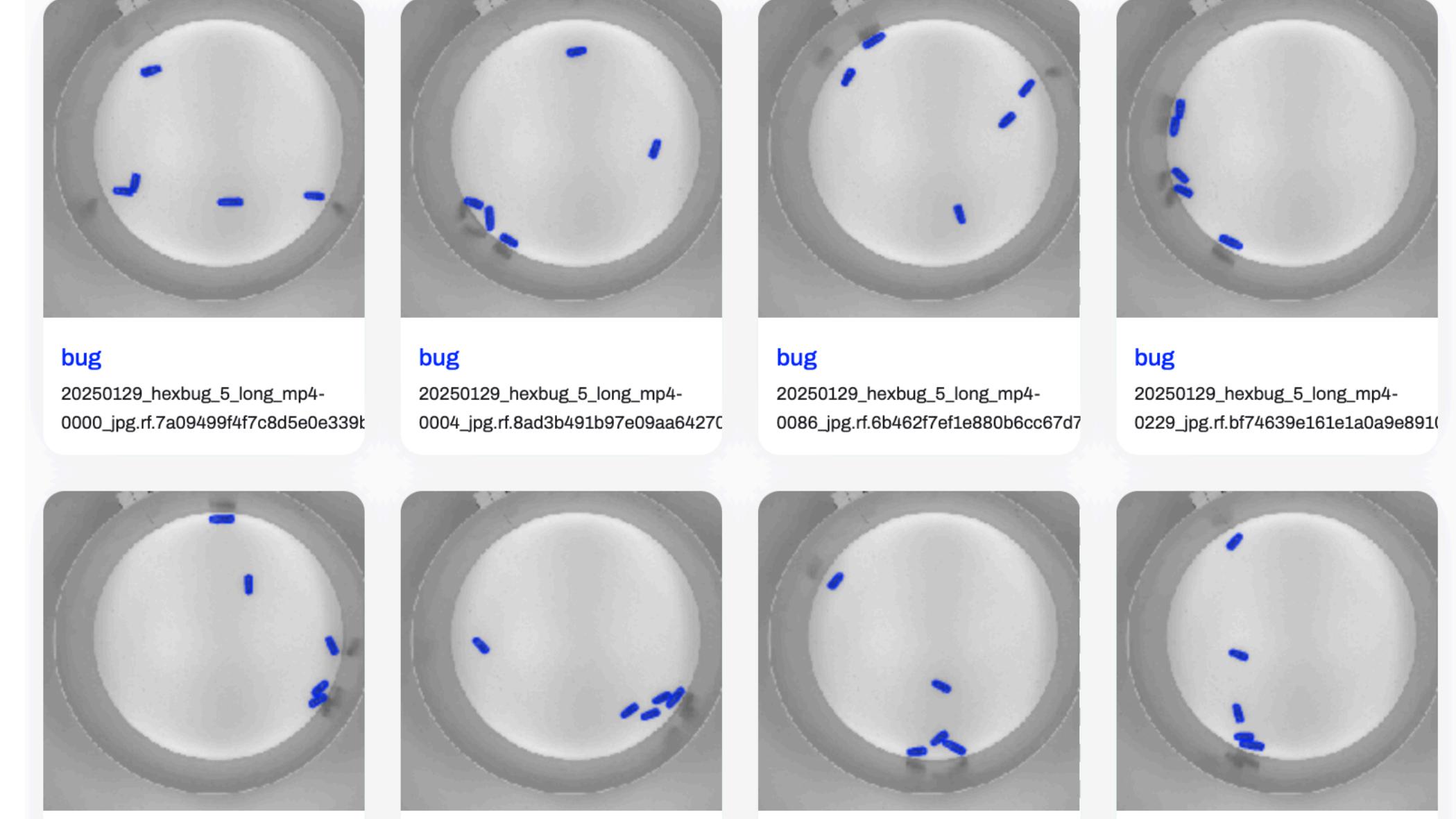
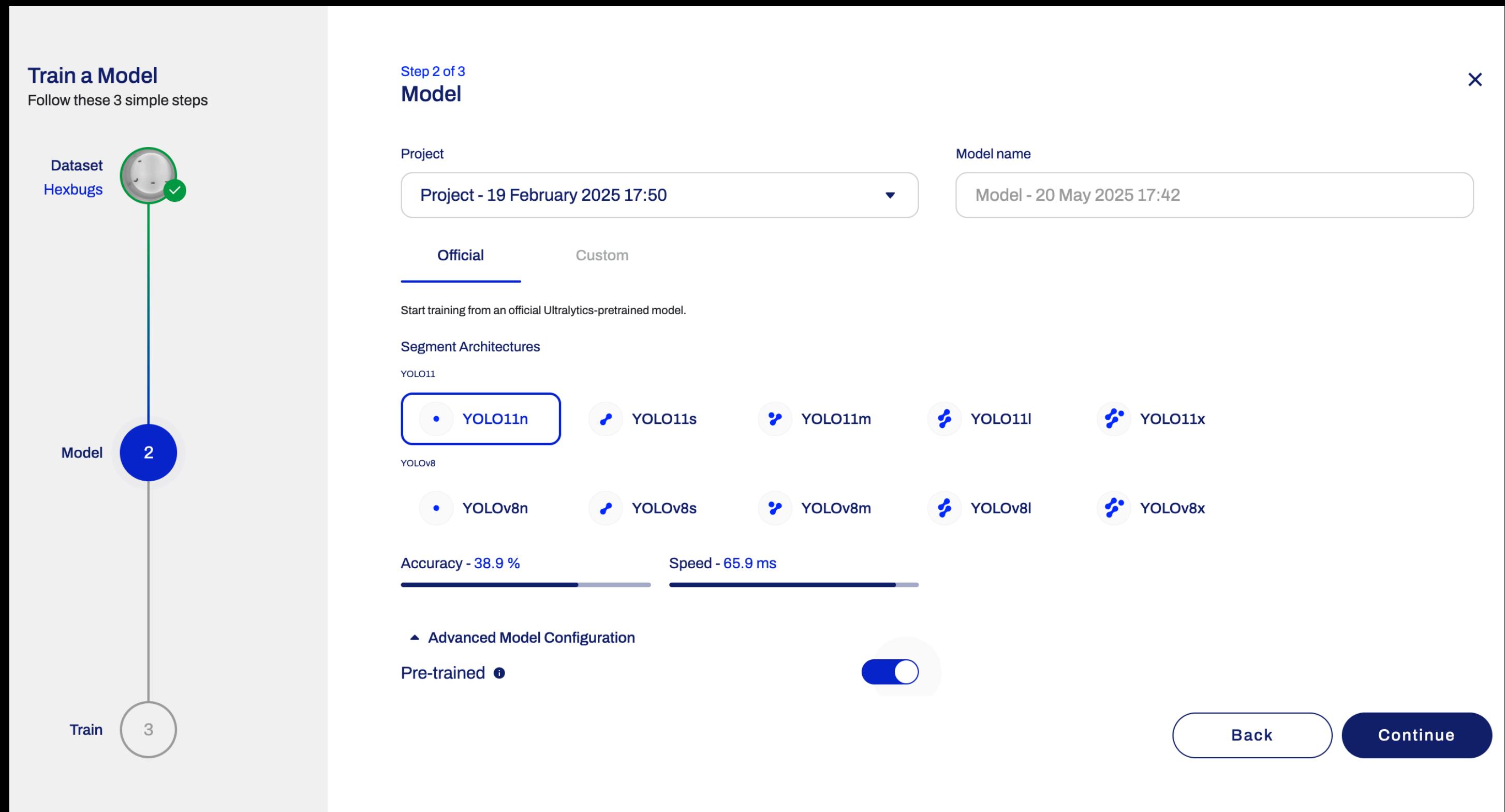
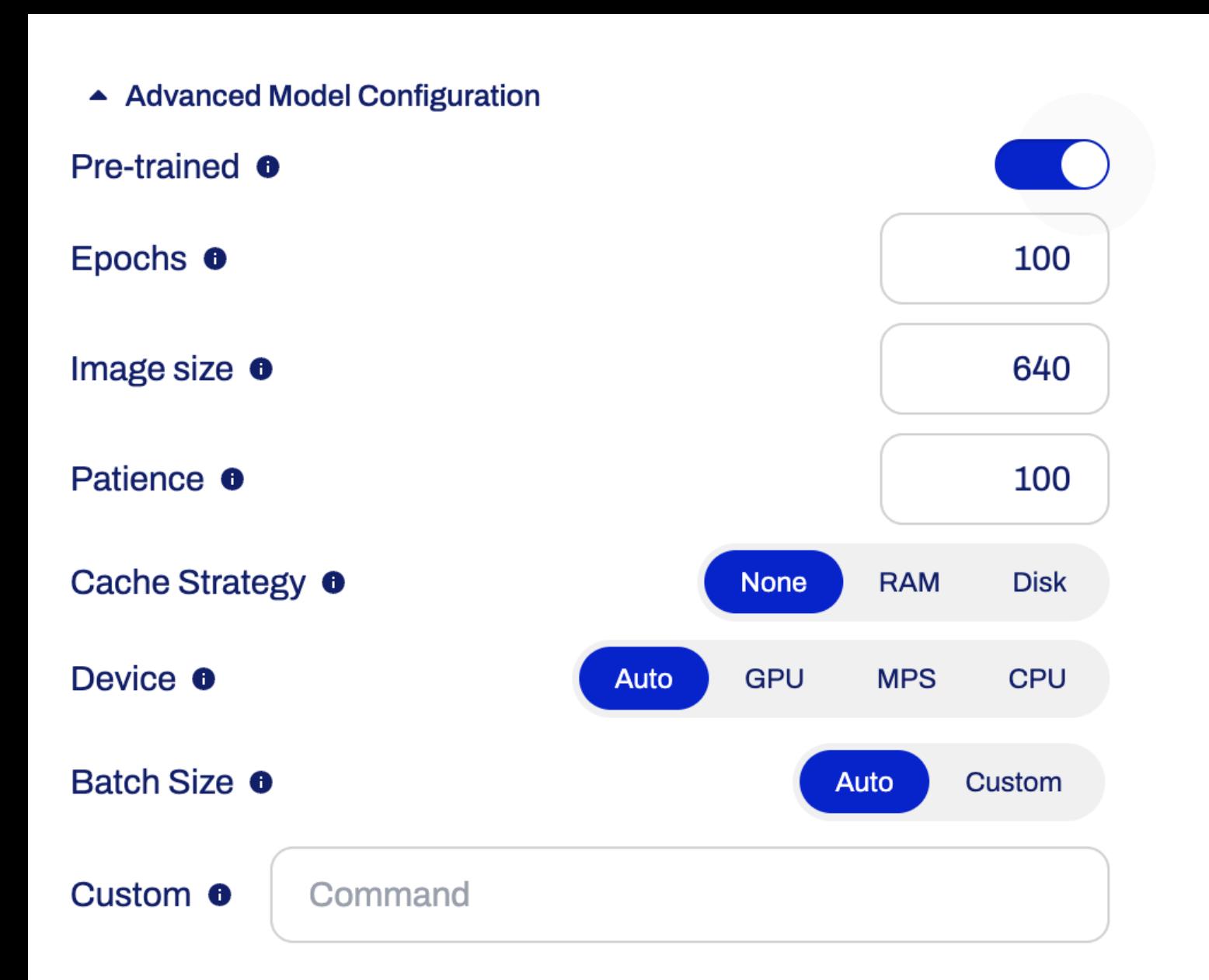


Image ID	File Name
bug 1	20250129_hexbug_5_long_mp4-0000.jpg.rf.7a09499f4f7c8d5e0e339t
bug 2	20250129_hexbug_5_long_mp4-0004.jpg.rf.8ad3b491b97e09aa6427c
bug 3	20250129_hexbug_5_long_mp4-0086.jpg.rf.6b462f7ef1e880b6cc67d7
bug 4	20250129_hexbug_5_long_mp4-0229.jpg.rf.bf74639e161e1a0a9e891c
bug 5	20250129_hexbug_5_long_mp4-0247.jpg.rf.e656daa44932d9bf861b1
bug 6	20250129_hexbug_5_long_mp4-0836.jpg.rf.8839a315a57bdxfc867ad
bug 7	20250129_hexbug_5_long_mp4-0840.jpg.rf.b4e01ea9f0bedd9dff505b
bug 8	20250129_hexbug_5_long_mp4-0843.jpg.rf.35ff28a8859c34eb2ebfa5

Training parameters



Some preprocessing can be defined here



More about YOLO models

Continue on Google Colab

Step 3 of 3
Train

Ultralytics Cloud **Google Colab** Bring your own agent

Step 1
Click to copy the Colab code

```
hub.login('12ae9fbcce46ea70f389b54535833fcf4a4f3ea75c')
model = YOLO('https://hub.ultralytics.com/models/htUFE2FWh3ljXvQ66wjQ')
results = model.train()
```

Copy paste

Step 2
Follow the steps on the Google Colab notebook

Open Google Colab

Waiting for connection

Back Done

Setup

Pip install `ultralytics` and `dependencies` and check software and hardware.

pypi v8.3.140 downloads 94M python 3.8 | 3.9 | 3.10 | 3.11 | 3.12

```
[ ] %pip install ultralytics
from ultralytics import YOLO, checks, hub
checks() # Verify system setup for Ultralytics training
```

→ Ultralytics 8.3.99 🚀 Python-3.11.11 torch-2.6.0+cu124 CUDA:0 (Tesla T4, 15095MiB)
Setup complete ✓ (2 CPUs, 12.7 GB RAM, 39.6/112.6 GB disk)

Start

⚡ Login with your API key, load your YOLO 🚀 model, and start training in 3 lines of code!

```
▶ # Login to HUB using your API key (https://hub.ultralytics.com/settings?tab=api+keys)
hub.login("YOUR_API_KEY")

# Load your model from HUB (replace 'YOUR_MODEL_ID' with your model ID)
model = YOLO(https://hub.ultralytics.com/models/YOUR\_MODEL\_ID)

# Train the model
results = model.train()
```

```
Epoch    GPU_mem   box_loss   seg_loss   cls_loss   dfl_loss   Instances   Size
100/100    3.6G     0.4658     0.4644     0.6787     0.7978      54      640: 100%|██████████| 1/1 [00:00<00:00, 2.42it/s]
          Class Images Instances Box(P R mAP50 mAP50-95) Mask(P R mAP50 mAP50-95): 100%|██████████| 1/1 [00:00<00:
          all    3       15        1       0.438      0.941     0.83      1       0.438      0.941     0.698

100 epochs completed in 0.027 hours.
Optimizer stripped from runs/segment/train/weights/last.pt, 6.0MB
Optimizer stripped from runs/segment/train/weights/best.pt, 6.0MB

Validating runs/segment/train/weights/best.pt...
Ultralytics 8.3.140 🚀 Python-3.11.12 torch-2.6.0+cu124 CUDA:0 (Tesla T4, 15095MiB)
YOLO11n-seg summary (fused): 113 layers, 2,834,763 parameters, 0 gradients, 10.2 GFLOPs
          Class Images Instances Box(P R mAP50 mAP50-95) Mask(P R mAP50 mAP50-95): 0%|          | 0/1 [00:00<?, 
WARNING ⚠ Limiting validation plots to first 50 items per image for speed...
WARNING ⚠ Limiting validation plots to first 50 items per image for speed...
          Class Images Instances Box(P R mAP50 mAP50-95) Mask(P R mAP50 mAP50-95): 100%|██████████| 1/1 [00:00<00:
          all    3       15        1       0.438      0.94     0.819      1       0.438      0.94     0.697

Speed: 0.4ms preprocess, 9.2ms inference, 0.0ms loss, 2.0ms postprocess per image
Results saved to runs/segment/train
Ultralytics HUB: Syncing final model...
100%|██████████| 5.73M/5.73M [00:00<00:00, 6.50MB/s] Ultralytics HUB: Done ✅
Ultralytics HUB: View model at https://hub.ultralytics.com/models/htUFE2FWh3ljXvQ66wjQ 🚀
```

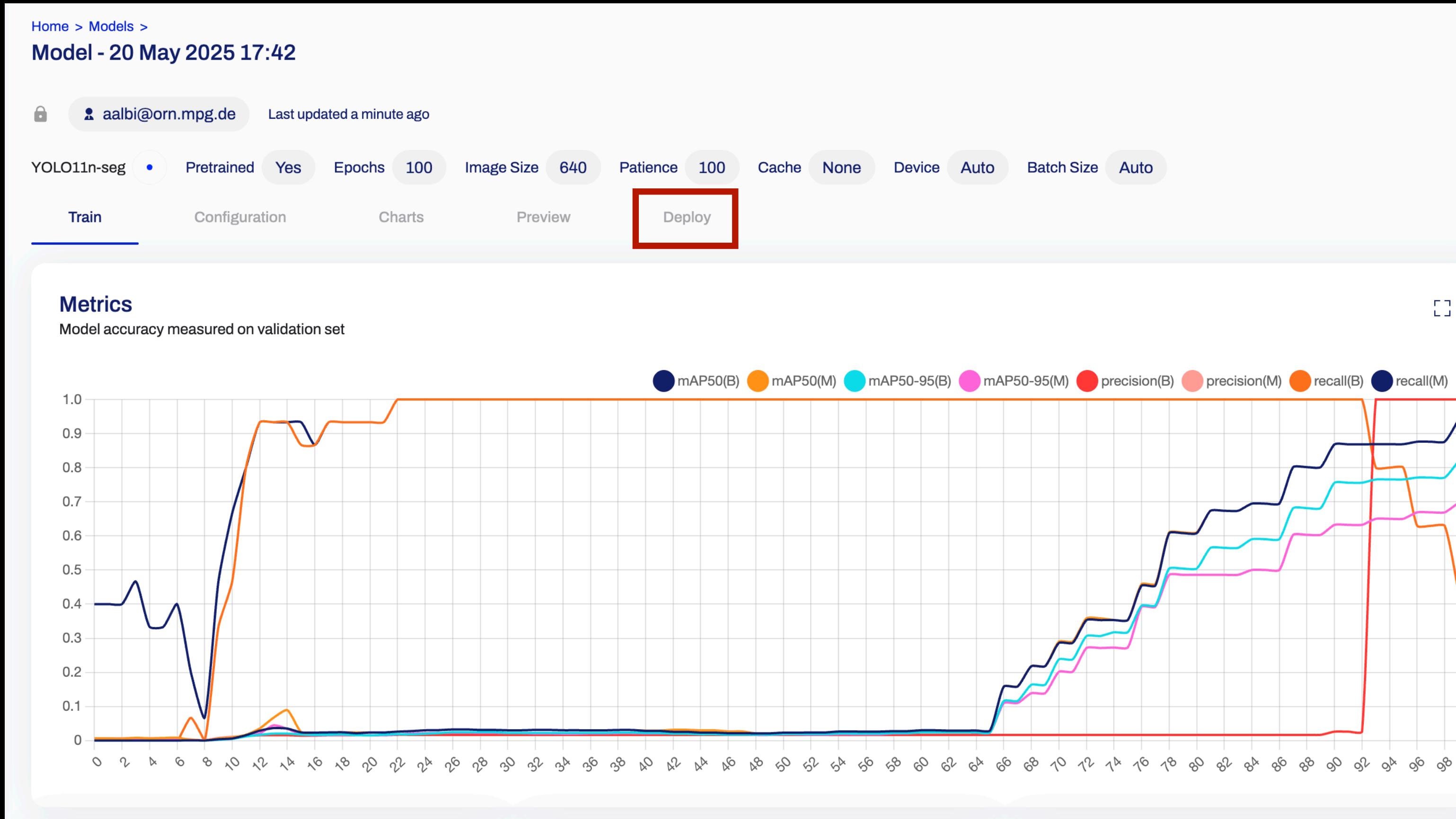
At the end of the training you can look at the model results

The screenshot shows the Ultralytics HUB interface. The left sidebar has a dark blue background with white text and icons. The 'Models' icon is highlighted in blue. The main area shows a list of models. The top navigation bar includes 'Home > Models' and a 'Train Model' button. Below the navigation is a search bar and filters for 'All', 'Public', 'Unlisted', and 'Private'. The model list includes:

- Model - 20 May 2025 17:42** (locked) YOLO11n-seg Hexbugs mAP 81.9 size 5.7 MB
- YOLO11n (locked) YOLO11n COCO2017 mAP 39.4 size 154.2 MB
- YOLOv8n (locked) YOLOv8n COCO2017 mAP 37.3 size 210.7 MB
- YOLO11x (locked) YOLO11x COCO2017 mAP 54.6 size 2.9 GB

A yellow vertical bar on the right side of the screen contains a 'Feedback' button with a smiley face icon.

Download the model



Click on ‘Deploy’ and scroll down to ‘Export’ to download the model