

Lab 6: Imaging tools (Roboflow)

3099704 AI for Digital Health (2025/2)



Outline

Objective

Lab 6.1: Object detection dataset (Polyp Detection)

Material

- Roboflow -> Ultralytics HUB -> Colab

- Colab

- Roboflow: Intro & Limitation

Lab 6.2: Segmentation dataset (Polyp Segmentation)

Other Data Labeling Tools

- Roboflow -> Colab (MONAI)

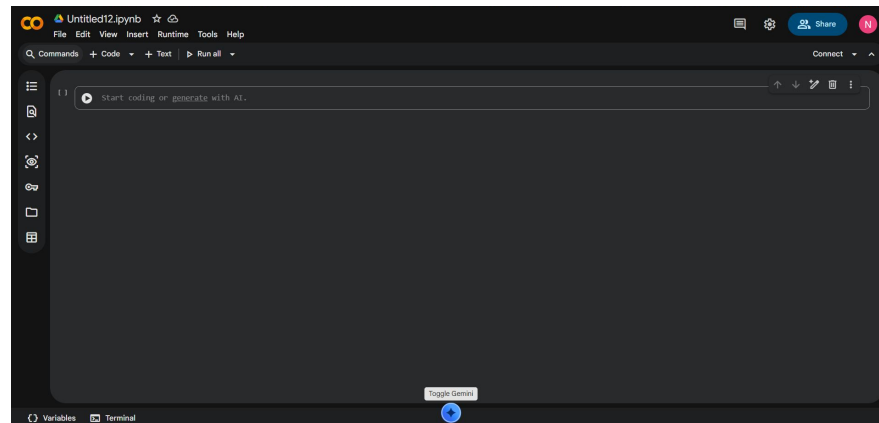
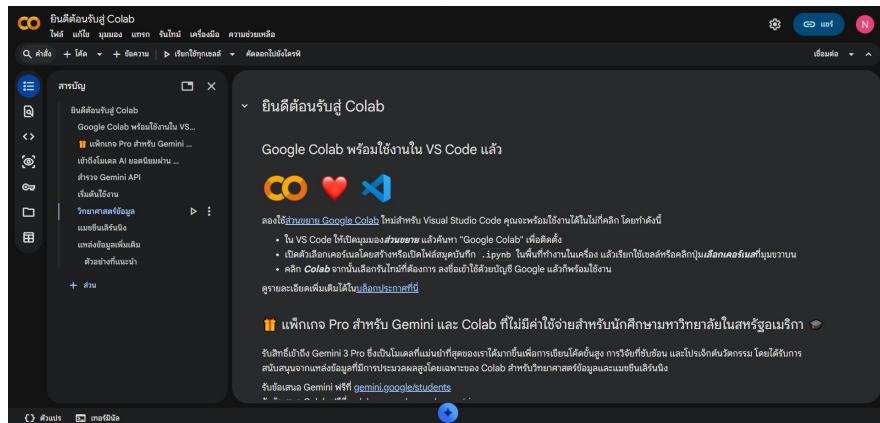
Objective

- Use the **Roboflow** to create a dataset.
- Use the created dataset to train the model (YOLO, UNet).



Material

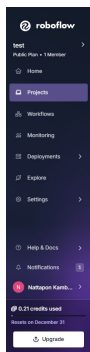
- With **Google Colab**, you don't need to install any software. All you need is a Google account, and you can start using it right away. Simply visit: <https://colab.research.google.com/> or select NEW NOTEBOOK to start a new file.



Roboflow



- **Roboflow** is a web-based platform that helps users easily prepare datasets. It can be accessed through a web browser at <https://roboflow.com/> by signing in with a Google or GitHub account.
- Users can upload images, annotate data, apply preprocessing and data augmentation, and export datasets in formats ready for training models such as YOLO.



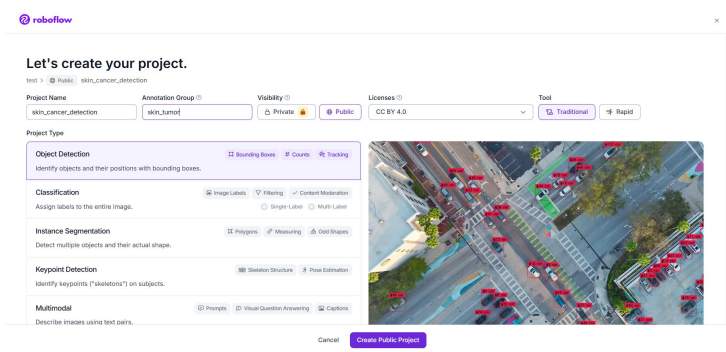
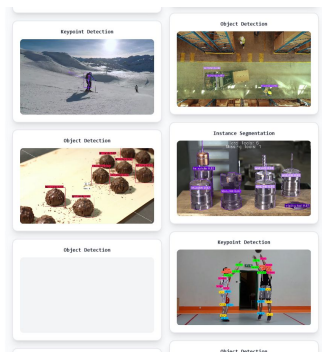
Projects

Build vision models to recognize anything

Upload your data, label it, and train vision models.

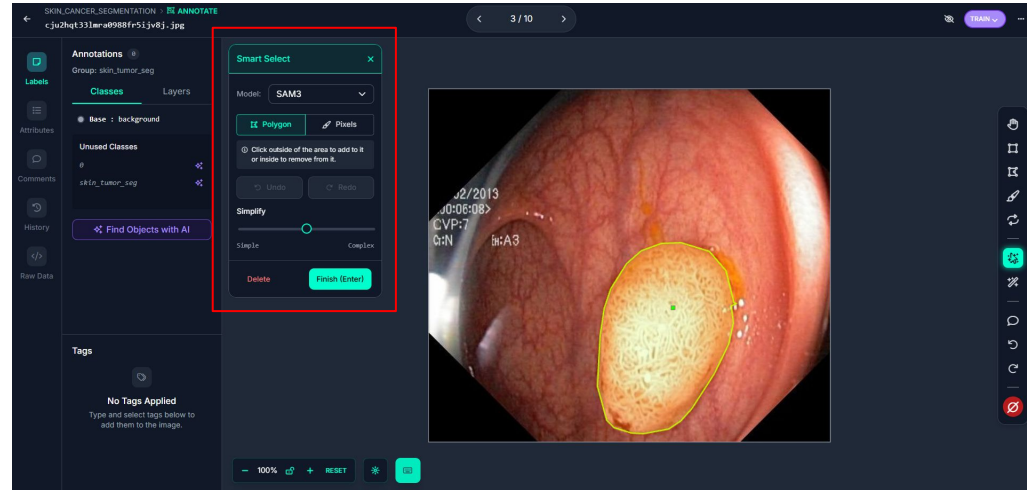
+ New Project

View a Tutorial



Roboflow (AI-Assisted Labeling)

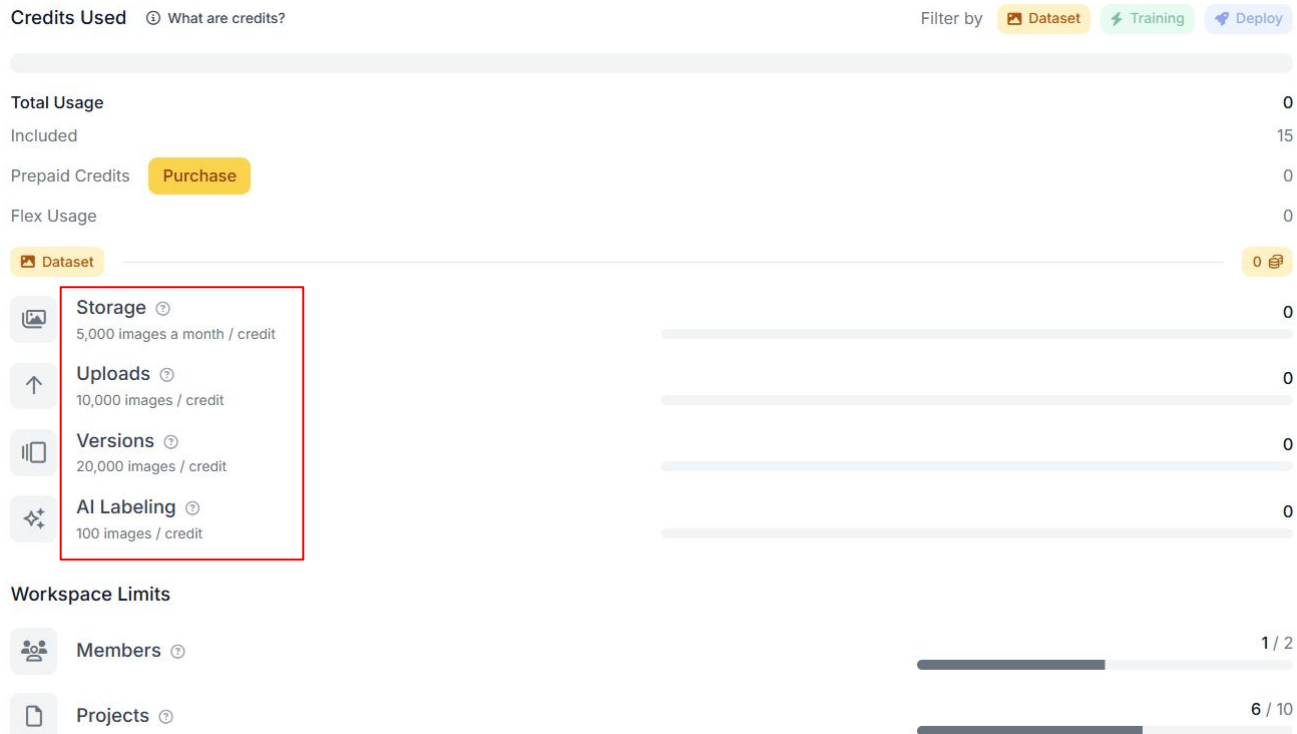
Roboflow has implemented the [SAM-3](#) model that allows users to build a computer vision detection model in just a few minutes. This tool is designed to quickly get projects and ideas up and running by allowing users to prompt what objects they want to detect.



Roboflow (limitation)

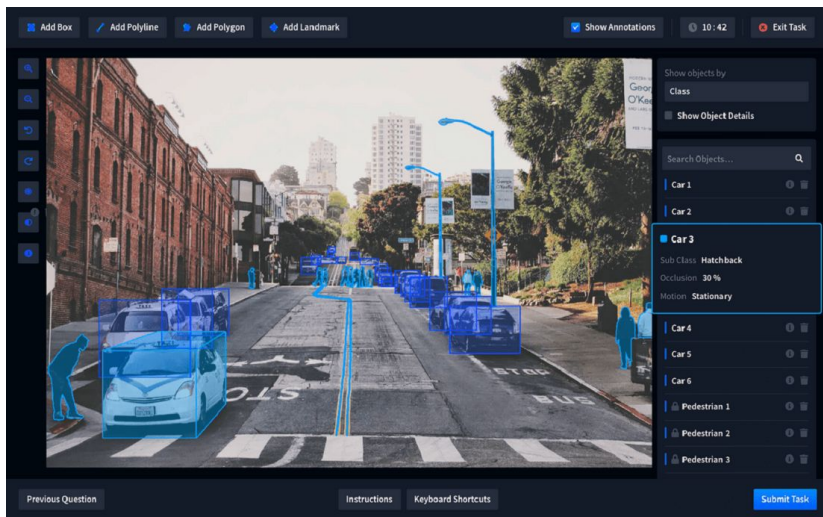


In this lab, we use the Roboflow free plan, which comes with the following limitations:

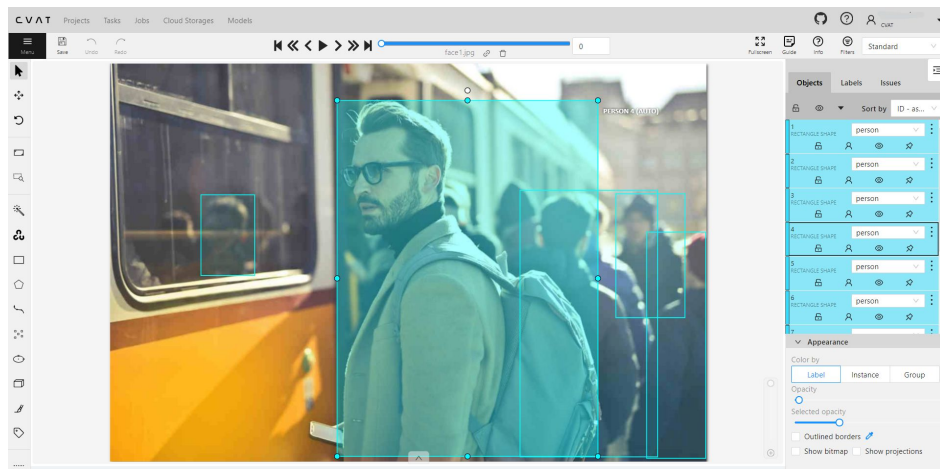


Other Data Labeling Tools

Besides Roboflow, there are other tools that can perform labeling, such as **LabelMe** and **CVAT**.



LabelMe



CVAT

Other Data Labeling Tools (cont.)

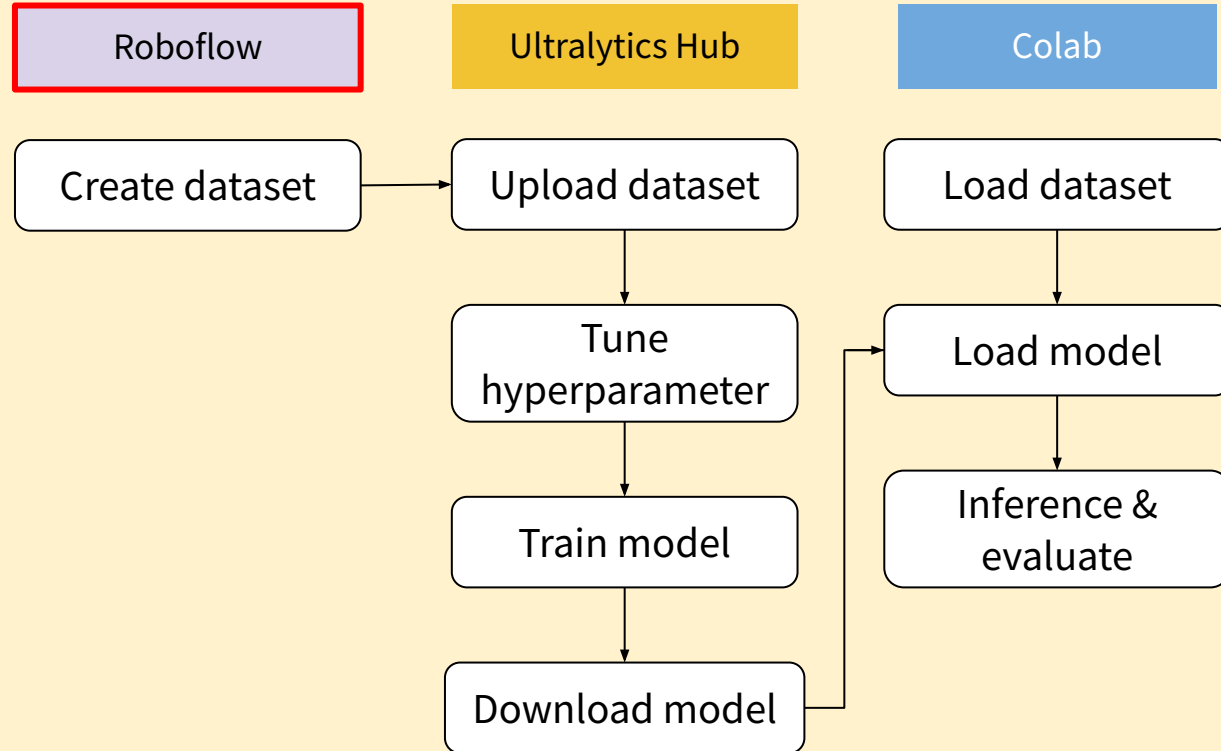
Tool	Developer	Main Use	Strengths	Limitations
CVAT	Intel	Detection, Segmentation, Tracking	<ul style="list-style-type: none">• Powerful for large datasets• Supports image & video• Team collaboration	<ul style="list-style-type: none">• Setup is complex• UI less beginner-friendly
Roboflow	Roboflow Inc.	Detection & Segmentation	<ul style="list-style-type: none">• AI-assisted labeling• Dataset management & augmentation• Easy model export	<ul style="list-style-type: none">• The free plan has limitations• Cloud-based
LabelMe	MIT CSAIL	Image Segmentation	<ul style="list-style-type: none">• Simple and lightweight• Easy to use for beginners• Good for academic use	<ul style="list-style-type: none">• Manual labeling only• Limited features for large datasets

Lab 6.1: Object detection dataset (Polyp Detection)

In this lab, we will repeat the experiment from **Lab 4.1 (YOLOv8n)**, but the dataset will be created using Roboflow instead.

- 1) Load image from GitHub.
- 2) Create an object detection dataset in Roboflow
- 3) Train YOLO model in the Ultralytics Hub.
- 4) evaluate YOLO in

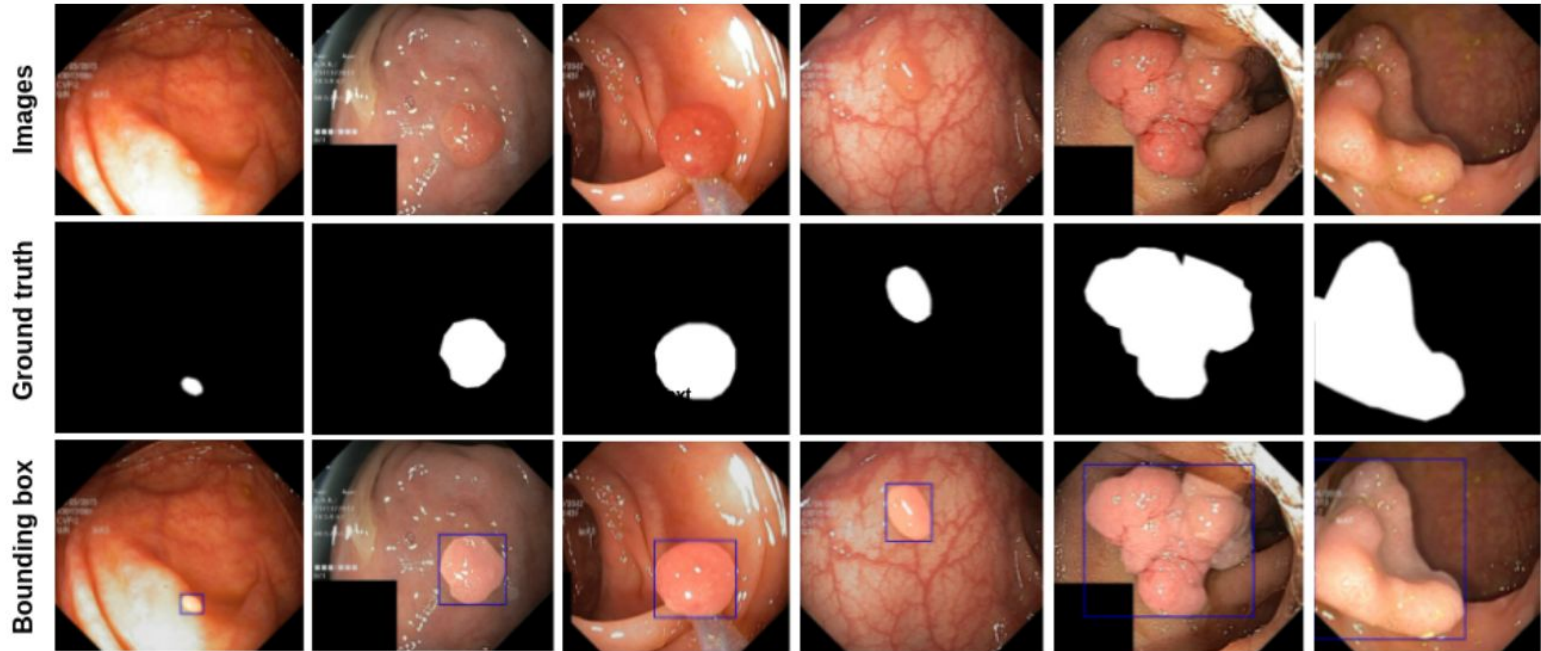
[Lab 6 1 ultralyricshub](#)



Dataset: kvasir dataset (2017)

- **Kvasir dataset** consists of 4,000 annotated images, including 8 classes showing anatomical landmarks, pathological findings, or endoscopic procedures in the GI tract.
- The dataset consist of the images with different resolutions, from 720x576 up to 1920x1072 pixels in JPG format and documents in JSON format
- The dataset was released in 2017 by the **Simula Research Laboratory, Norway**.
- To keep the experiment simple and easy to follow, we selected only **100 images**. These images are used to create target annotations for **detection (Lab6.1) and segmentation (Lab6.2)** in Roboflow.

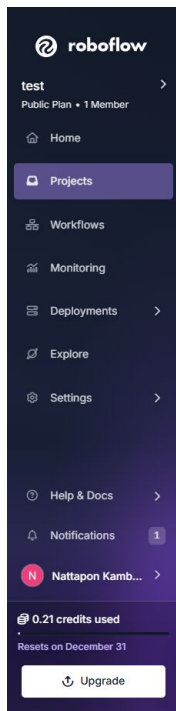
Dataset: kvasir dataset (2017)



The figure shows the example images, bounding box, and mask from Kvasir-SEG. The white mask shows the area covered by the polyp region, and the background regions contain non-polyp tissue pixels.

Lab 6.1: Object detection dataset

1) Sign in [Roboflow](#)



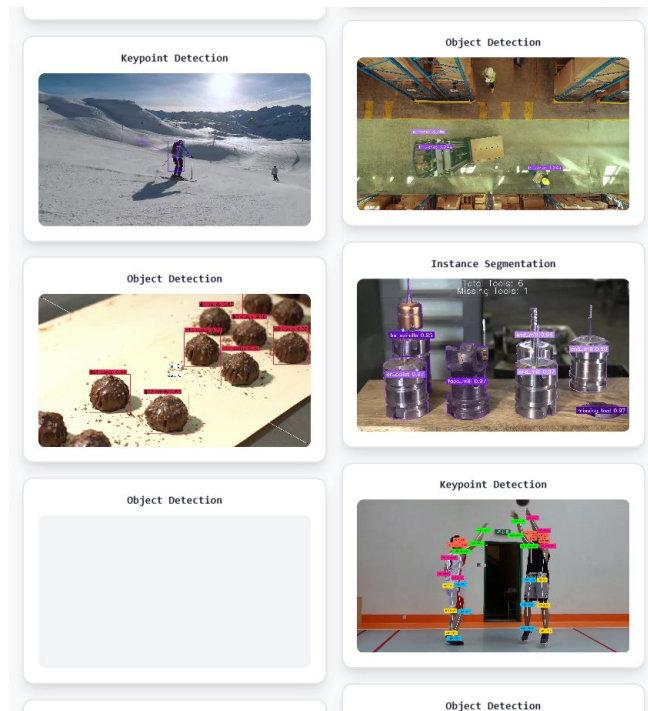
Projects

Build vision models to recognize anything

Upload your data, label it, and train vision models.


+ New Project

[View a Tutorial](#)



Lab 6.1: Object detection dataset

2) Create new project (Object Detection)



Let's create your project.

test > Public skin_cancer_detection

Project Name: skin_cancer_detection

Annotation Group: skin_tumor

Visibility: Private Public

Licenses: CC BY 4.0

Tool: Traditional Rapid

Project Type

Object Detection Bounding Boxes # Counts Tracking

Identify objects and their positions with bounding boxes.

Classification Image Labels Filtering Content Moderation

Assign labels to the entire image.

☐ Single-Label ☐ Multi-Label

Instance Segmentation Polygons Measuring Odd Shapes

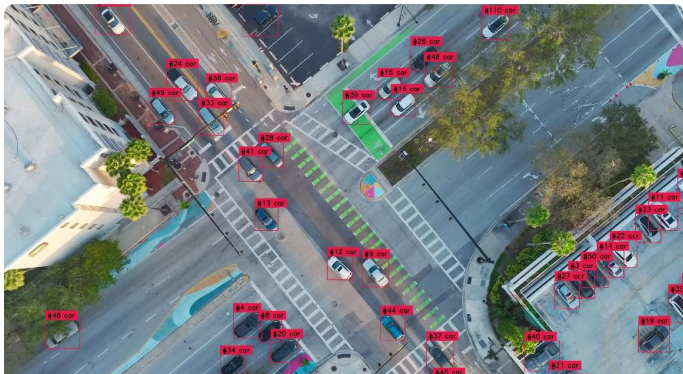
Detect multiple objects and their actual shape.

Keypoint Detection Skeleton Structure Pose Estimation

Identify keypoints ("skeletons") on subjects.

Multimodal Prompts Visual Question Answering Captions

Describe images using text pairs.



Cancel Create Public Project

Lab 6.1: Object detection dataset

3) Download the dataset from [GitHub](#), then upload it to **Roboflow**.

The screenshot displays the Roboflow web application interface. On the left is a dark sidebar with navigation icons. The main content area is titled 'TEST' and shows a dataset named 'skin_cancer_d...' under 'Object Detection'. Below this, there's a 'DATA' section with an 'Upload Data' button. The central part of the interface is the 'Upload' section, which includes a 'Batch Name' field (containing 'Uploaded on 12/26/25 at 12:57 pm'), a 'Tags' field (with a search prompt), and a 'Create batch instantly' checkbox. A large dashed box with an upward arrow prompts users to 'Drag and drop file(s) to upload, or:'. Below this are 'Select File(s)' and 'Select Folder' buttons. A 'Supported Formats' section lists 'Images' (with file extensions: .jpg, .png, .bmp, .webp, .avif), 'Annotations' (in 26 formats), 'Videos' (.mov, .mp4), and 'PDFs' (.pdf). On the right side, there are three promotional cards: 'Need images to get started?' with a QR code for mobile uploads, 'Search on Roboflow Universe' with a search bar, and 'Bulk Upload Images' with a code icon.

Lab 6.1: Object detection dataset

- 3) Download the dataset from [GitHub](#), then upload it to **Roboflow**.

The screenshot displays the Roboflow web application interface for uploading a dataset. On the left is a dark sidebar with navigation icons and labels: TEST, DATA, Upload Data, Annotate, Dataset, Versions, Train, Analytics, Classes & Tags, MODELS, Visualize, DEPLOY, and Deployments. The main content area is titled 'Upload'. It features a 'Batch Name' field with the text 'Uploaded on 12/26/25 at 1:18 pm' and a 'Tags' field with the placeholder 'Search or add tags for images...'. Below these fields is a checkbox for 'Create batch instantly'. A row of tabs shows 'All Images' (18), 'Annotated' (0), and 'Not Annotated' (18). A large section titled 'Drag and drop images, annotations, and videos.' contains a file selection area with 'Select Files', 'Select Folder', and a red-outlined 'Save and Continue' button. Below this is a grid of eight uploaded medical images, each with a unique ID and filename. At the bottom, there is a search bar with the text 'Want to add similar images?' and a '0 selected' status.

Lab 6.1: Object detection dataset

4) Check “Label Myself”

The screenshot displays the Roboflow web interface for a dataset named "skin_cancer_d...". The left sidebar contains navigation options: TEST, DATA, Annotate (highlighted), Dataset, Versions, Analytics, Classes & Tags, MODELS, Visualize, and DEPLOY. The main area shows a batch of 10 images uploaded on 12/26/25 at 1:18 pm. Below the images, there are two rows of image thumbnails with their respective IDs. On the right, a panel titled "How do you want to label your images?" offers three options: "Auto-Label Entire Batch", "Label Myself" (highlighted with a red border), and "Label With My Team". The "Label Myself" option includes the text "Label images with our AI labeling tools." and an "Upgrade" button.

← TEST

skin_cancer_d...
Object Detection

DATA

↑ Upload Data

Annotate

Dataset

Versions Train

Analytics

Classes & Tags

MODELS

Models

Visualize

DEPLOY

Deployments

Annotate > Batch

Uploaded on 12/26/25 at 1:18 pm

Uploaded Dec 26, 2025 (1:18 PM)

cju2hw5gjl1r5h0988so2q...

cju2hx006vid107991gm81...

cju2i03ptvkiu0799xbdd4...

cju2htabevq9100015qje1...

cju2hqt33lra0988fr51j...

cju213hzc1u3o0988rrgh9...

cju216acqv0610799u20f1...

cju2hugv9vgt0799hhk7k...

cju2hl1m19vjf8001o69qn...

cju2hos5711xm08359g92p...

How do you want to label your images?

Auto-Label Entire Batch
Use your own custom model or a zero-shot model to automatically label your entire batch.
Try with SAM3

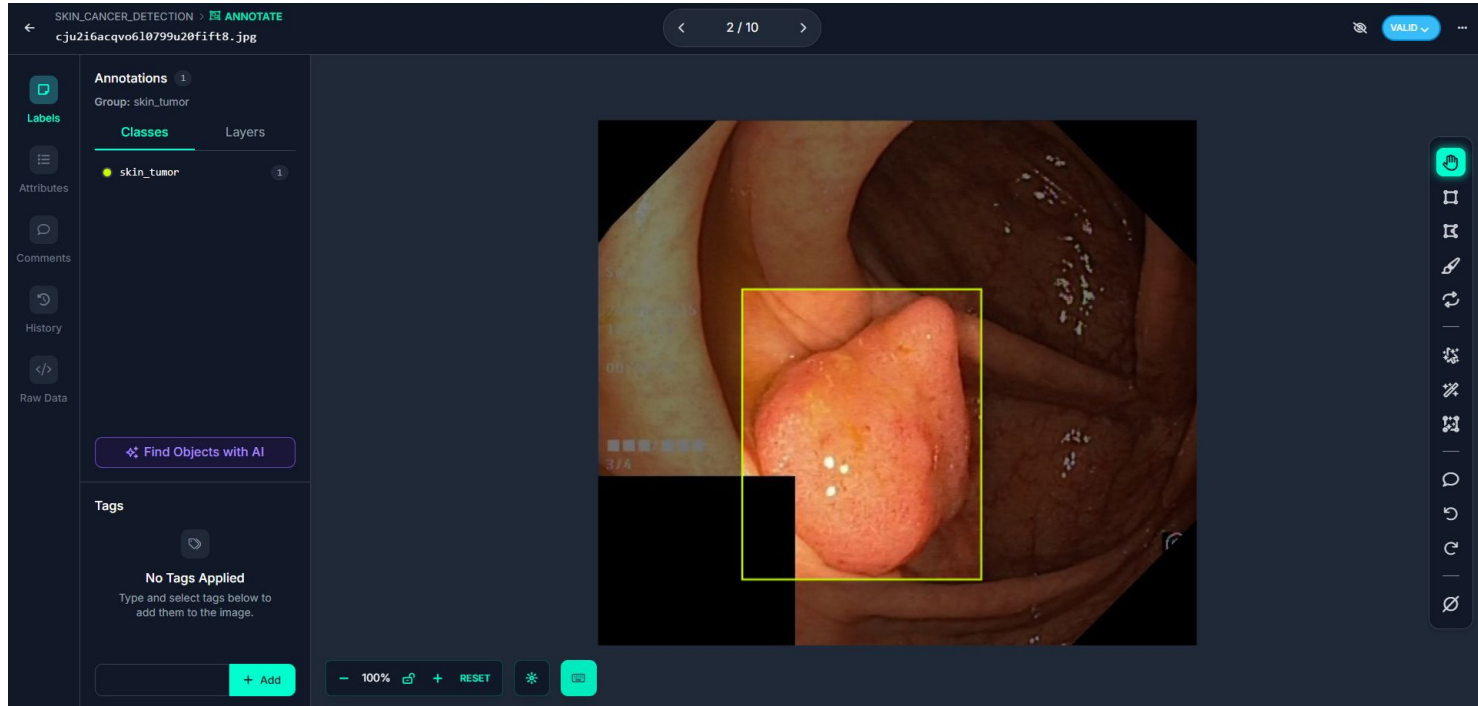
Label Myself
Label images with our AI labeling tools.

Label With My Team
Split up the labeling work across your team.

Hire Outsourced Labelers
Work with an professional labeling team vetted by Roboflow.

Lab 6.1: Object detection dataset

5) Label polyp



Lab6.1: Object detection dataset

6) Split Train:60%, Validation:20%, Test:20%

← TEST

skin_cancer_d...
Object Detection

DATA

↑ Upload Data

Annotate

Dataset 10

Versions Train

Analytics

Classes & Tags

MODELS

Models

Visualize

DEPLOY

Deployments

Versions

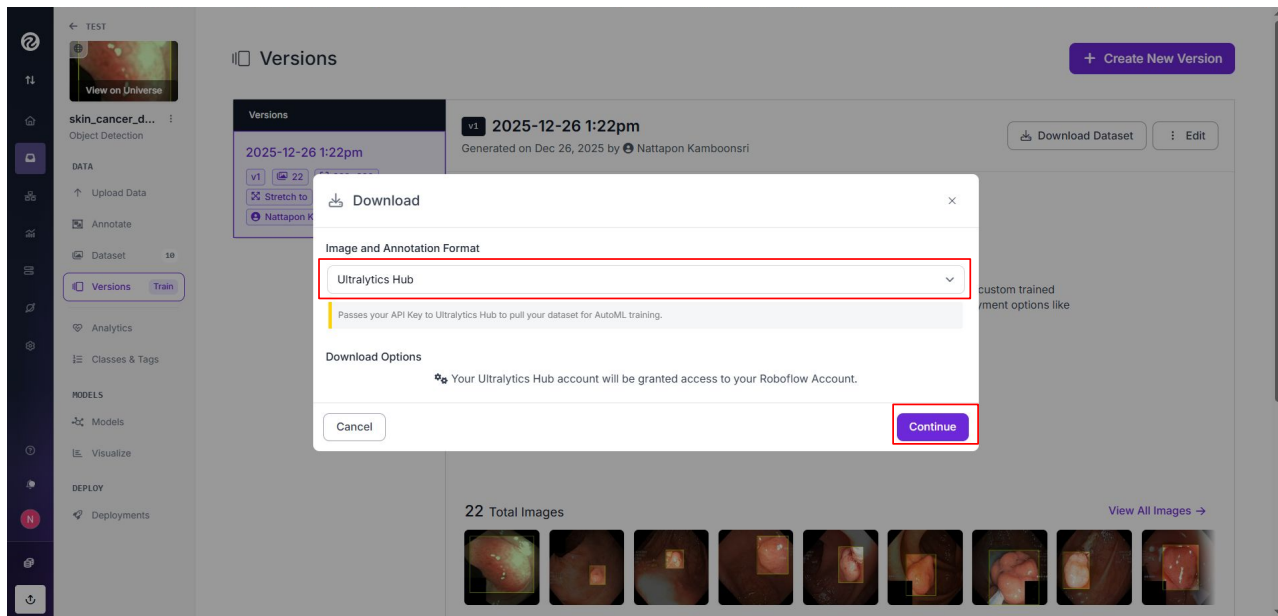
No versions created yet.

Version Name:
2025-12-26 1:21pm

- ✓ Source Images
Images: 10
Classes: 1
Unannotated: 0
- ✓ Train/Test Split
Training Set: 6 images
Validation Set: 2 images
Testing Set: 2 images
- ✓ Preprocessing
Auto-Orient: Applied
Resize: Stretch to 320×320
- ✓ Augmentation
Flip: Horizontal, Vertical
Noise: Up to 0.1% of pixels
- 5 Create
Review your selections and select a version size to create a moment-in-time snapshot of your dataset with the applied transformations.

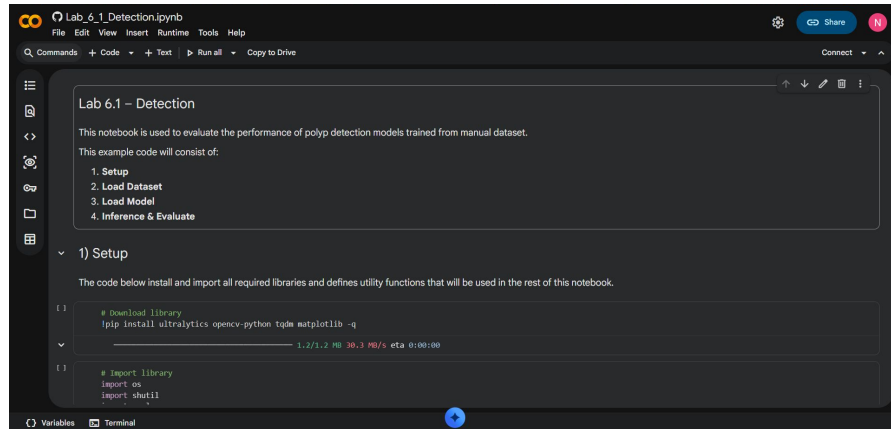
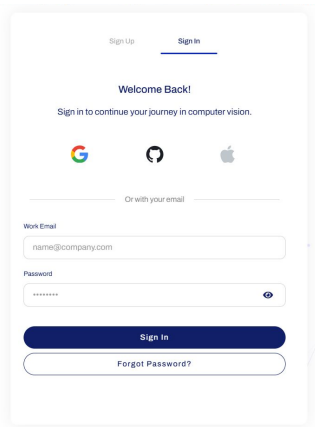
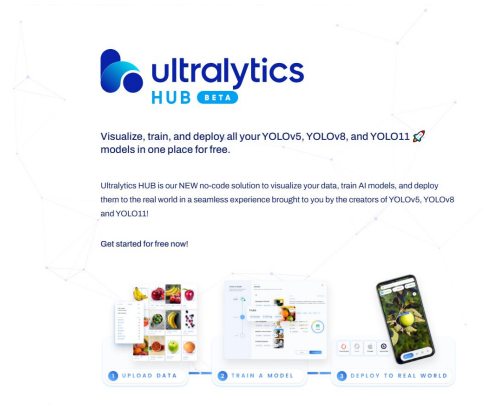
Lab 6.1: Object detection dataset

- 7) Download the dataset in two formats: (1) Ultralytics HUB format for training the model and (2) YOLOv8 format for evaluation using a Google Colab notebook.



Lab 6.1: Object detection dataset

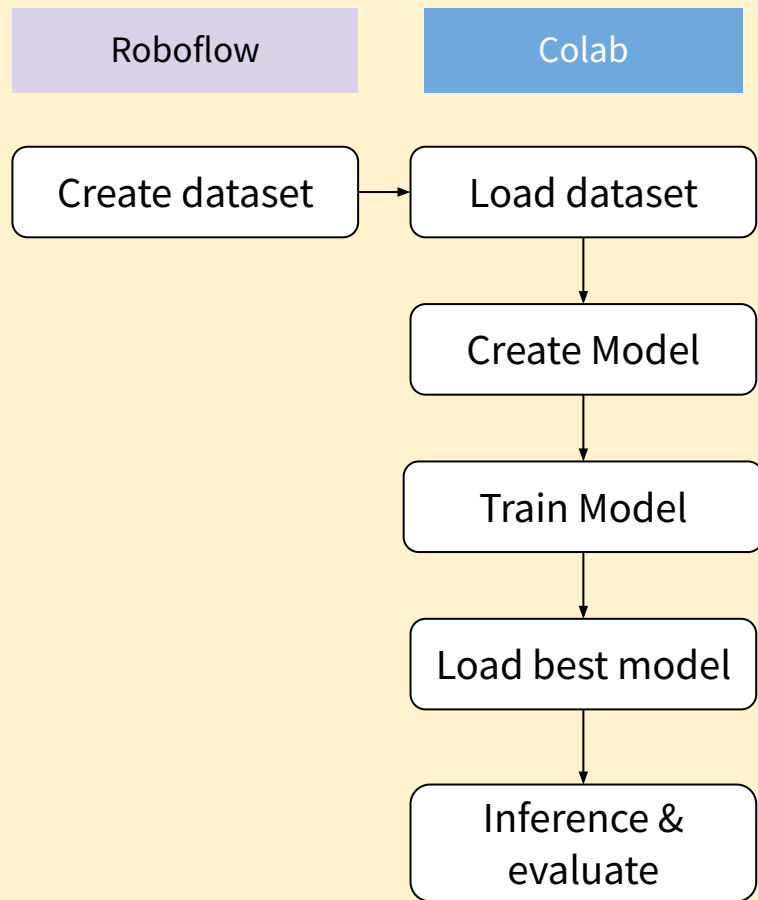
- 8) Train YOLOv8n in Ultralytics Hub
- 9) Load model to run in [Lab 6 1 Detection](#) (in **Colab**).



Lab 6.2: Segmentation dataset (Polyp Segmentation)

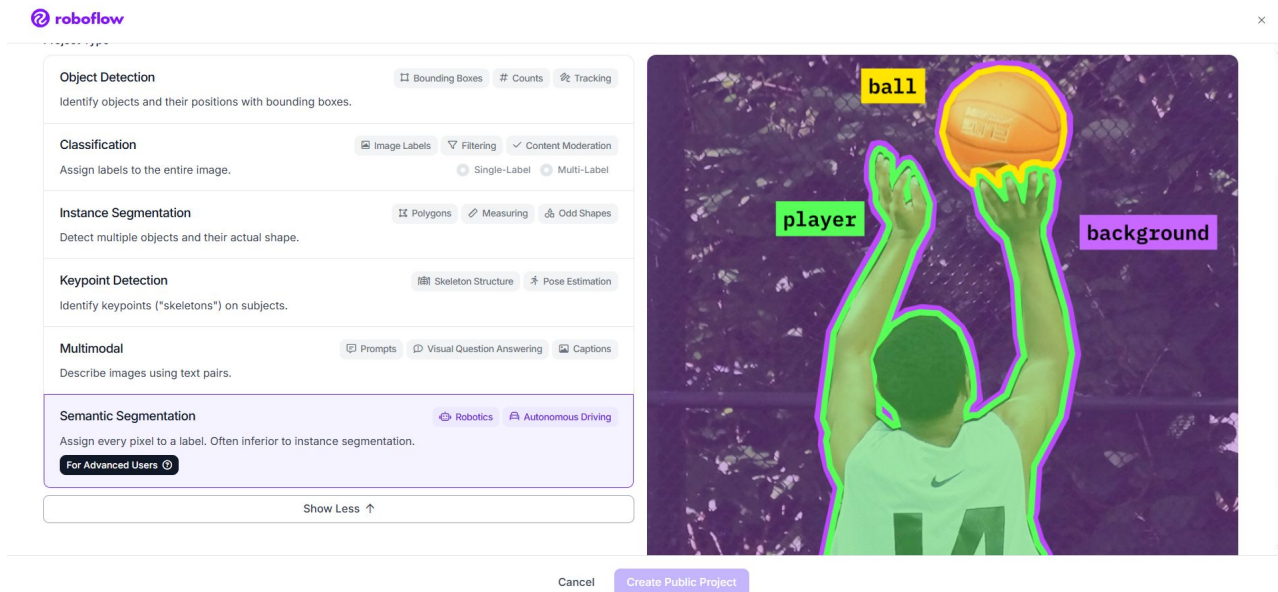
In this lab, we will repeat the experiment from **Lab 5.1 (2DUNet)**, but the dataset will be created using Roboflow instead.

- 1) Load image from [GitHub](#)
- 2) Create segmentation dataset in Roboflow
- 3) Download the dataset in segment formats
- 4) Upload the dataset to [Lab 6 2 Segmentation](#), then train and evaluate the model.



Lab 6.2: Segmentation dataset

In Lab 6.2, the labeling process is the same as in Lab 6.1. However, when creating the project, you must select “*Semantic Segmentation*.” Additionally, during the download step, the dataset must be saved in the “*Semantic Segmentation Masks*” format.



Lab 6.2: Segmentation dataset

In Lab 6.2, the labeling process is the same as in Lab 6.1. However, when creating the project, you must select “*Semantic Segmentation*.” Additionally, during the download step, the dataset must be saved in the “*Semantic Segmentation Masks*” format.

