

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

Other Data Labeling Tools

Lab 6.2: Segmentation dataset (Polyp Segmentation)

- Roboflow -> Colab (MONAI)

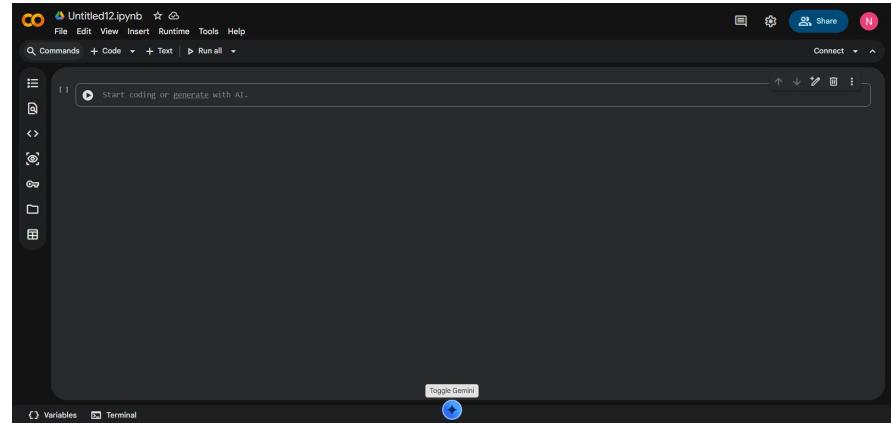
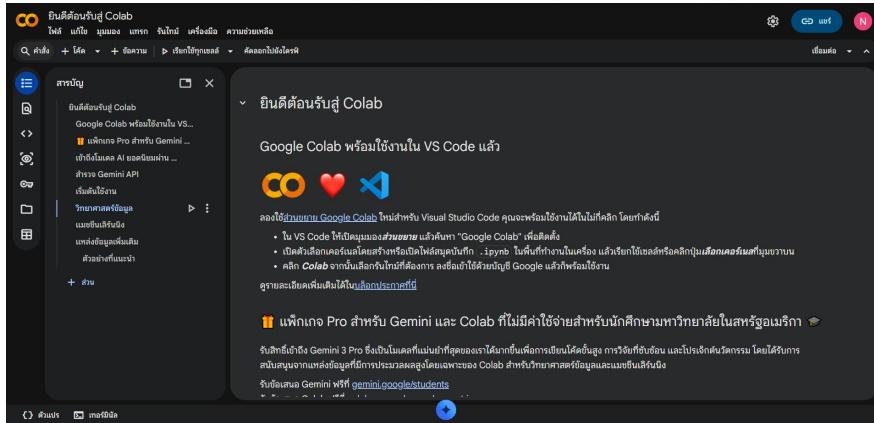
Objective

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

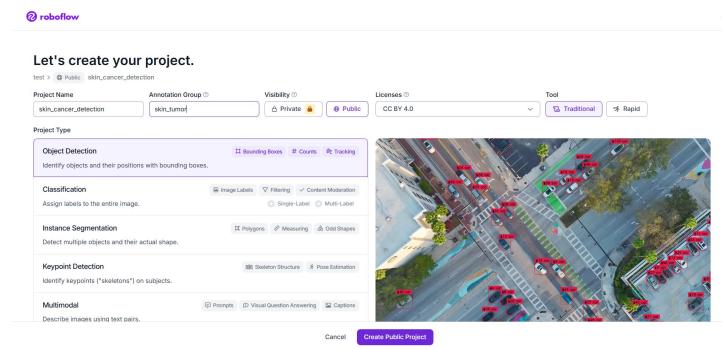
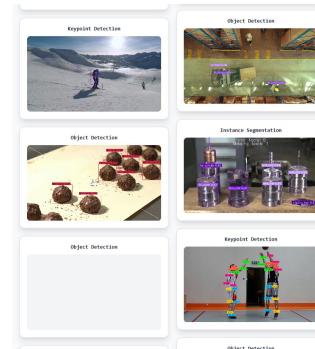
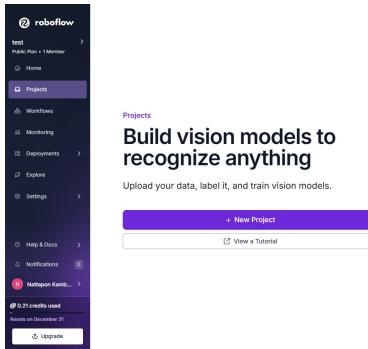


Material

- 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.

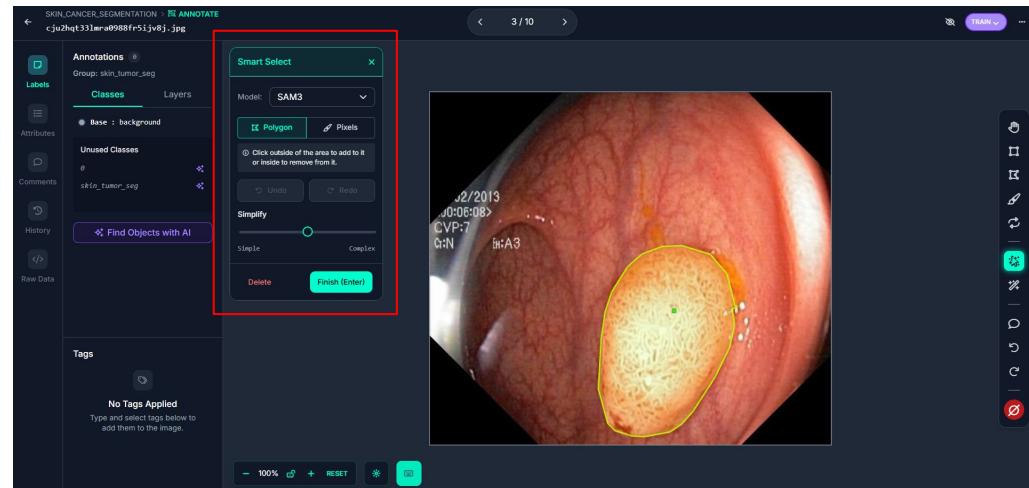


- **Roboflow** is a web-based platform that helps users easily prepare datasets. It can be accessed through a web browser at <https://roboflow.com/> by signing in with a Google or GitHub account.
- Users can upload images, annotate data, apply preprocessing and data augmentation, and export datasets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



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:

Credits Used ① What are credits?

Total Usage 0

Included 15

Prepaid Credits 0 [Purchase](#)

Flex Usage 0

Filter by [Dataset](#) [Training](#) [Deploy](#)

[Dataset](#) 0

	Storage <small>②</small> 5,000 images a month / credit	0
	Uploads <small>②</small> 10,000 images / credit	0
	Versions <small>②</small> 20,000 images / credit	0
	AI Labeling <small>②</small> 100 images / credit	0

Workspace Limits

Members ② 1 / 2

Projects ② 6 / 10

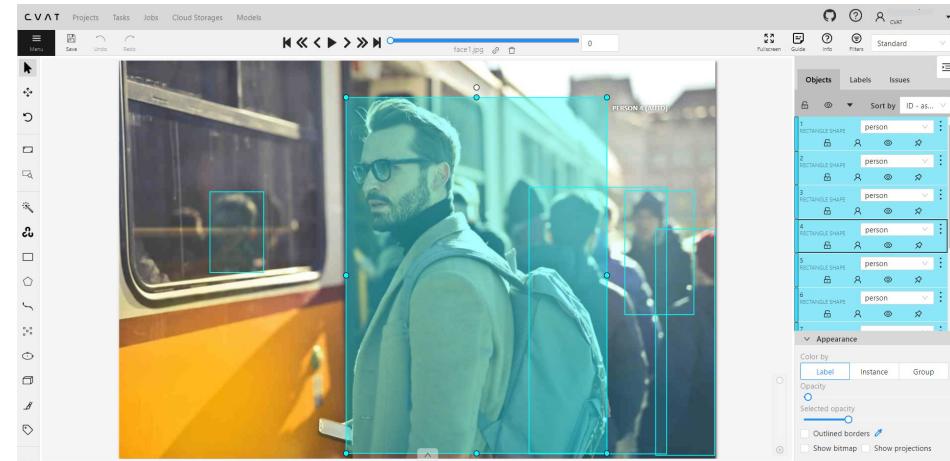
A screenshot of the Roboflow Credits Used page. The page shows various usage metrics and purchase options. A red box highlights the 'Storage' section, which includes icons for storage, uploads, versions, and AI labeling, along with their respective descriptions and limits (5,000 images/month/credit, 10,000 images/credit, 20,000 images/credit, and 100 images/credit). Below this is a 'Workspace Limits' section with icons for members and projects, showing usage counts of 1/2 and 6/10 respectively.

Other Data Labeling Tools

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



LabelMe



CVAT

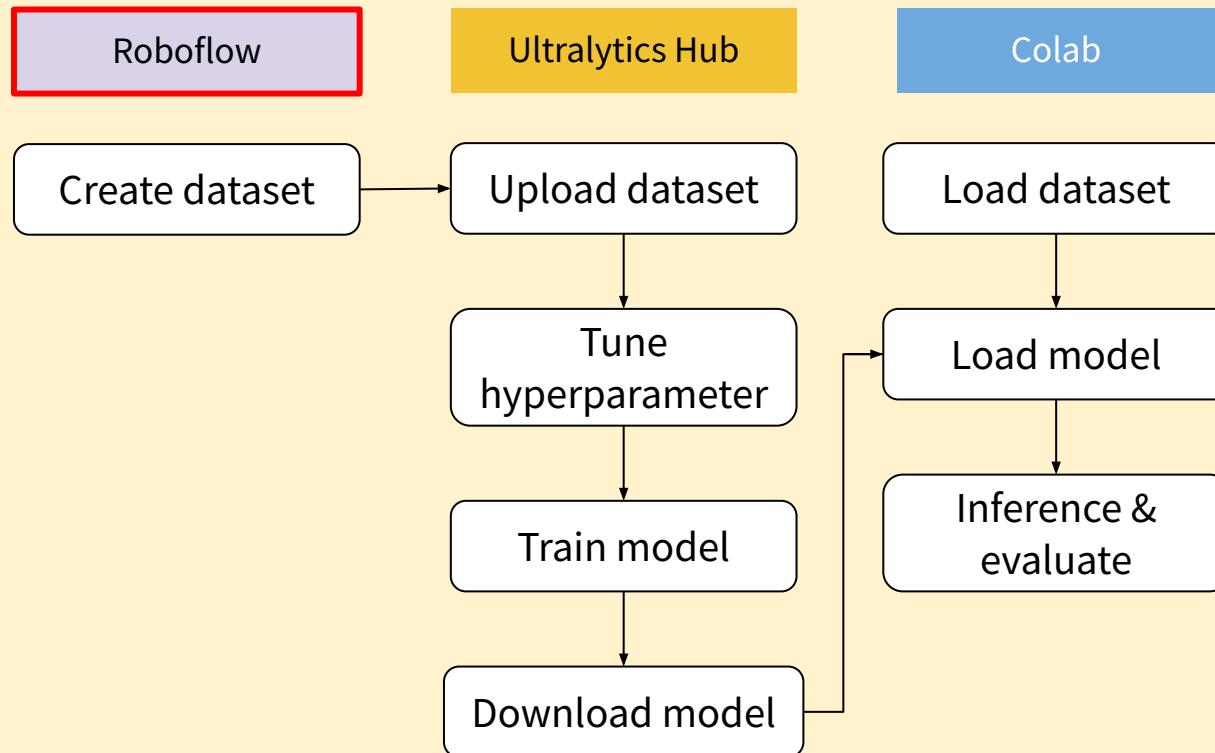
Other Data Labeling Tools (cont.)

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.

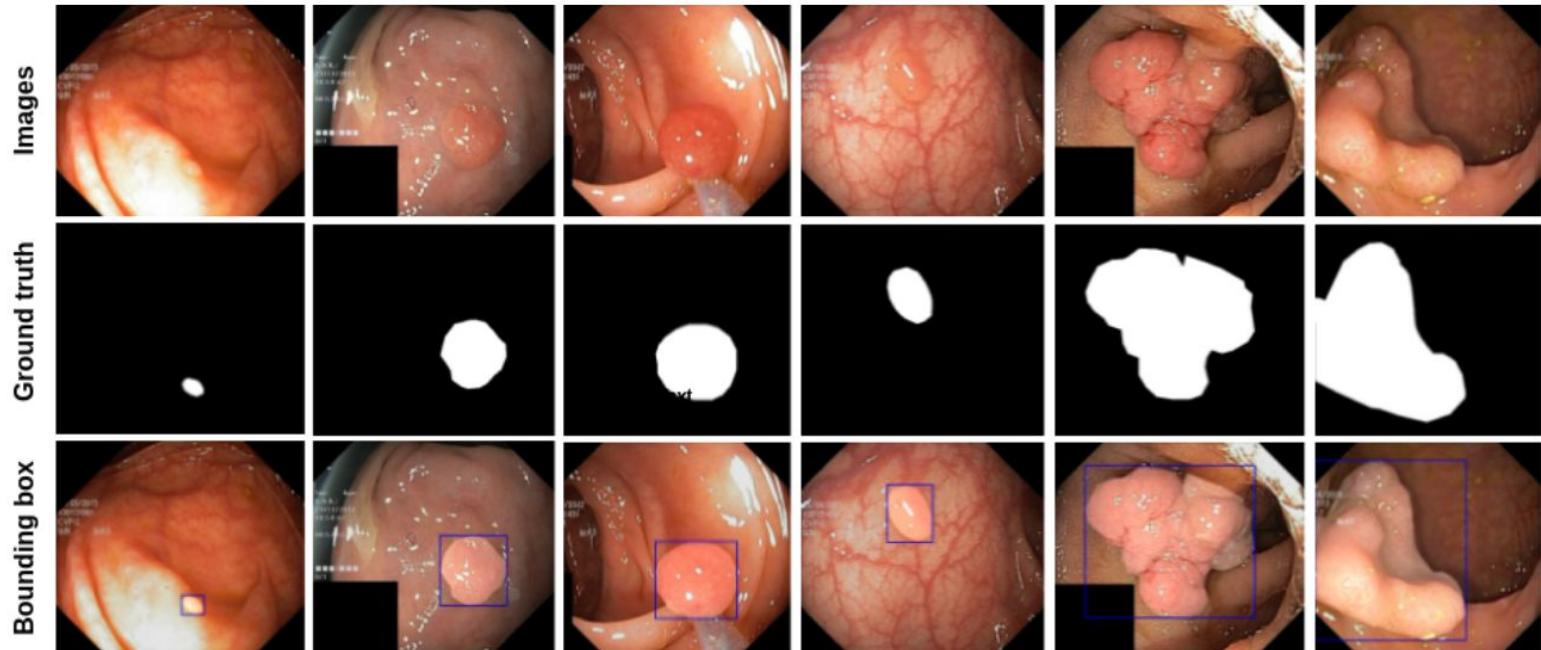
- 1) Load image from GitHub.
- 2) Create an object detection dataset in Roboflow
- 3) Train YOLO model in the Ultralytics Hub.
- 4) evaluate YOLO in [Lab 6.1 ultralyricshub](#)



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.

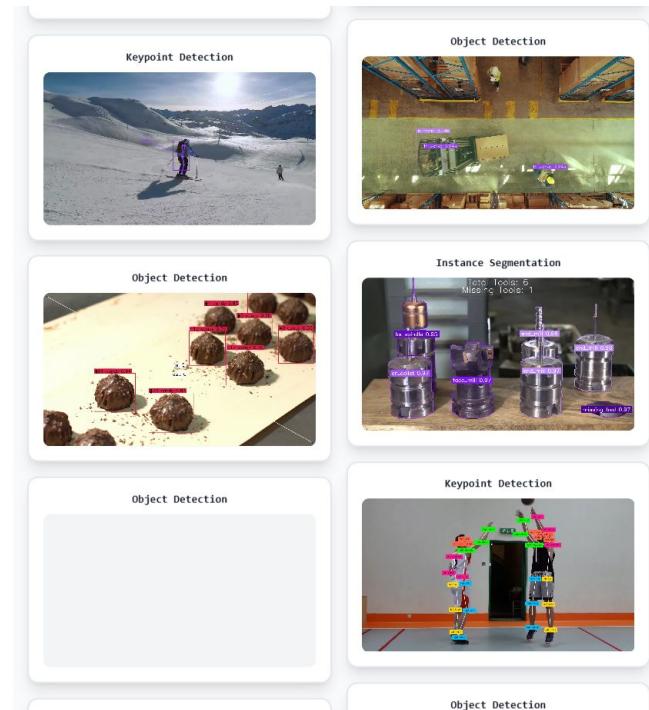
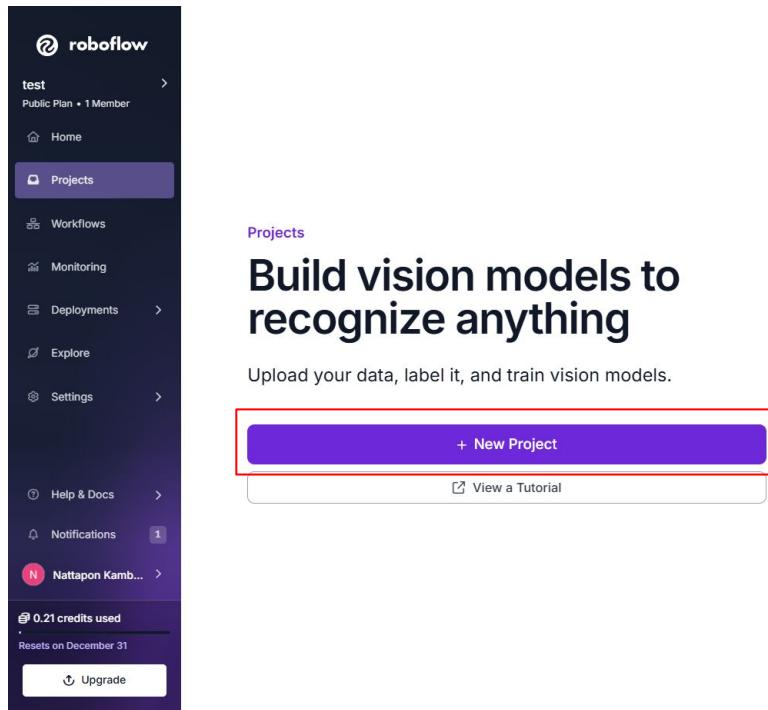
Dataset: kvasir dataset (2017)



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](#)



Lab 6.1: Object detection dataset

2) Create new project (**Object Detection**)

roboflow

Let's create your project.

test > Public skin_cancer_detection

Project Name: skin_cancer_detection
Annotation Group: skin_tumor
Visibility: Private (Public selected)
Licenses: CC BY 4.0
Tool: Traditional (Rapid selected)

Project Type: Object Detection (Bounding Boxes, # Counts, Tracking selected)
Classification (Single-Label selected)
Instance Segmentation (Polygons, Measuring, Odd Shapes)
Keypoint Detection (Skeleton Structure, Pose Estimation)
Multimodal (Prompts, Visual Question Answering, Captions)

Identify objects and their positions with bounding boxes.



Cancel Create Public Project

Lab 6.1: Object detection dataset

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

The screenshot shows the Roboflow web interface. On the left, a sidebar navigation bar includes icons for Home, Projects, Datasets, Annotations, Models, Visualize, Deployments, and a New Project button. The main workspace is titled 'TEST' and contains a 'skin_cancer_d...' dataset. The 'DATA' section is active, showing options like 'Upload Data' (which is highlighted in purple), 'Annotate', 'Dataset', 'Versions', 'Train' (selected), 'Analytics', 'Classes & Tags', 'Models', and 'Visualize'. A 'DEPLOY' section is also present. The central area is titled 'Upload' and shows a large dashed box for file upload with a circular arrow icon. Below it, the text 'Drag and drop file(s) to upload, or:' is displayed, along with two buttons: 'Select File(s)' and 'Select Folder'. A 'Supported Formats' section lists 'Images' (jpg, png, bmp, webp, avif), 'Annotations' (in 26 formats), 'Videos' (mov, mp4), and 'PDFs'. A note at the bottom states: '*Max size of 20MB and 16,400 x 16,900 pixels.' To the right, there are three sections: 'Need images to get started?' (with a QR code for phone upload), 'Search on Roboflow Universe' (with a search bar), and 'Bulk Upload Images' (with a note about using Python SDK, REST API, and CLI).

Lab 6.1: Object detection dataset

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

TEST

skin_cancer_d... Object Detection

DATA

Upload Data

Annotate

Dataset

Versions Train

Analytics

Classes & Tags

MODELS

Models

Visualize

DEPLOY

Deployments

Upload

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

Tags: Search or add tags for images...

Create batch instantly

All Images (16) Annotated 0 Not Annotated 16

Select Files Select Folder Save and Continue →

Drag and drop images, annotations, and videos.
*.jpg, *.png, *.bmp, *.webp, *.avif in 26 formats .mov, .mp4
*Max size of 200B and 16,400 x 10,900 pixels.

cju2i6acqv06i0799u20f1t8.jpg cju2i3hzcw3o0988rgh911.jpg cju2i03ptvkiu0799xb0d4det.jpg cju2hx006vid0799gmm81vh.jpg cju2hw5glr5h0988so2qqres.jpg cju2hugv9vget0799hk7ksvg.jpg cju2htabevq9108015jel0x7.jpg cju2hqt33imra0988f5ijv8j.jpg

Want to add similar images? Powered by Objects365

0 selected + Add

16

Lab 6.1: Object detection dataset

4) Check “Label Myself”

The screenshot shows the Roboflow interface for managing datasets. On the left, a sidebar navigation includes: TEST, skin_cancer_d..., Object Detection, DATA, Annotate (highlighted), Dataset, Versions (Train selected), Analytics, Classes & Tags, MODELS, Models, Visualize, DEPLOY, Deployments, and a circular icon with 'N'.

The main area displays a dataset named "TEST" with the following details:

- Annotate > Batch
- Uploaded on 12/26/25 at 1:18 pm
- Uploaded Dec 26, 2025 (1:18 PM)
- Upload More, Rename buttons

A grid of 10 images from the dataset is shown, each with a unique identifier below it:

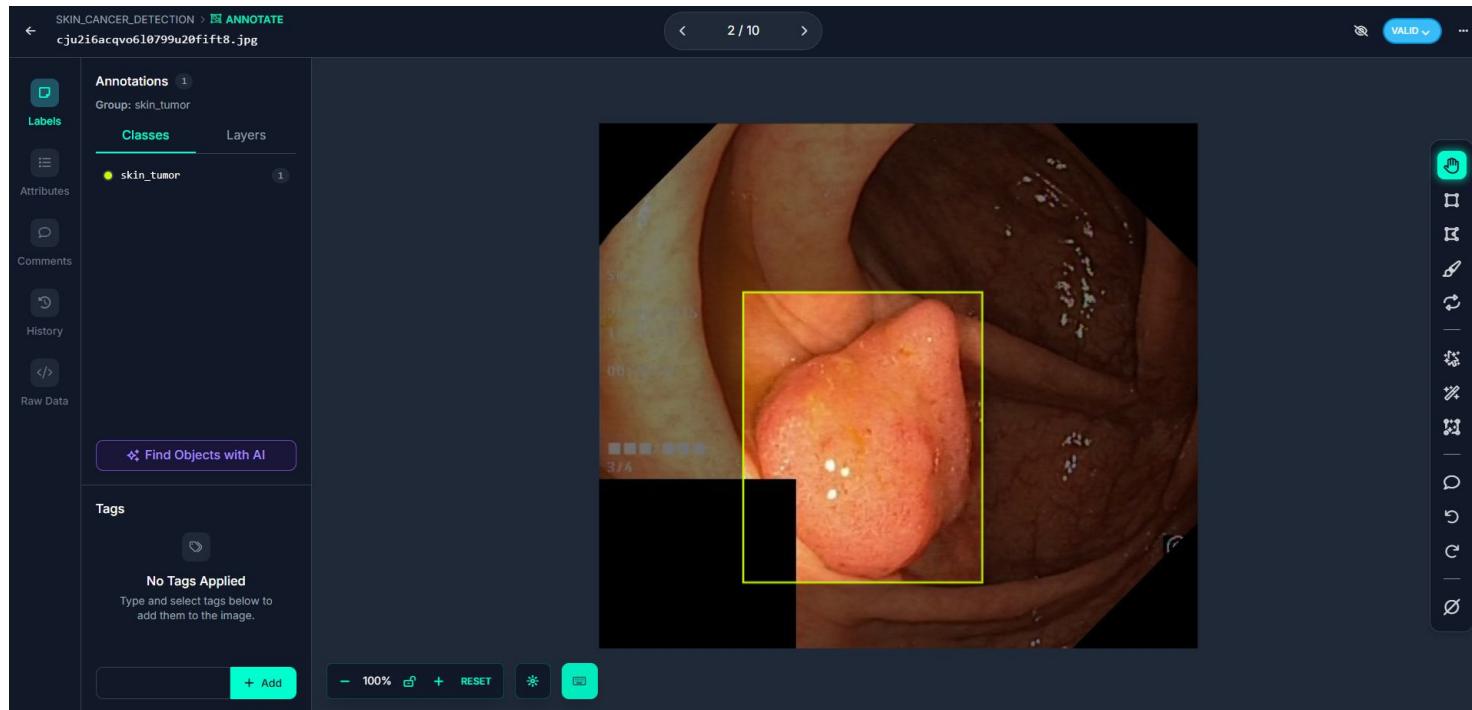
- cju2hw5gj1r5h0988so2qq...
- cju2hx006vid107991gn81...
- cju2i03ptvkiu0799xbbd4...
- cju2htabevq9108015qje1...
- cju2hqts3lma0988fr5ij_...
- cju2i3hzclw3o0988rrgh9...
- cju2i6acqv0610799u20fL...
- cju2hlm19vjjf0801o69qn...
- cju2hos57llxm08359g92p...

To the right, a section titled "How do you want to label your images?" contains four options:

- 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** (highlighted with a red border): Label images with our AI labeling tools.
- Label With My Team**: Split up the labeling work across your team.
- Hire Outsourced Labelers** (with an Upgrade button): Work with a 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%

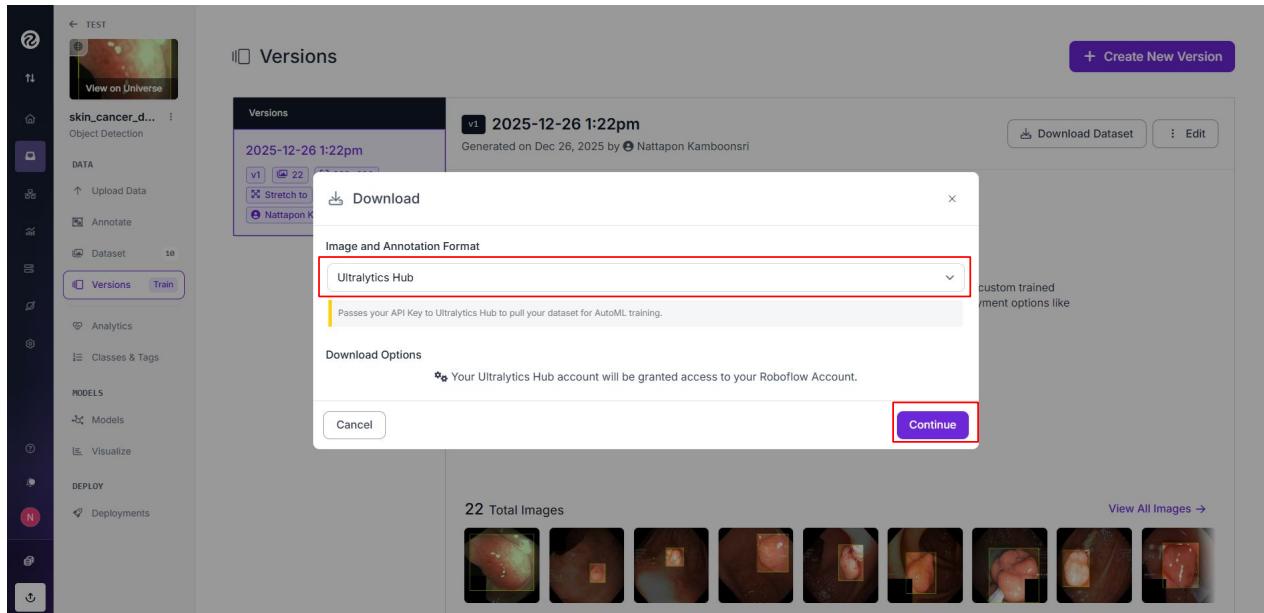
The screenshot shows a user interface for managing datasets, specifically for object detection. On the left is a sidebar with various icons and links: TEST, skin_cancer_d..., DATA (Upload Data, Annotate), Dataset (10), Versions (selected), Train, Analytics, Classes & Tags, MODELS (Models, Visualize), and DEPLOY (Deployments). The main area is titled "Versions" and shows a "Versions" card with the message "No versions created yet." Below this is a "Version Name:" input field containing "2025-12-26 1:21pm". The interface then details the dataset's composition:

- Source Images:** Images: 10, Classes: 1, Unannotated: 0
- Train/Test Split:** Training Set: 6 images, Validation Set: 2 images, Testing Set: 2 images (this section is highlighted with a red box)
- Preprocessing:** Auto-Orient: Applied, Resize: Stretch to 320x320
- Augmentation:** Flip: Horizontal, Vertical, Noise: Up to 0.1% of pixels

At the bottom, there is a "Create" button with a "5" icon and a note: "Review your selections and select a version side to create a moment-in-time snapshot of your dataset with the applied transformations." A red box highlights the "Create" button.

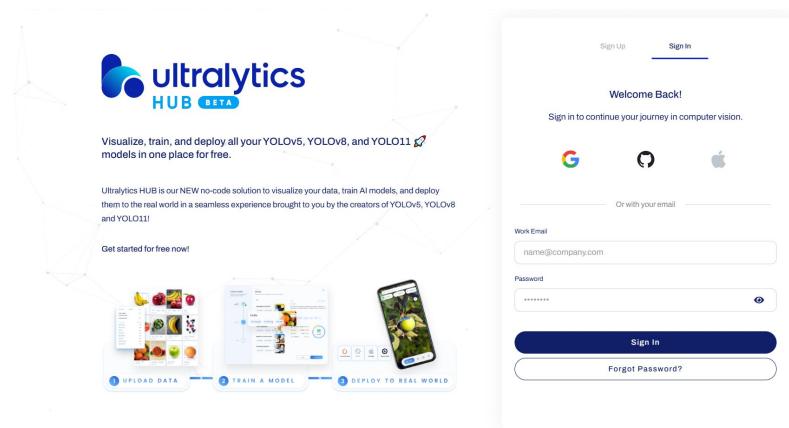
Lab 6.1: Object detection dataset

- 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.

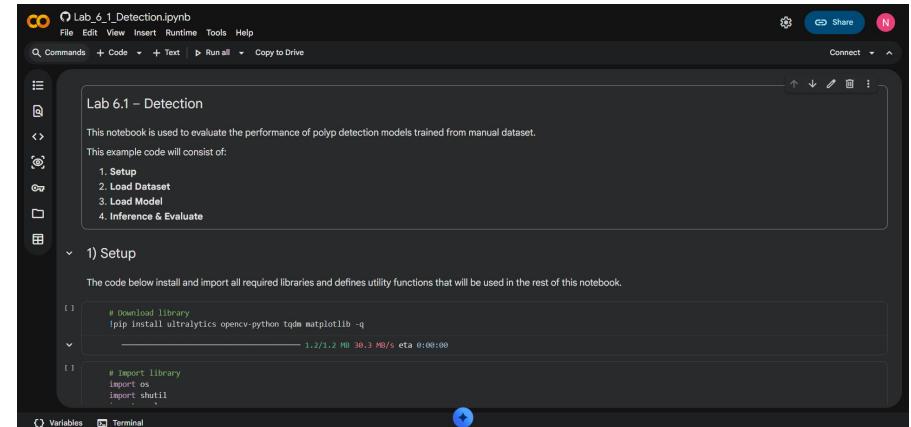


Lab 6.1: Object detection dataset

- 8) Train YOLOv8n in Ultralytics Hub
- 9) Load model to run in [Lab_6_1_Detection](#) (in **Colab**).



The image shows two screenshots of the Ultralytics Hub interface. On the left is the homepage, featuring the Ultralytics logo, a 'HUB BETA' badge, and a brief description: 'Visualize, train, and deploy all your YOLOv5, YOLOv8, and YOLOv11 models in one place for free.' It includes a 'Get started for free now!' button and three icons for 'UPLOAD DATA', 'TRAIN A MODEL', and 'DEPLOY TO REAL WORLD'. On the right is the sign-in screen, which has 'Sign Up' and 'Sign In' buttons at the top. The 'Sign In' button is highlighted. Below it is a 'Welcome Back!' message and a 'Sign in to continue your journey in computer vision.' prompt. There are social login buttons for Google, GitHub, and Apple, followed by a 'Or with your email' field and a 'Sign In' button.



The image shows a Google Colab notebook titled 'Lab_6_1_Detection.ipynb'. The title bar includes the notebook name, file menu, and sharing options. The main code cell contains the following text:
This notebook is used to evaluate the performance of polyp detection models trained from manual dataset.
This example code will consist of:

1. Setup
2. Load Dataset
3. Load Model
4. Inference & Evaluate

Below this, the first cell is expanded to show the '1) Setup' section, which includes the command: # Download library !pip install ultralytics opencv-python tqdm matplotlib -q. The cell output shows the command being run and its progress: 1/2 1/2 MB 30.2 MB/s eta 0:00:00.

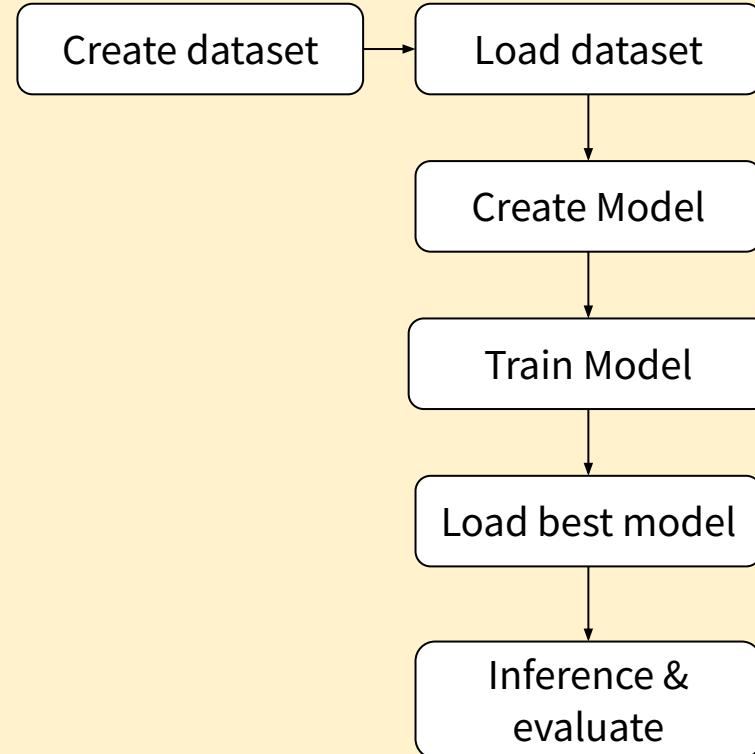
Lab 6.2: Segmentation dataset (Polyp Segmentation)

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.

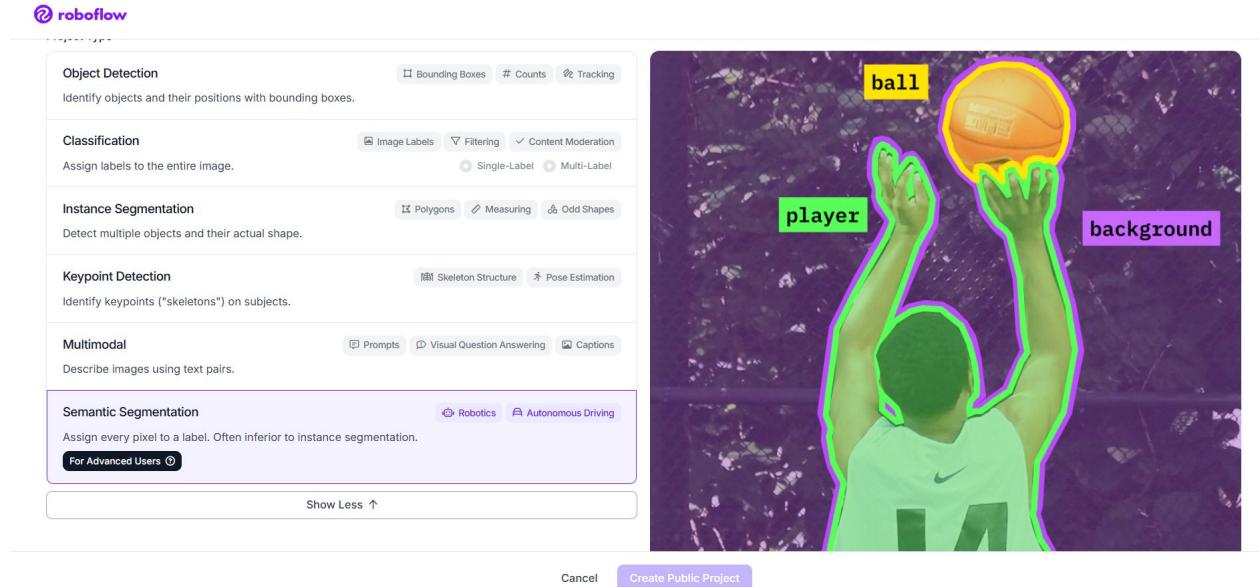
Roboflow

Colab



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.

