Lab 6: Imaging tools (Roboflow)

3099704 AI for Digital Health (2025/2)

Outline

Objective

Material

- Colab

- Roboflow: Intro & Limitation

Other Data Labeling Tools

Lab 6.1: Object detection dataset (Polyp Detection)

- Roboflow -> Ultralytics HUB -> Colab

Lab 6.2: Segmentation dataset (Polyp Segmentation)

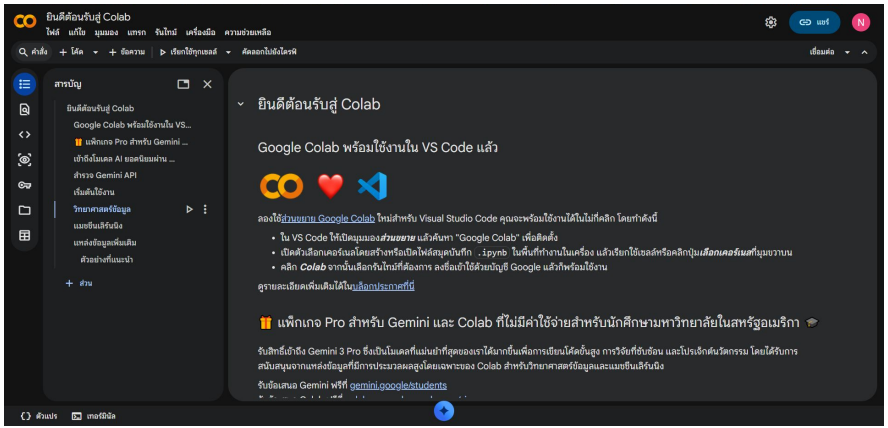
- Roboflow -> Colab (MONAI)

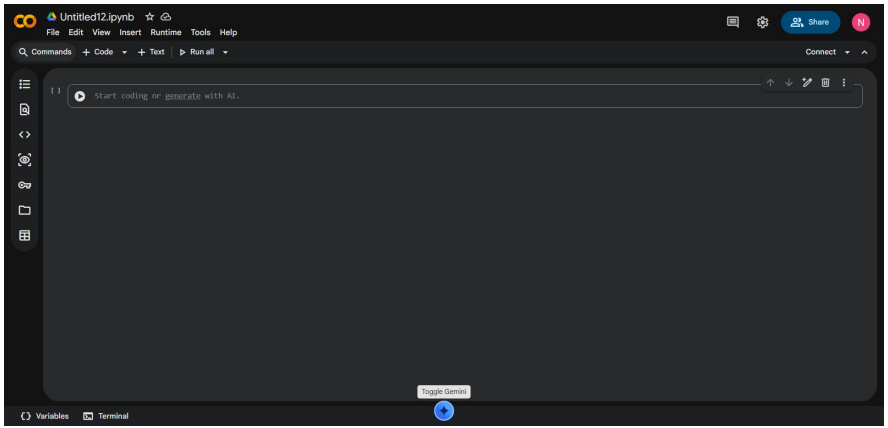
Objective

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

Material

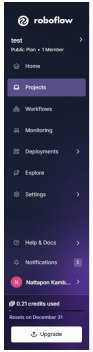
- With **Google Colab**, you don't need to install any software. All you need is a Google account, and you can start using it right away. Simply visit: https://colab.research.google.com/ or select NEW NOTEBOOK to start a new file.

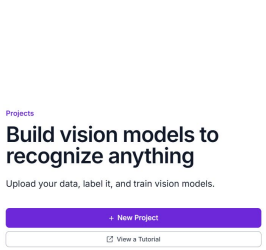


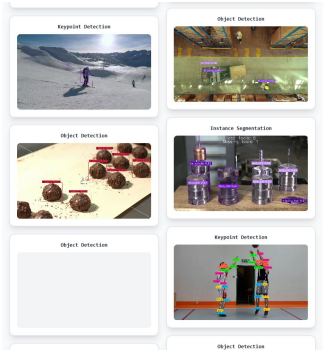


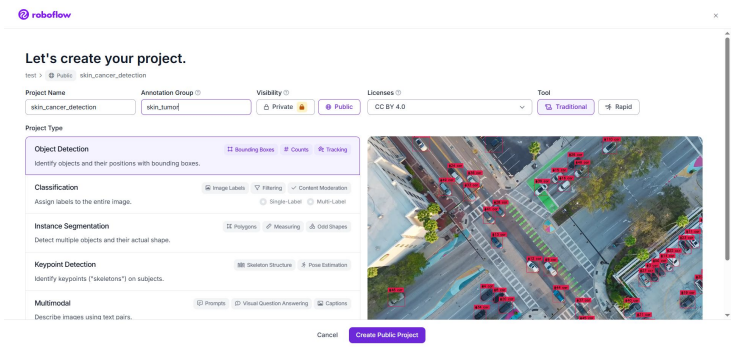
Roboflow

- **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.



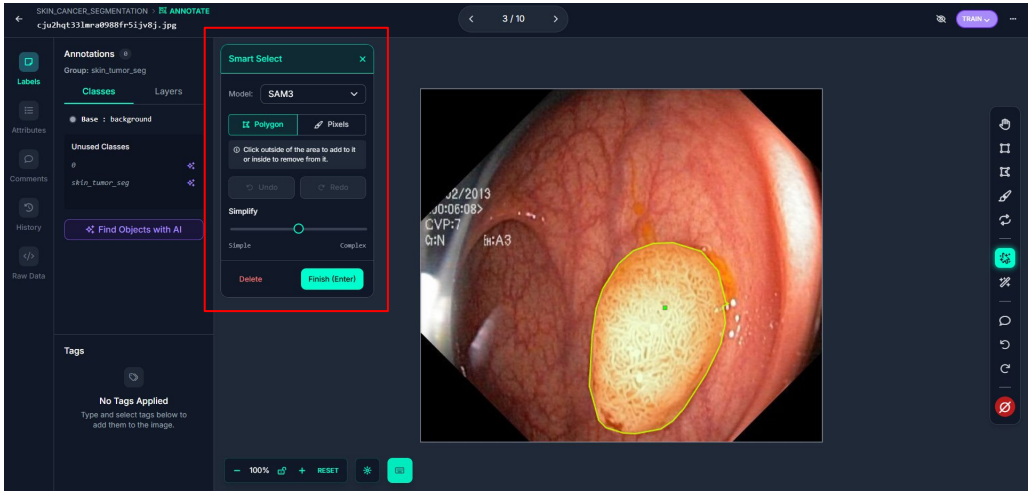






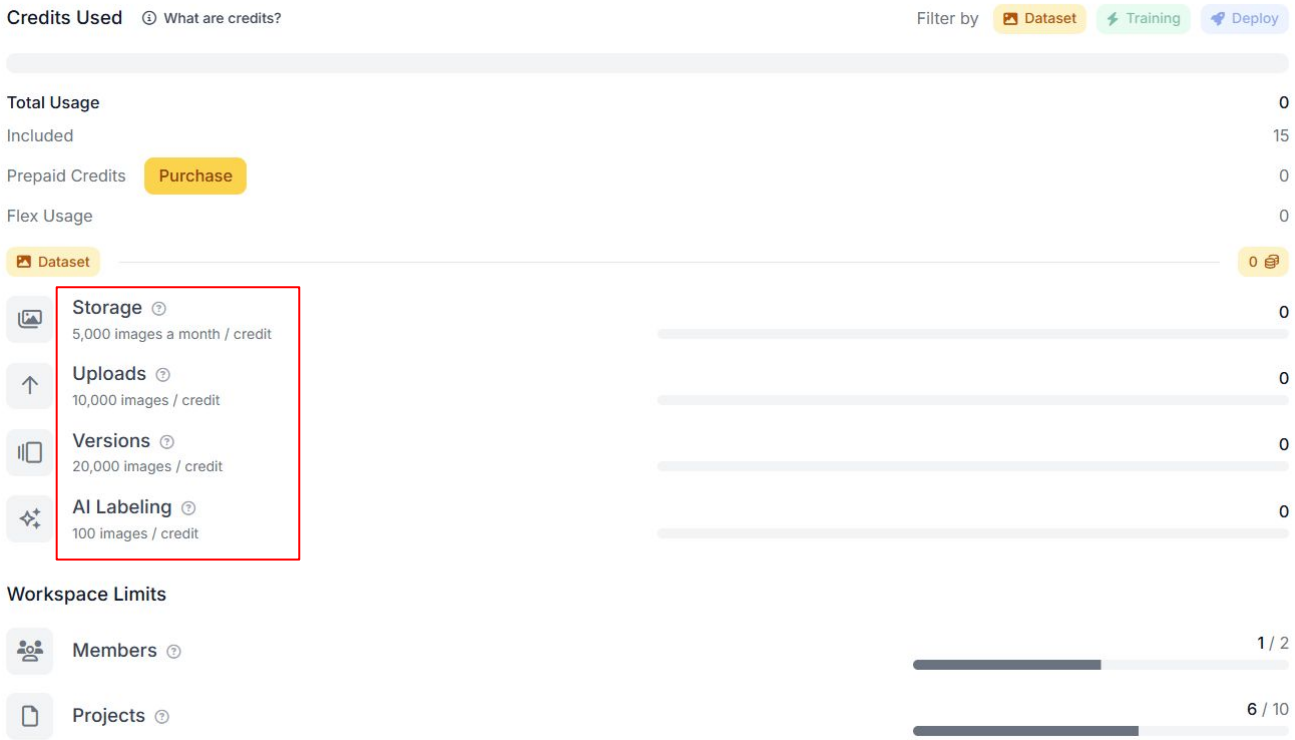
Roboflow (AI-Assisted Labeling)

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.



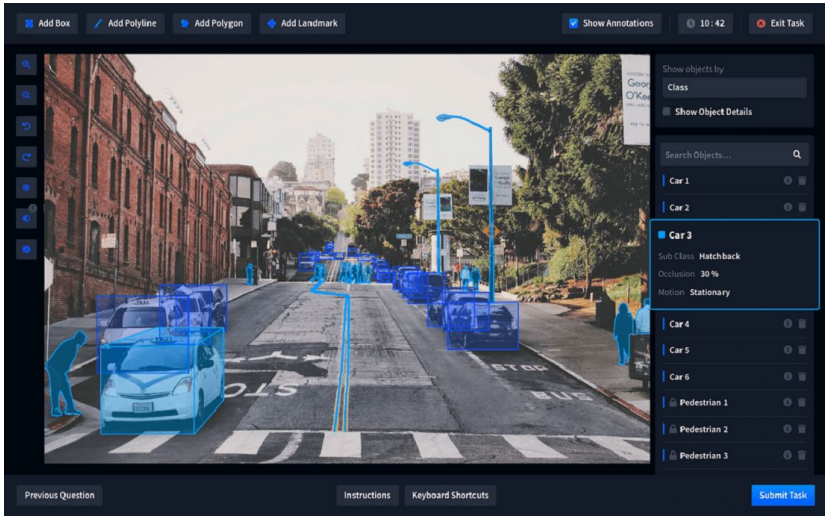
Roboflow (limitation)

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

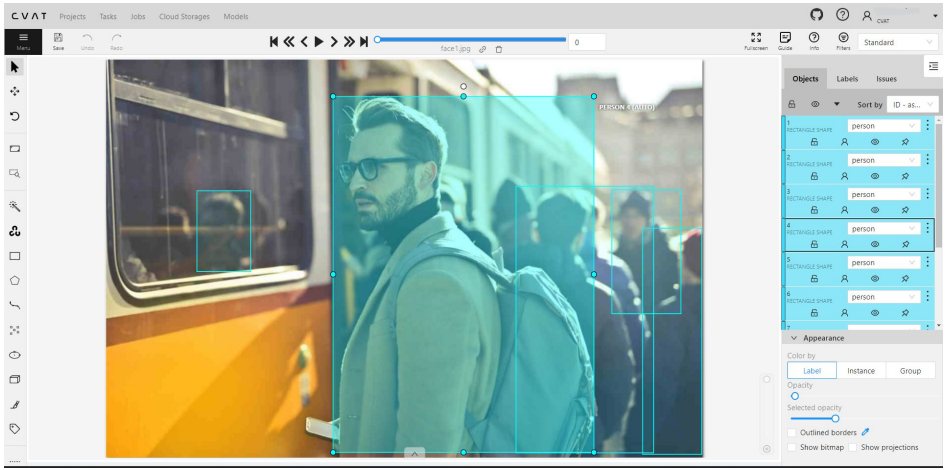


Other Data Labeling Tools

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



LabelMe



CVAT

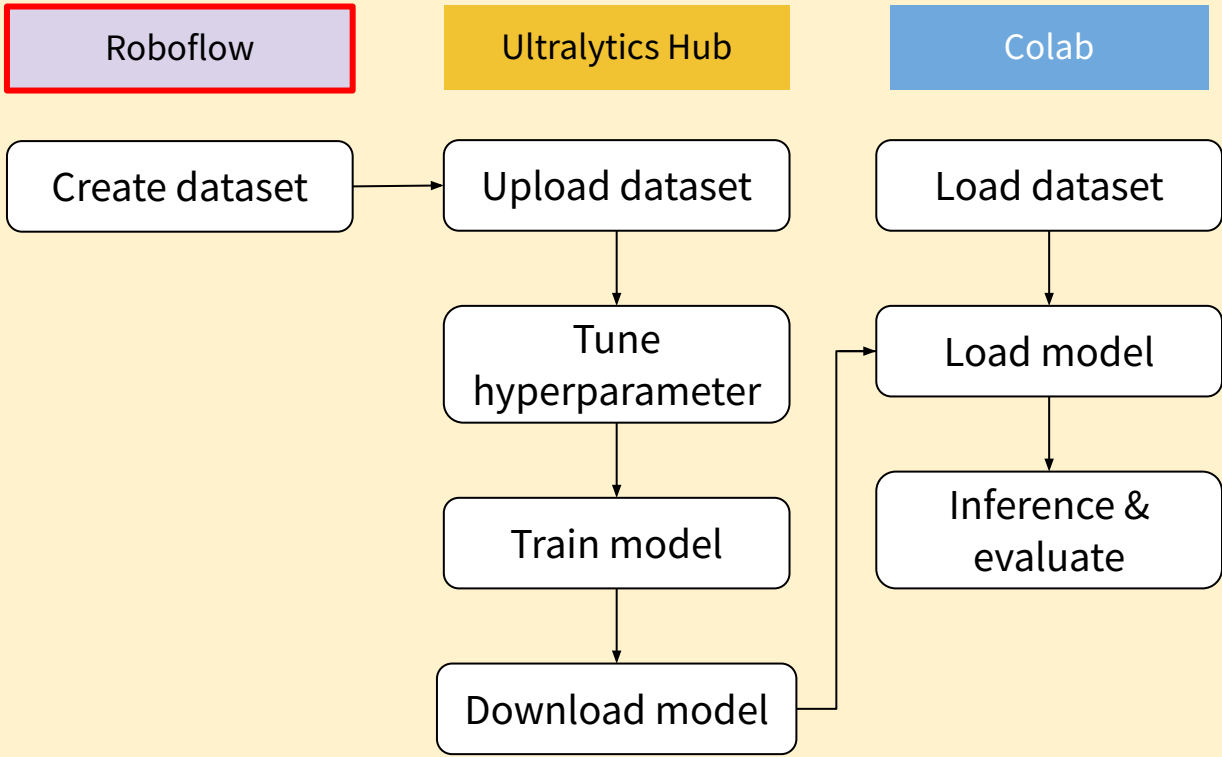
Other Data Labeling Tools (cont.)

Tool	Developer	Main Use	Strengths	Limitations
CVAT	Intel	Detection, Segmentation, Tracking	• Powerful for large datasets • Supports image & video • Team collaboration	• Setup is complex • UI less beginner-friendly
Roboflow	Roboflow Inc.	Detection & Segmentation	• AI-assisted labeling • Dataset management & augmentation • Easy model export	• The free plan has limitations • Cloud-based
LabelMe	MIT CSAIL	Image Segmentation	• Simple and lightweight • Easy to use for beginners • Good for academic use	• 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.

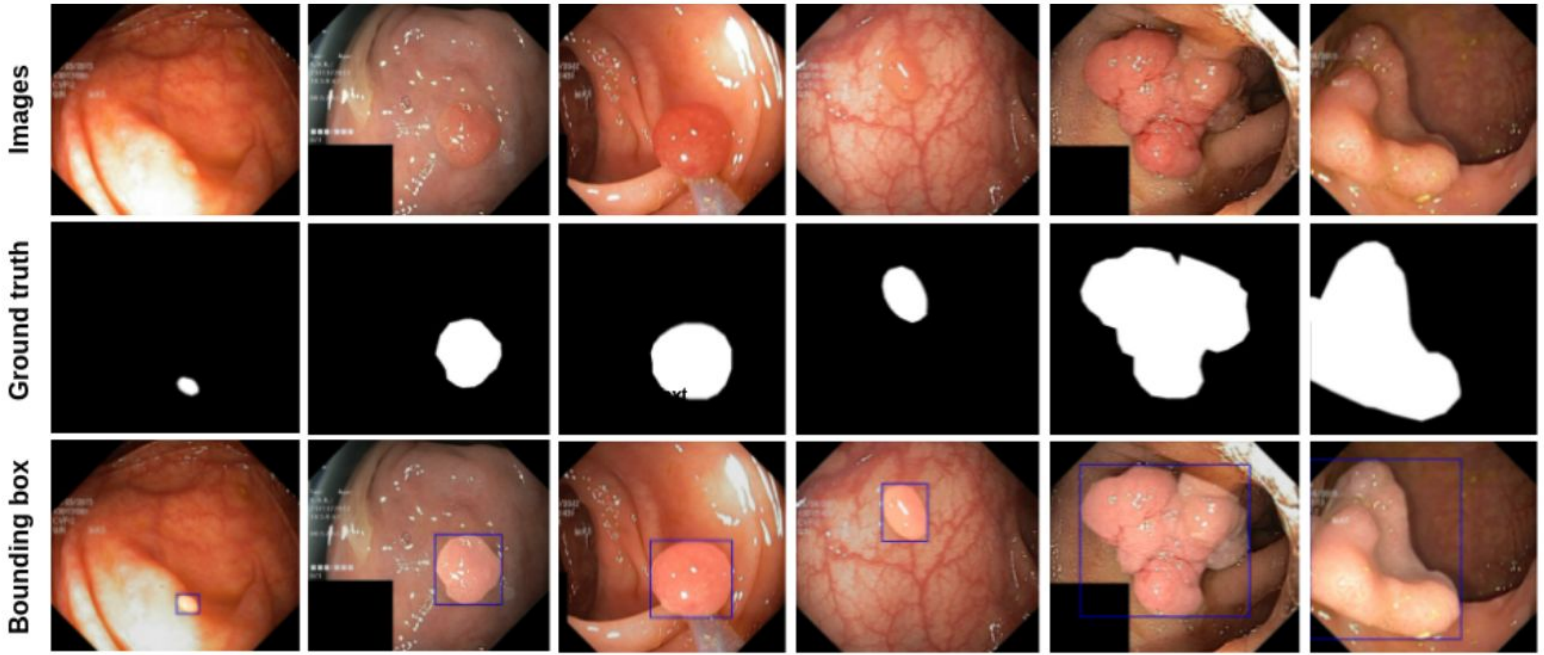
1) Load image from GitHub.
2) Create an object detection dataset in Roboflow
3) Train YOLO model in the Ultralytics Hub.
4) evaluate YOLO in Lab_6_1_ultralyricshub



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.

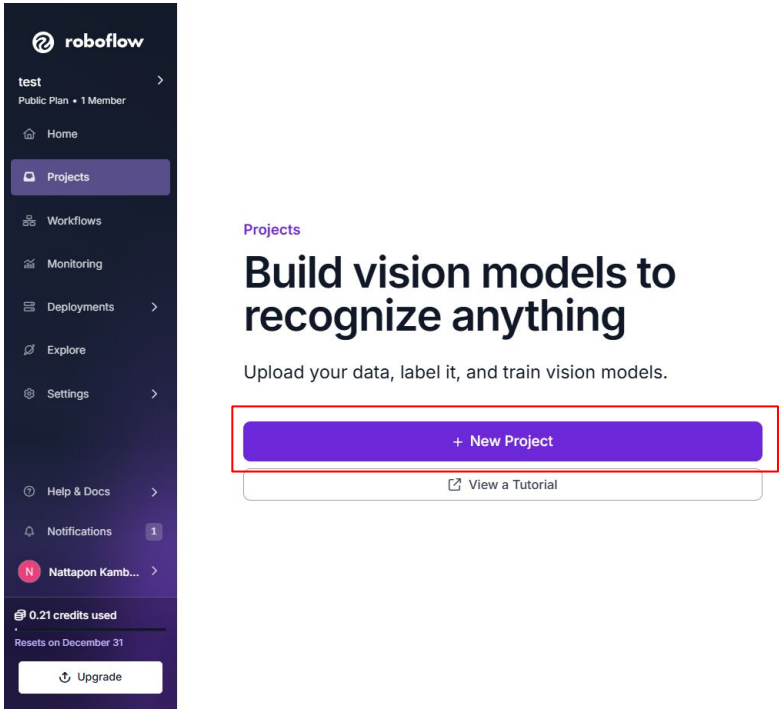
Dataset: kvasir dataset (2017)

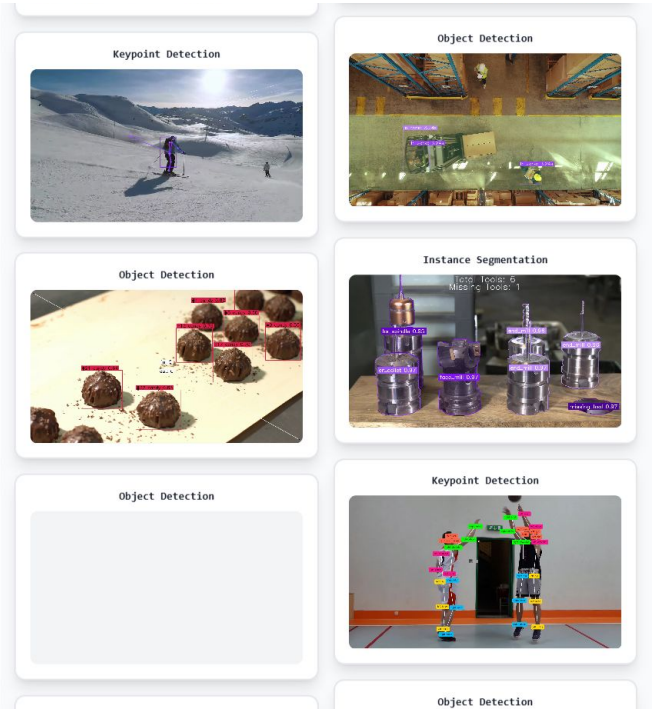


The figure shows the example images, bounding box, and mask from Kvasir-SEG. The white mask shows the area covered by the polyp region, and the background regions contain non-polyp tissue pixels.

Lab 6.1: Object detection dataset

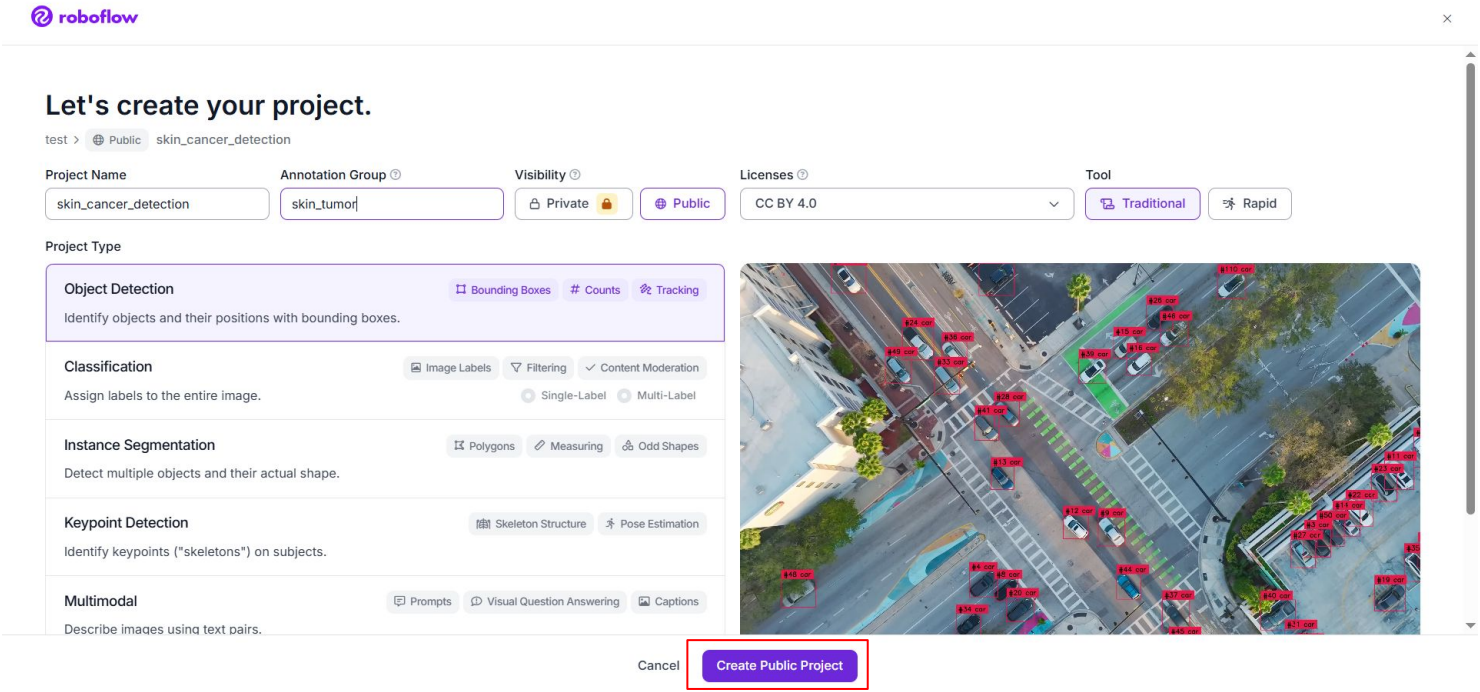
1) Sign in [Roboflow]





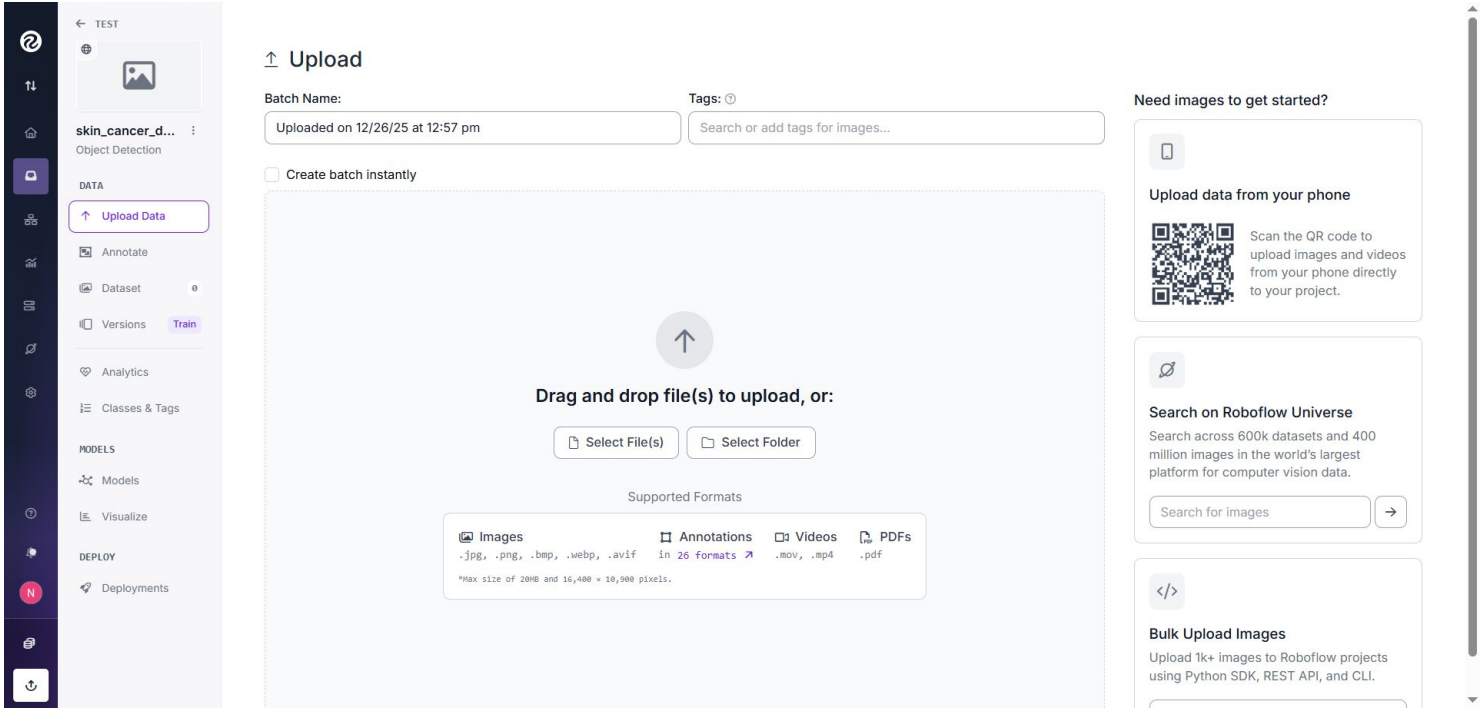
Lab 6.1: Object detection dataset

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



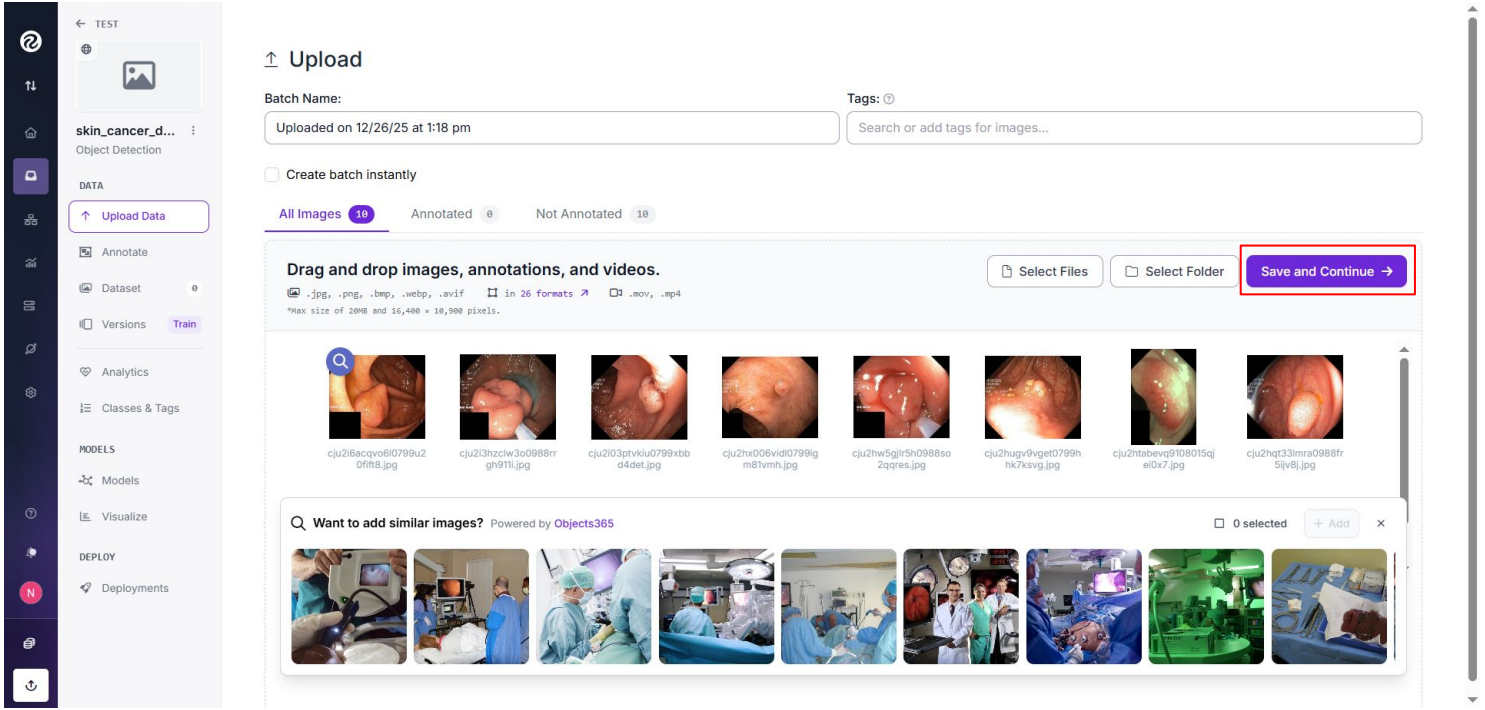
Lab 6.1: Object detection dataset

3) Download the dataset from GitHub, then upload it to **Roboflow**.



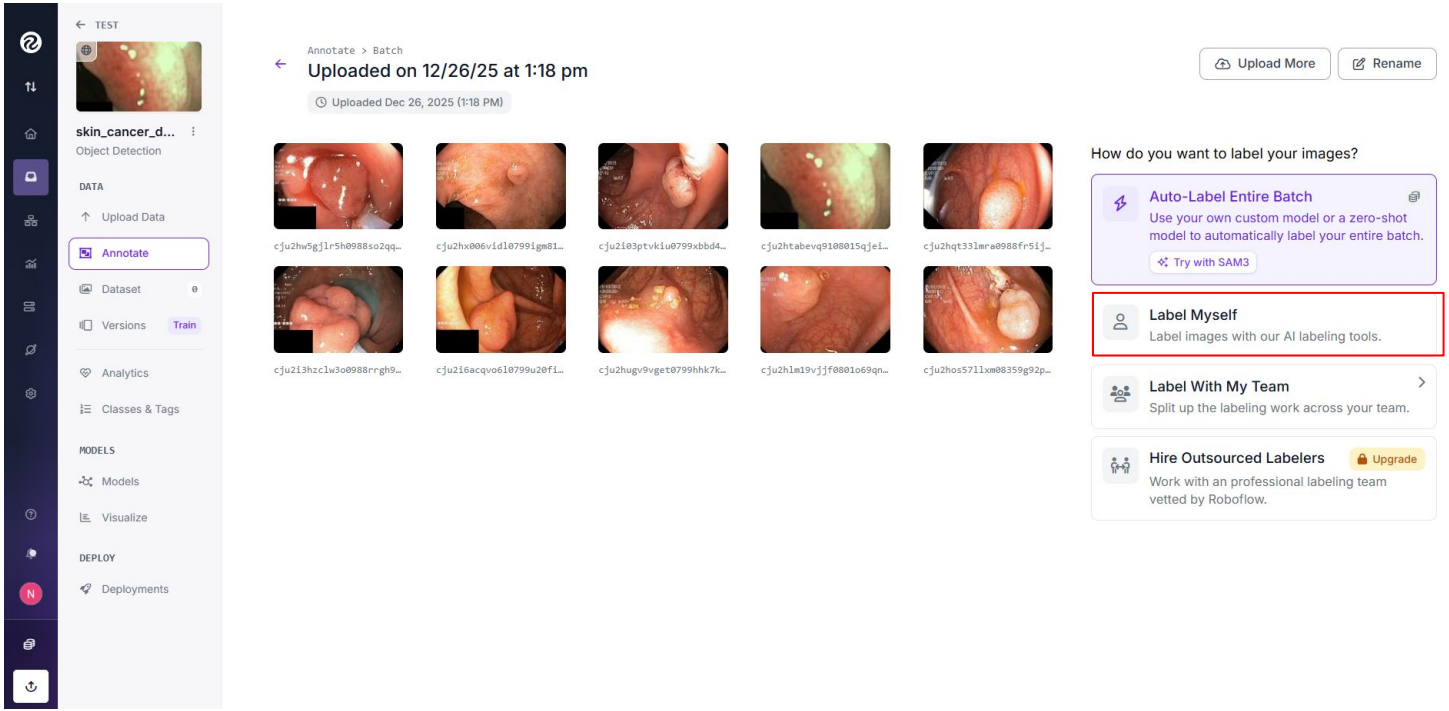
Lab 6.1: Object detection dataset

3) Download the dataset from GitHub, then upload it to **Roboflow**.



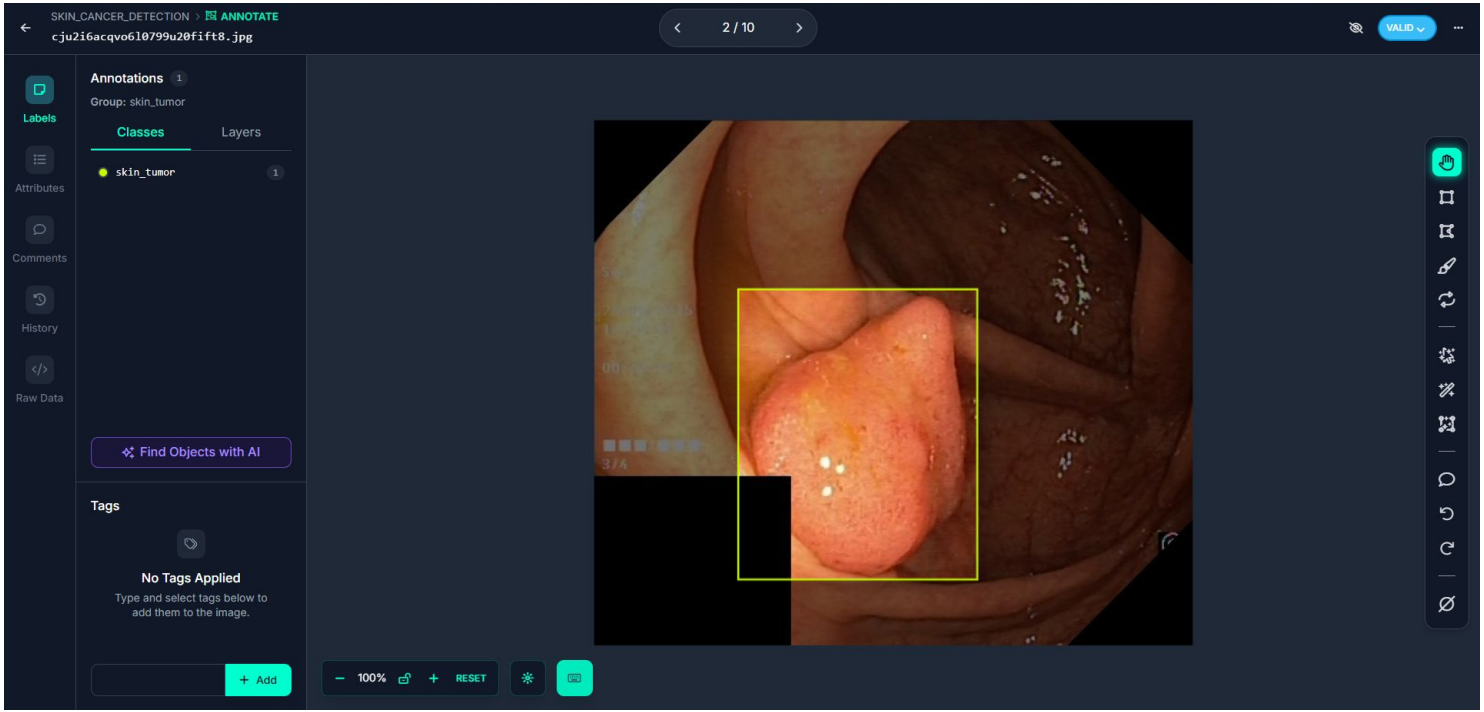
Lab 6.1: Object detection dataset

4) Check “**Label Myself**”



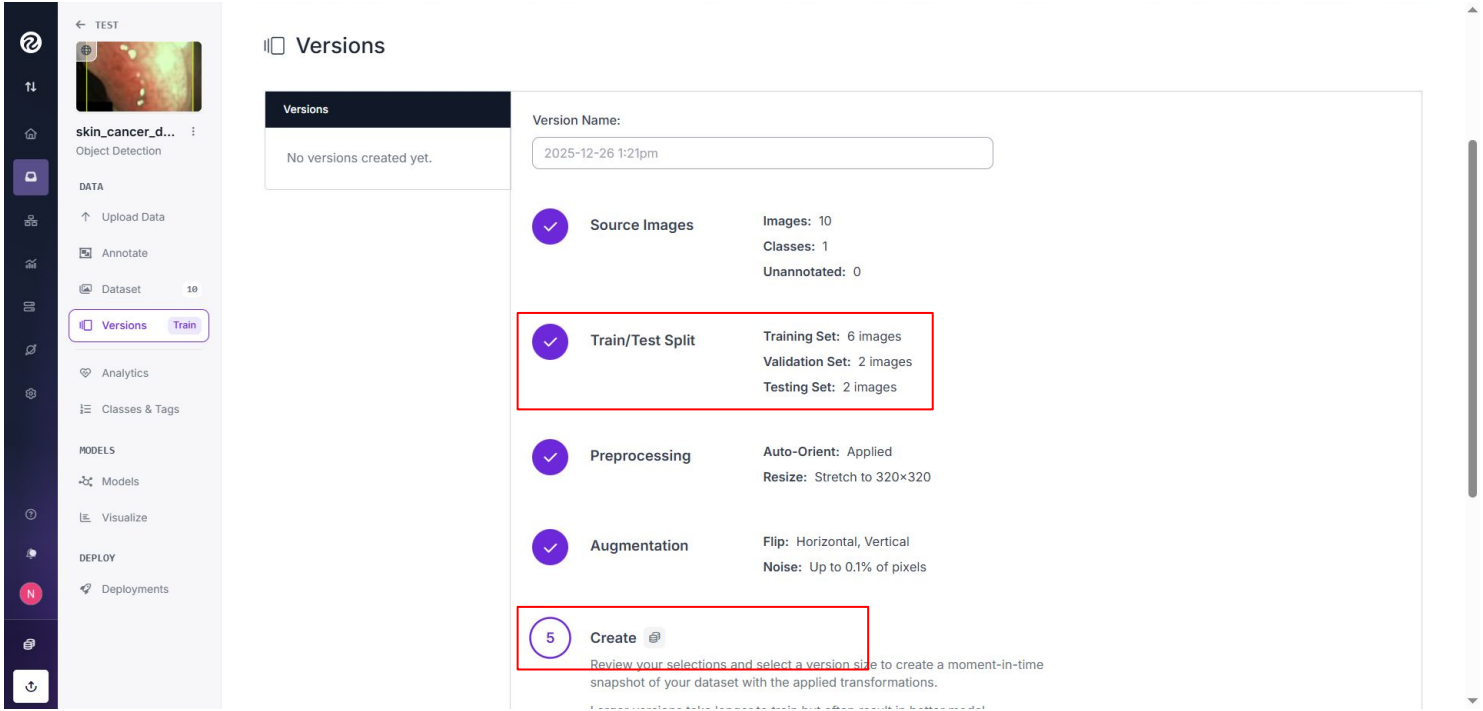
Lab 6.1: Object detection dataset

5) Label polyp



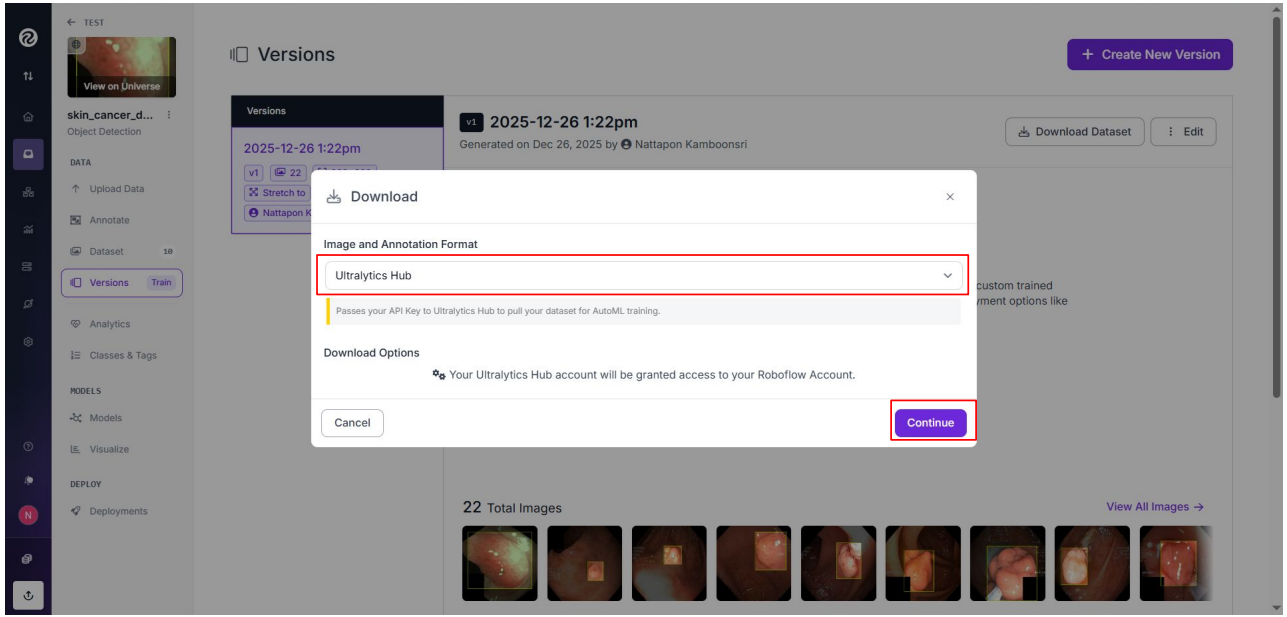
Lab6.1: Object detection dataset

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



Lab 6.1: Object detection dataset

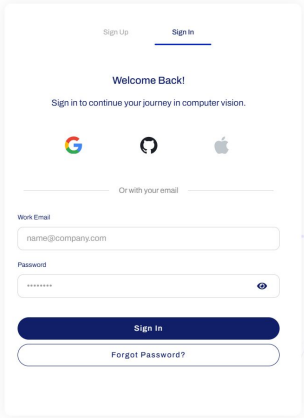
7) Download the dataset in two formats: (1) Ultralytics HUB format for training the model and (2) YOLOv8 format for evaluation using a Google Colab notebook.

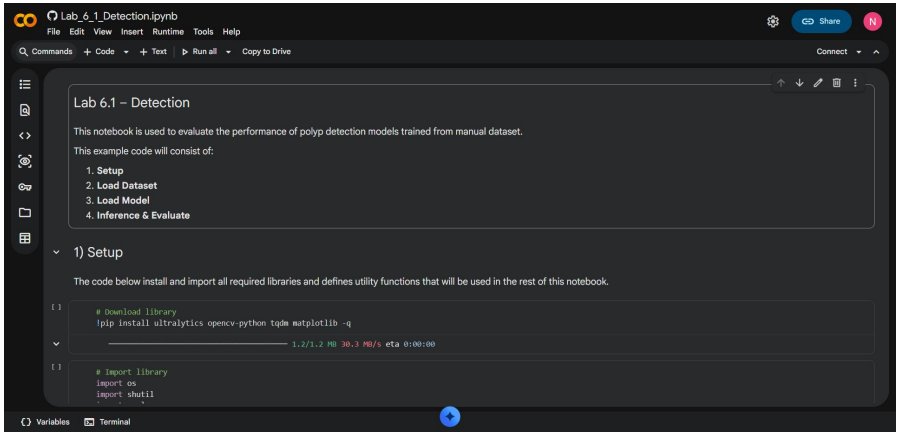


Lab 6.1: Object detection dataset

8) Train YOLOv8n in Ultralytics Hub

9) Load model to run in Lab_6_1_Detection (in **Colab).**

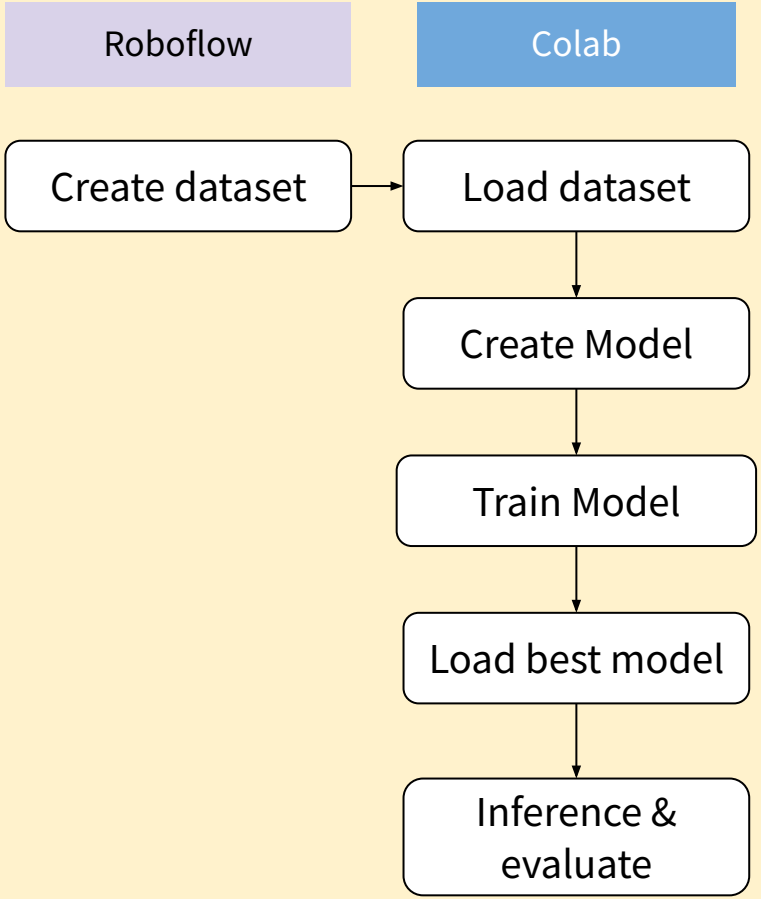




Lab 6.2: Segmentation dataset (Polyp Segmentation)

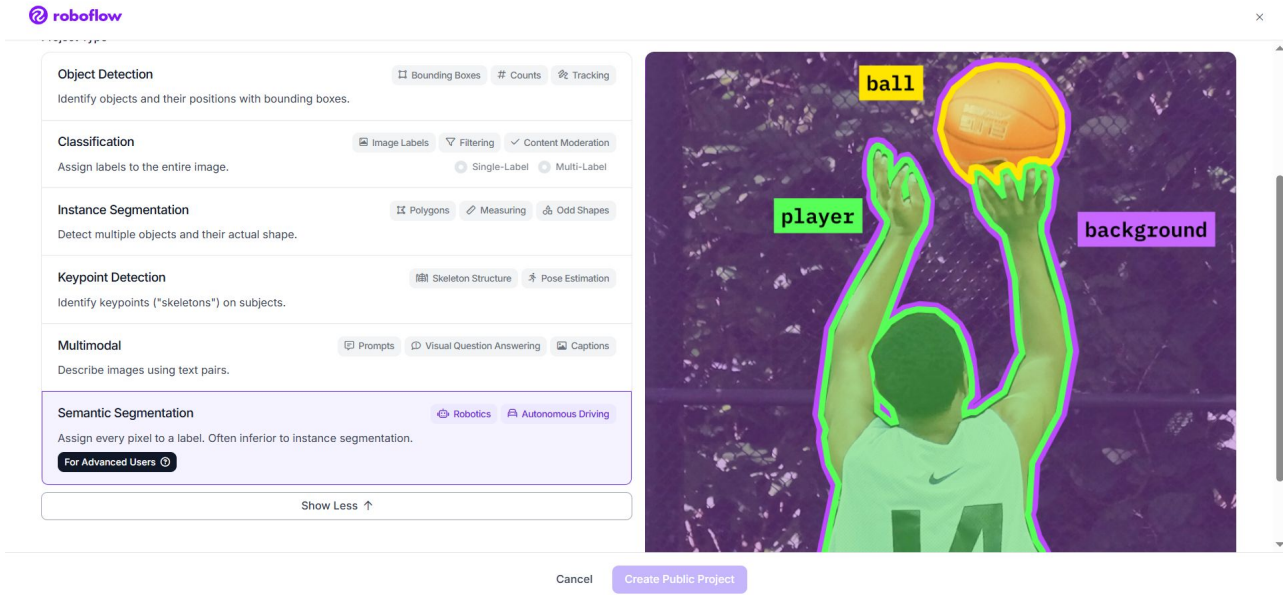
In this lab, we will repeat the experiment from **Lab 5.1 (2DUNet)**, but the dataset will be created using Roboflow instead.

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.