STEP 1: Set Up Google Colab Environment

```
# Enable GPU from Runtime > Change Runtime Type > Select GPU
```

STEP 2: Install Required Libraries

```
!pip install ultralytics roboflow
```

STEP 3: Download the Dataset from Roboflow

```
from roboflow import Roboflow

# Initialize Roboflow with API key
rf = Roboflow(api_key="mfKwxGPJMp9kGXkCoBVd")

# Load the dataset project and version
project = rf.workspace("fruits-dataset").project("fruitsv2-duplk")
version = project.version(5)

# Download dataset in YOLOv8 format
dataset = version.download("yolov8")
```

STEP 4: Verify Dataset Location

```
import os

# List files in the /content directory
print(os.listdir("/content"))
```

STEP 5: Check Dataset Structure

```
dataset_path = "/content/Fruitsv2-5"

# Print files in the dataset folder
print(os.listdir(dataset_path))
```

STEP 6: Train YOLOv8 Model

```
from ultralytics import YOLO

# Define dataset YAML file path
```

```
data_yaml = "/content/Fruitsv2-5/data.yaml"

# Load the YOLOv8 model (pretrained)
model = YOLO("yolov8n.pt")

# Train the model
model.train(data=data_yaml, epochs=50, batch=16, imgsz=640, device="cuda")
```

STEP 7: Validate the Model Performance

```
metrics = model.val()
```

STEP 8: Test the Model on New Images

```
from google.colab import files
import cv2
from PIL import Image

# Upload an image for testing
uploaded = files.upload()

# Load trained model
model = YOLO("/content/runs/detect/train/weights/best.pt")

# Perform detection
results = model(list(uploaded.keys())[0], show=True, save=True)
```

STEP 9: Download the Trained Model

```
from google.colab import files

# Download trained model weights
files.download("/content/runs/detect/train/weights/best.pt")
```