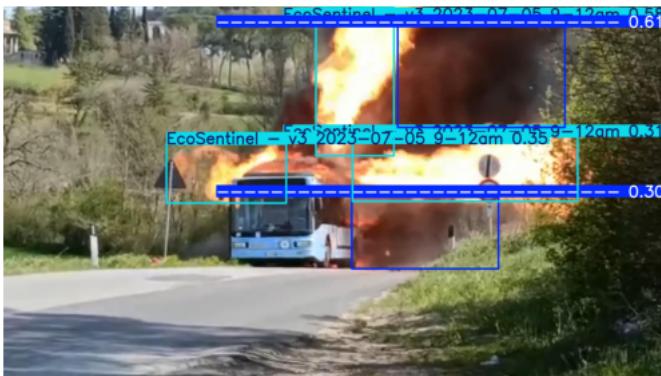


```
Using sample image: /content/smoke-1/valid/images/youtube-22.jpg.rf.fc9c484c03f70730d30ccb3fd532e0ab.jpg
```

```
image 1/1 /content/smoke-1/valid/images/youtube-22.jpg.rf.fc9c484c03f70730d30ccb3fd532e0ab.jpg: 384x640 2 -----
Speed: 4.8ms preprocess, 186.7ms inference, 5.1ms postprocess per image at shape (1, 3, 384, 640)
```



CCT Enhancement Starts Here

```
!pip install roboflow

from roboflow import Roboflow
rf = Roboflow(api_key="Lp0RtHgnDdhFscxfmw")
project = rf.workspace("akemi").project("smoke-ddba9-zjcub")
version = project.version(1)
dataset = version.download("yolov8")

print("Dataset location:", dataset.location)

DATASET_DIR = dataset.location
print("DATASET_DIR set to:", DATASET_DIR)

# I did line because after starting run-time it couldn't find my dataset

Requirement already satisfied: roboflow in /usr/local/lib/python3.12/dist-packages (1.2.11)
Requirement already satisfied: certifi in /usr/local/lib/python3.12/dist-packages (from roboflow) (2025.11.12)
Requirement already satisfied: idna==3.7 in /usr/local/lib/python3.12/dist-packages (from roboflow) (3.7)
Requirement already satisfied: cycler in /usr/local/lib/python3.12/dist-packages (from roboflow) (0.12.1)
Requirement already satisfied: kiwisolver>=1.3.1 in /usr/local/lib/python3.12/dist-packages (from roboflow) (1.4.9)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.12/dist-packages (from roboflow) (3.10.0)
Requirement already satisfied: numpy>=1.18.5 in /usr/local/lib/python3.12/dist-packages (from roboflow) (2.0.2)
Requirement already satisfied: opencv-python-headless==4.10.0.84 in /usr/local/lib/python3.12/dist-packages (from roboflow) (4.1
Requirement already satisfied: Pillow>7.1.2 in /usr/local/lib/python3.12/dist-packages (from roboflow) (11.3.0)
Requirement already satisfied: pi-heif<2 in /usr/local/lib/python3.12/dist-packages (from roboflow) (1.1.1)
Requirement already satisfied: pillow-avif-plugin<2 in /usr/local/lib/python3.12/dist-packages (from roboflow) (1.5.2)
Requirement already satisfied: python-dateutil in /usr/local/lib/python3.12/dist-packages (from roboflow) (2.9.0.post0)
Requirement already satisfied: python-dotenv in /usr/local/lib/python3.12/dist-packages (from roboflow) (1.2.1)
Requirement already satisfied: requests in /usr/local/lib/python3.12/dist-packages (from roboflow) (2.32.4)
Requirement already satisfied: six in /usr/local/lib/python3.12/dist-packages (from roboflow) (1.17.0)
Requirement already satisfied: urllib3>=1.26.6 in /usr/local/lib/python3.12/dist-packages (from roboflow) (2.5.0)
Requirement already satisfied: tqdm>=4.41.0 in /usr/local/lib/python3.12/dist-packages (from roboflow) (4.67.1)
Requirement already satisfied: PyYAML>=5.3.1 in /usr/local/lib/python3.12/dist-packages (from roboflow) (6.0.3)
Requirement already satisfied: requests-toolbelt in /usr/local/lib/python3.12/dist-packages (from roboflow) (1.0.0)
Requirement already satisfied: filetype in /usr/local/lib/python3.12/dist-packages (from roboflow) (1.2.0)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.12/dist-packages (from matplotlib->roboflow) (1.3.3)
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Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.12/dist-packages (from matplotlib->roboflow) (25.0)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.12/dist-packages (from matplotlib->roboflow) (3.2.5)
Requirement already satisfied: charset_normalizer<4,>=2 in /usr/local/lib/python3.12/dist-packages (from requests->roboflow) (3.
loading Roboflow workspace...
loading Roboflow project...
Dataset location: /content/smoke-1
DATASET_DIR set to: /content/smoke-1
```

```
!pip install timm
```

```
Requirement already satisfied: timm in /usr/local/lib/python3.12/dist-packages (1.0.22)
Requirement already satisfied: torch in /usr/local/lib/python3.12/dist-packages (from timm) (2.9.0+cu126)
Requirement already satisfied: torchvision in /usr/local/lib/python3.12/dist-packages (from timm) (0.24.0+cu126)
```

```
Requirement already satisfied: pyyaml in /usr/local/lib/python3.12/dist-packages (from timm) (6.0.3)
Requirement already satisfied: huggingface_hub in /usr/local/lib/python3.12/dist-packages (from timm) (0.36.0)
Requirement already satisfied: safetensors in /usr/local/lib/python3.12/dist-packages (from timm) (0.7.0)
Requirement already satisfied: filelock in /usr/local/lib/python3.12/dist-packages (from huggingface_hub->timm) (3.20.0)
Requirement already satisfied: fsspec>=2023.5.0 in /usr/local/lib/python3.12/dist-packages (from huggingface_hub->timm) (2025.3)
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Requirement already satisfied: tqdm>=4.42.1 in /usr/local/lib/python3.12/dist-packages (from huggingface_hub->timm) (4.67.1)
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Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.12/dist-packages (from requests->huggingface_hub->ti
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.12/dist-packages (from requests->huggingface_hub->ti
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Requirement already satisfied: networkx>=2.5.1 in /usr/local/lib/python3.12/dist-packages (from torch->timm) (3.6)
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Requirement already satisfied: nvidia-cudnn-cu12==9.10.2.21 in /usr/local/lib/python3.12/dist-packages (from torch->timm) (9.10.
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Requirement already satisfied: numpy in /usr/local/lib/python3.12/dist-packages (from torchvision->timm) (2.0.2)
Requirement already satisfied: pillow!=8.3.*,>=5.3.0 in /usr/local/lib/python3.12/dist-packages (from torchvision->timm) (11.3.0
```

```
!pip install --upgrade pip
!pip install ultralytics timm torchvision
```

```
Requirement already satisfied: pip in /usr/local/lib/python3.12/dist-packages (25.3)
Requirement already satisfied: ultralytics in /usr/local/lib/python3.12/dist-packages (8.3.235)
Requirement already satisfied: timm in /usr/local/lib/python3.12/dist-packages (1.0.22)
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Requirement already satisfied: nvidia-cuda-runtime-cu12==12.6.77 in /usr/local/lib/python3.12/dist-packages (from torch>=1.8.0->
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Requirement already satisfied: nvidia-cudnn-cu12==9.10.2.21 in /usr/local/lib/python3.12/dist-packages (from torch>=1.8.0->ultra
Requirement already satisfied: nvidia-cublas-cu12==12.6.4.21 in /usr/local/lib/python3.12/dist-packages (from torch>=1.8.0->ultra
Requirement already satisfied: nvidia-cufft-cu12==11.3.0.4 in /usr/local/lib/python3.12/dist-packages (from torch>=1.8.0->ultral
Requirement already satisfied: nvidia-curand-cu12==10.3.7.77 in /usr/local/lib/python3.12/dist-packages (from torch>=1.8.0->ultr
Requirement already satisfied: nvidia-cusolver-cu12==11.7.1.2 in /usr/local/lib/python3.12/dist-packages (from torch>=1.8.0->ult
Requirement already satisfied: nvidia-cusparse-cu12==12.5.4.2 in /usr/local/lib/python3.12/dist-packages (from torch>=1.8.0->ultr
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Requirement already satisfied: nvidia-nccl-cu12==2.27.5 in /usr/local/lib/python3.12/dist-packages (from torch>=1.8.0->ultralyti
Requirement already satisfied: nvidia-nvshmem-cu12==3.3.20 in /usr/local/lib/python3.12/dist-packages (from torch>=1.8.0->ultral
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Requirement already satisfied: triton==3.5.0 in /usr/local/lib/python3.12/dist-packages (from torch>=1.8.0->ultralytics) (3.5.0)
```

```
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.12/dist-packages (from matplotlib>=3.3.0->ultralytics)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.12/dist-packages (from matplotlib>=3.3.0->ultralytics) (0)
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.12/dist-packages (from matplotlib>=3.3.0->ultralytics)
Requirement already satisfied: kiwisolver>=1.3.1 in /usr/local/lib/python3.12/dist-packages (from matplotlib>=3.3.0->ultralytics)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.12/dist-packages (from matplotlib>=3.3.0->ultralytics)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.12/dist-packages (from matplotlib>=3.3.0->ultralytics)
Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.12/dist-packages (from matplotlib>=3.3.0->ultralytics)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.12/dist-packages (from python-dateutil>=2.7->matplotlib>=3.3.0)
Requirement already satisfied: charset_normalizer<4,>=2 in /usr/local/lib/python3.12/dist-packages (from requests>=2.23.0->ultralytics)
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.12/dist-packages (from requests>=2.23.0->ultralytics) (3.7)
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.12/dist-packages (from requests>=2.23.0->ultralytics)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.12/dist-packages (from requests>=2.23.0->ultralytics)
Requirement already satisfied: mpmath<1.4,>=1.0 in /usr/local/lib/python3.12/dist-packages (from sympy>=1.13.3->torch>=1.8.0->ultralytics)
Requirement already satisfied: tqdm>=4.42.1 in /usr/local/lib/python3.12/dist-packages (from huggingface_hub->timm) (4.67.1)
Requirement already satisfied: hf-xet<2.0.0,>=1.1.3 in /usr/local/lib/python3.12/dist-packages (from huggingface_hub->timm) (1.2)
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.12/dist-packages (from jinja2->torch>=1.8.0->ultralytics)
```

```
from ultralytics import YOLO
import timm
import torch
print("ultralytics, timm, and torch imported successfully")
```

```
ultralytics, timm, and torch imported successfully
```

```
from PIL import Image
import os
from ultralytics import YOLO

# Load trained YOLO model (uploaded from your computer)
best_pt_path = "/content/best.pt"
model = YOLO(best_pt_path)

# Select one validation image
val_images_dir = os.path.join(DATASET_DIR, "valid", "images")
sample_image = os.listdir(val_images_dir)[0]
img_path = os.path.join(val_images_dir, sample_image)

print("Using image:", img_path)

# Run YOLO on the image
results = model(img_path)

# Load original image
orig_img = Image.open(img_path).convert("RGB")
```

```
Using image: /content/smoke-1/valid/images/M_00968_png_jpg.rf.a4a5a2d42fc643ae37dbf44151de898e.jpg
```

```
image 1/1 /content/smoke-1/valid/images/M_00968_png_jpg.rf.a4a5a2d42fc643ae37dbf44151de898e.jpg: 640x640 3 -----
Speed: 34.1ms preprocess, 511.1ms inference, 43.0ms postprocess per image at shape (1, 3, 640, 640)
```

```
from ultralytics import YOLO
from PIL import Image
import os

# Path to trained YOLO model
best_pt_path = "/content/best.pt"
model = YOLO(best_pt_path)

# Pick one validation image
val_images_dir = os.path.join(DATASET_DIR, "valid", "images")
sample_image = os.listdir(val_images_dir)[0]
img_path = os.path.join(val_images_dir, sample_image)

print("Using image:", img_path)

# Run YOLO on the image
results = model(img_path)

# Load original image
orig_img = Image.open(img_path).convert("RGB")
```

```
Using image: /content/smoke-1/valid/images/M_00968_png_jpg.rf.a4a5a2d42fc643ae37dbf44151de898e.jpg
```

```
image 1/1 /content/smoke-1/valid/images/M_00968.png.jpg.rf.a4a5a2d42fc643ae37dbf44151de898e.jpg: 640x640 3 -----
Speed: 5.2ms preprocess, 199.4ms inference, 1.0ms postprocess per image at shape (1, 3, 640, 640)
```

```
# Extract YOLO detection boxes
boxes = results[0].boxes

if len(boxes) == 0:
    print("No boxes detected - try another image.")
else:
    box = boxes[0] # take first detection
    x1, y1, x2, y2 = box.xyxy[0].tolist()
    crop = orig_img.crop((x1, y1, x2, y2))

    display(crop) # Display a cropped image
```



```
import timm
import torch

# Confirm ViT models exist
print([m for m in timm.list_models() if "vit" in m][:10])

# Load a Vision Transformer (Transformer-based classifier)
vit_model = timm.create_model(
    "vit_base_patch16_224",
    pretrained=True
)

vit_model.eval()
print("Transformer model loaded successfully!")
```

```
['convit_base', 'convit_small', 'convit_tiny', 'crossvit_9_240', 'crossvit_9_dagger_240', 'crossvit_15_240', 'crossvit_15_dagger']
```

The secret `HF_TOKEN` does not exist in your Colab secrets.
To authenticate with the Hugging Face Hub, create a token in your settings tab (<https://huggingface.co/settings/tokens>), set it
You will be able to reuse this secret in all of your notebooks.
Please note that authentication is recommended but still optional to access public models or datasets.
Transformer model loaded successfully!

```
import torchvision.transforms as T

# ImageNet-style preprocessing
transform = T.Compose([
    T.Resize((224, 224)),
    T.ToTensor(),
    T.Normalize(
        mean=[0.485, 0.456, 0.406],
        std=[0.229, 0.224, 0.225]
    ),
])

if len(boxes) > 0:
    inp = transform(crop).unsqueeze(0)

    with torch.no_grad():
        logits = vit_model(inp)
        probs = torch.softmax(logits, dim=1)[0]

    top5 = torch.topk(probs, 5)
    print("Top-5 Transformer predictions (ImageNet):")
    print(top5)
```

```
else:  
    print("Skipping Transformer: no boxes from YOLO.")  
  
Top-5 Transformer predictions (ImageNet):  
torch.return_types.topk(  
values=tensor([0.8009, 0.0156, 0.0121, 0.0115, 0.0061]),  
indices=tensor([974, 975, 449, 660, 970]))
```