```
!pip install -q "transformers>=4.41.2" "torch>=2.1" pillow matplotlib

import torch
import requests
from PIL import Image
import matplotlib.pyplot as plt
import numpy as np
from tqdm.notebook import tqdm
import imageio
from decord import VideoReader, cpu

# Check for GPU availability and set the device
device = "cuda" if torch.cuda.is_available() else "cpu"
print(f"✅ Using device: {device}")
```

```
✅ Using device: cpu
```

```
from transformers import AutoProcessor, AutoModelForZeroShotObjectDete

# Load GroundingDINO (Text-to-Box)
grounding_dino_processor = AutoProcessor.from_pretrained("IDEA-Researc
grounding_dino_model = AutoModelForZeroShotObjectDetection.from_pretra

# Load Original SAM (Box-to-Mask)
sam_model_id = "facebook/sam-vit-base" # <-- Open-access model
sam_model = SamModel.from_pretrained(sam_model_id).to(device)
sam_processor = SamProcessor.from_pretrained(sam_model_id)
```

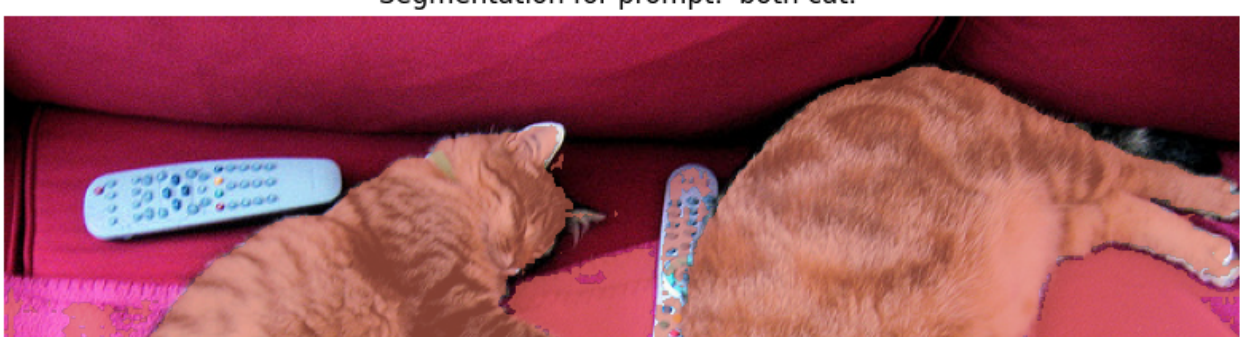
```
/usr/local/lib/python3.12/dist-packages/huggingface_hub/utils/_auth.py:
The secret `HF_TOKEN` does not exist in your Colab secrets.
To authenticate with the Hugging Face Hub, create a token in your setti
You will be able to reuse this secret in all of your notebooks.
Please note that authentication is recommended but still optional to ac
  warnings.warn(
Fetching 1 files: 100% 1/1 [00:00<00:00, 20.77it/s]
Fetching 1 files: 100% 1/1 [00:00<00:00, 23.84it/s]
Fetching 1 files: 100% 1/1 [00:00<00:00, 30.94it/s]
```

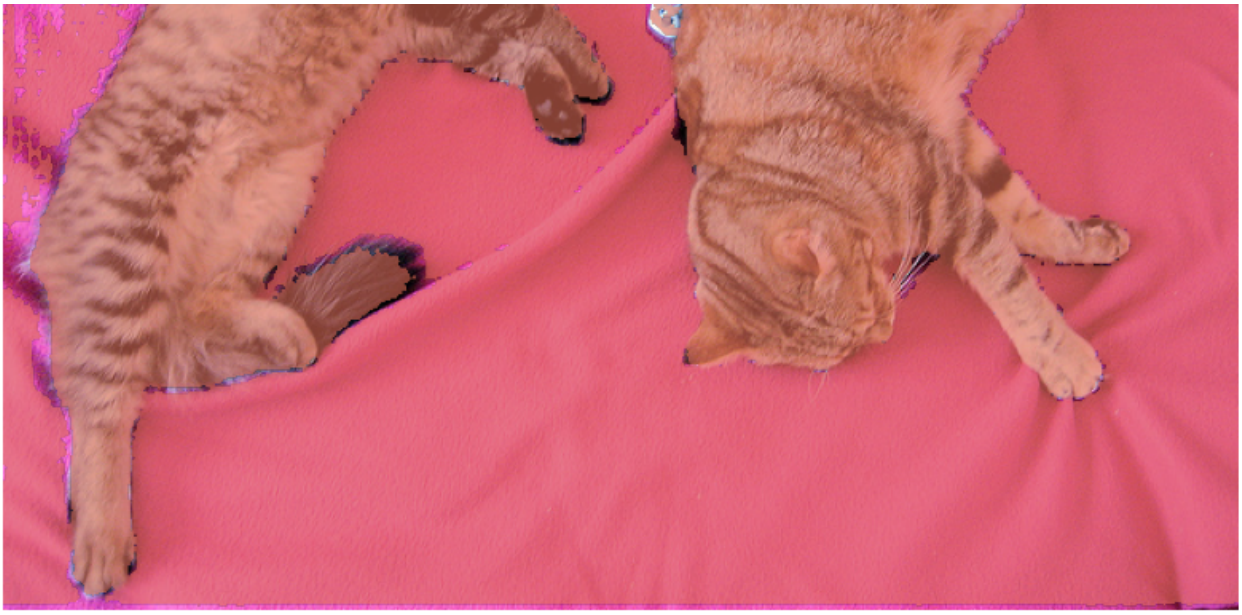
```
# Helper functions to display the final mask overlay.
# ======================================================================
def show_mask(mask, ax, random_color=False):
    """Overlays a segmentation mask on a matplotlib axis."""
    if random_color:
        color = np.concatenate([np.random.random(3), np.array([0.6])],
    else:
        color = np.array([30/255, 144/255, 255/255, 0.6]) # Blue with
    h, w = mask.shape[-2:]
    mask_image = mask.reshape(h, w, 1) * color.reshape(1, 1, -1)
    ax.imshow(mask_image)

def display_image_with_masks(image, masks, title=""):
    """Displays the original image with segmentation masks overlaid."'
    plt.figure(figsize=(10, 10))
    plt.imshow(image)
    # The 'masks' tensor has a shape of (num_boxes, 3, height, width),
    # We loop through each detected box.
    for mask_set in masks:
        # For each box, SAM predicts 3 masks. We'll just display the
        single_mask = mask_set[0]
        show_mask(single_mask.cpu().numpy(), plt.gca(), random_color=
    plt.title(title)
    plt.axis('off')
    plt.show()
```

```
# ======================================================================
# 4. SINGLE IMAGE SEGMENTATION PIPELINE
# ======================================================================
print("\n--- Starting Text-Driven Image Segmentation ---")

# --- Step 1: Load Image ---
image_url = "http://images.cocodataset.org/val2017/000000039769.jpg"
image_pil = Image.open(requests.get(image_url, stream=True).raw).conve
print(f"Image loaded from URL.")

# --- Step 2: Accept a Text Prompt ---
text_prompt = "both cat."
print(f" Text Prompt: '{text_prompt}'")

# --- Step 3: Convert Text to Region Seeds (GroundingDINO) ---
print(" Running GroundingDINO to find the object...")
inputs = grounding_dino_processor(images=image_pil, text=text_prompt,
with torch.no_grad():
    outputs = grounding_dino_model(**inputs)

#  FINAL CORRECTION: Call the function on the .image_processor attribu
```

```
results = grounding_dino_processor.image_processor.post_process_objec
    outputs,
    target_sizes=[image_pil.size[::-1]],
    threshold=0.4
)

# Extract bounding boxes
boxes = results[0]["boxes"]
print(f" Found {len(boxes)} instance(s) of '{text_prompt}'.")


# --- Step 4: Feed Seeds to SAM ---
print(" Running SAM to generate segmentation masks...")
# Format boxes for SAM input
input_boxes = [[box.tolist()] for box in boxes]
sam_inputs = sam_processor(image_pil, input_boxes=input_boxes, return_

# Generate masks
with torch.no_grad():
    sam_outputs = sam_model(**sam_inputs)

# Post-process masks
masks = sam_processor.image_processor.post_process_masks(
    sam_outputs.pred_masks.cpu(),
    sam_inputs["original_sizes"].cpu(),
    sam_inputs["reshaped_input_sizes"].cpu()
)[0]
print(" Mask generation complete.")

# --- Step 5: Display the Final Mask Overlay ---
display_image_with_masks(image_pil, masks, title=f"Segmentation for pr
```

```
--- Starting Text-Driven Image Segmentation ---
Image loaded from URL.
 Text Prompt: 'both cat.'
 Running GroundingDINO to find the object...
 Found 1 instance(s) of 'both cat.'.
 Running SAM to generate segmentation masks...
 Mask generation complete.
```





```
import numpy as np

def get_bounding_box(mask):
    """
    Calculates the bounding box of a binary mask.
    The mask should be a 2D numpy array.
    """
    y_indices, x_indices = np.where(mask)
    if len(x_indices) == 0: # Handle cases where the mask is empty
        return [0, 0, 0, 0]
    x_min, x_max = np.min(x_indices), np.max(x_indices)
    y_min, y_max = np.min(y_indices), np.max(y_indices)
    # Return in [x_min, y_min, x_max, y_max] format
    return [int(x_min), int(y_min), int(x_max), int(y_max)]
```

```
# ================================================================
# 5. (BONUS) VIDEO OBJECT SEGMENTATION (Final Corrected Version)
# ================================================================
print("\n--- Starting Text-Driven Video Segmentation (Bonus) ---")

import cv2
import os
from google.colab import files

# --- Step 1: Upload Video From Your Computer ---
print(" KPlease upload a short video file from your computer.")
uploaded = files.upload()

if not uploaded:
    print("❌ No file was uploaded. Please run the cell again.")
```

```
else:
    video_path = list(uploaded.keys())[0]
    print(f"✅ User uploaded file: '{video_path}'")

    # --- Step 2: Perform Initial Segmentation on the First Frame ---
    cap = cv2.VideoCapture(video_path)
    if not cap.isOpened():
        print("❌ Error: OpenCV could not open the uploaded video fil
    else:
        ret, first_frame = cap.read()
        if not ret:
            print("❌ Error: Could not read the first frame.")
        else:
            first_frame_rgb = cv2.cvtColor(first_frame, cv2.COLOR_BGR
            first_frame_pil = Image.fromarray(first_frame_rgb)
            cap.release()

            # IMPORTANT: Change this prompt to match the object in YOU
            video_text_prompt = "a dog."
            print(f"💬 Video Text Prompt: '{video_text_prompt}'")

            print("🔍 Running GroundingDINO on the first frame...")
            inputs = grounding_dino_processor(images=first_frame_pil,
            with torch.no_grad():
                outputs = grounding_dino_model(**inputs)

            results = grounding_dino_processor.image_processor.post_pr
                outputs, target_sizes=[first_frame_pil.size[::-1]], th
            )
            boxes = results[0]['boxes']

            if len(boxes) == 0:
                print(f"⚠️ No '{video_text_prompt}' found in the firs
            else:
                print("🎨 Running SAM on the first frame...")
                input_boxes = [[boxes[0].tolist()]]
                sam_inputs = sam_processor(first_frame_pil, input_boxe
                with torch.no_grad():
                    sam_outputs = sam_model(**sam_inputs)
                masks = sam_processor.image_processor.post_process_mas
                    sam_outputs.pred_masks.cpu(), sam_inputs["original
                )[0]
                prev_mask = masks[0]

                # --- Step 3: Propagate Mask Across Frames ---
                print("🏃 Propagating mask across video frames...")
                output_frames = []
```

```
# The broken import line has been removed. We now use

cap = cv2.VideoCapture(video_path)
frame_count = int(cap.get(cv2.CAP_PROP_FRAME_COUNT))

for _ in tqdm(range(frame_count), desc="Video Frame Pr
    ret, frame = cap.read()
    if not ret: break

    frame_rgb = cv2.cvtColor(frame, cv2.COLOR_BGR2RGB)
    frame_pil = Image.fromarray(frame_rgb)

    # Use our new helper function
    bbox = get_bounding_box(prev_mask[0].numpy())
    video_inputs = sam_processor(frame_pil, input_boxe
    with torch.no_grad():
        video_outputs = sam_model(**video_inputs)

    new_masks = sam_processor.image_processor.post_pro
        video_outputs.pred_masks.cpu(), video_inputs['
    )[0]
    prev_mask = new_masks[0]

    frame_overlayed = frame_rgb.copy()
    color_mask = np.array([30, 144, 255], dtype=np.uin
    frame_overlayed[prev_mask[0].numpy().astype(bool)]
    output_frames.append(frame_overlayed)

cap.release()

# --- Step 4: Save the Output Video ---
if output_frames:
    output_video_path = "output_segmented_video.mp4"
    print(f"💾 Saving segmented video to {output_vide
    imageio.mimsave(output_video_path, output_frames,
    print("✅ Video processing complete!")
```

```
--- Starting Text-Driven Video Segmentation (Bonus) ---
 KPlease upload a short video file from your computer.
Choose Files no files selected  Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.
Saving 2795691-uhd_3840_2160_25fps.mp4 to 2795691-uhd_3840_2160_25fps (
✅ User uploaded file: '2795691-uhd_3840_2160_25fps (1).mp4'
💬 Video Text Prompt: 'a dog.'
🔍 Running GroundingDINO on the first frame...
🎨 Running SAM on the first frame...
🏃 Propagating mask across video frames...
Video Frame Processing: 100% ████████████████████ 154/154 [1:13:24<00:00, 28.04s/it]
```

```
💾 Saving segmented video to output_segmented_video.mp4...
✅ Video processing complete!
```

Start coding or generate with AI.