```
import kagglehub

# Download dataset
path = kagglehub.dataset_download("mohamedhanyyy/chest-ctscan-images")
print("Dataset path:", path)
```

```
Using Colab cache for faster access to the 'chest-ctscan-images' dataset.
Dataset path: /kaggle/input/chest-ctscan-images
```

```
!pip install torch torchvision torchaudio --index-url https://download.pytorch.org/whl/cu118
!pip install opencv-python matplotlib segment-anything
!wget -O sam_vit_b_01ec64.pth https://dl.fbaipublicfiles.com/segment_anything/sam_vit_b_01ec64.pth
```

```
Looking in indexes: https://download.pytorch.org/whl/cu118
Requirement already satisfied: torch in /usr/local/lib/python3.12/dist-packages (2.9.0+cpu)
Requirement already satisfied: torchvision in /usr/local/lib/python3.12/dist-packages (0.24.0+cpu)
Requirement already satisfied: torchaudio in /usr/local/lib/python3.12/dist-packages (2.9.0+cpu)
Requirement already satisfied: filelock in /usr/local/lib/python3.12/dist-packages (from torch) (3.20.0)
Requirement already satisfied: typing-extensions>=4.10.0 in /usr/local/lib/python3.12/dist-packages (from torch) (4.15.0)
Requirement already satisfied: setuptools in /usr/local/lib/python3.12/dist-packages (from torch) (75.2.0)
Requirement already satisfied: sympy>=1.13.3 in /usr/local/lib/python3.12/dist-packages (from torch) (1.14.0)
Requirement already satisfied: networkx>=2.5.1 in /usr/local/lib/python3.12/dist-packages (from torch) (3.6.1)
Requirement already satisfied: jinja2 in /usr/local/lib/python3.12/dist-packages (from torch) (3.1.6)
Requirement already satisfied: fsspec>=0.8.5 in /usr/local/lib/python3.12/dist-packages (from torch) (2025.3.0)
Requirement already satisfied: numpy in /usr/local/lib/python3.12/dist-packages (from torchvision) (2.0.2)
Requirement already satisfied: pillow!=8.3.*,>=5.3.0 in /usr/local/lib/python3.12/dist-packages (from torchvision) (11.3.0)
Requirement already satisfied: mpmath<1.4,>=1.1.0 in /usr/local/lib/python3.12/dist-packages (from sympy>=1.13.3->torch) (1.3.0)
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.12/dist-packages (from jinja2->torch) (3.0.3)
Requirement already satisfied: opencv-python in /usr/local/lib/python3.12/dist-packages (4.12.0.88)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.12/dist-packages (3.10.0)
Collecting segment-anything
  Downloading segment_anything-1.0-py3-none-any.whl.metadata (487 bytes)
Requirement already satisfied: numpy<2.3.0,>=2 in /usr/local/lib/python3.12/dist-packages (from opencv-python) (2.0.2)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.12/dist-packages (from matplotlib) (1.3.3)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.12/dist-packages (from matplotlib) (0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.12/dist-packages (from matplotlib) (4.61.1)
Requirement already satisfied: kiwisolver>=1.3.1 in /usr/local/lib/python3.12/dist-packages (from matplotlib) (1.4.9)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.12/dist-packages (from matplotlib) (25.0)
Requirement already satisfied: pillow>=8 in /usr/local/lib/python3.12/dist-packages (from matplotlib) (11.3.0)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.12/dist-packages (from matplotlib) (3.2.5)
Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.12/dist-packages (from matplotlib) (2.9.0.post0)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.12/dist-packages (from python-dateutil>=2.7->matplotlib) (1.17.0)
Downloading segment_anything-1.0-py3-none-any.whl (36 kB)
Installing collected packages: segment-anything
Successfully installed segment-anything-1.0
--2025-12-24 06:12:15--  https://dl.fbaipublicfiles.com/segment_anything/sam_vit_b_01ec64.pth
Resolving dl.fbaipublicfiles.com (dl.fbaipublicfiles.com)... 13.249.182.62, 13.249.182.81, 13.249.182.33, ...
Connecting to dl.fbaipublicfiles.com (dl.fbaipublicfiles.com)|13.249.182.62|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 375042383 (358M) [binary/octet-stream]
Saving to: 'sam_vit_b_01ec64.pth'

sam_vit_b_01ec64.pt 100%[===================>] 357.67M   326MB/s    in 1.1s

2025-12-24 06:12:16 (326 MB/s) - 'sam_vit_b_01ec64.pth' saved [375042383/375042383]
```

```
# 4️⃣ Load SAM
from segment_anything import sam_model_registry, SamPredictor
import cv2
import numpy as np
import matplotlib.pyplot as plt

sam = sam_model_registry["vit_b"](checkpoint="sam_vit_b_01ec64.pth")
predictor = SamPredictor(sam)
```

```
# 5️⃣ Function to run SAM segmentation and save results
def run_sam_segmentation(img_path, save_path):
    img = cv2.imread(img_path)
    img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
    predictor.set_image(img)

    # Example: one foreground click at center
    h, w, _ = img.shape
    input_points = np.array([[w//2, h//2]])
    input_labels = np.array([1])

    masks, scores, _ = predictor.predict(point_coords=input_points,
                                         point_labels=input_labels,
                                         multimask_output=False)

    # Visualize Before/After
    plt.figure(figsize=(8,4))
    plt.subplot(1,2,1)
    plt.imshow(img)
    plt.title("Before")
    plt.subplot(1,2,2)
    plt.imshow(img)
    plt.imshow(masks[0], alpha=0.5)
    plt.title("After")
    plt.show()

    # Save mask overlay
    mask_save_path = os.path.join(save_path, os.path.basename(img_path).split('.')[0]+"_after.png")
    plt.imsave(mask_save_path, masks[0], cmap='gray')
```

```
import os

# Input folder (read-only)
img_folder = "/kaggle/input/chest-ctscan-images"

# Output folder (writeable)
result_folder = "/content/results/before_after"
os.makedirs(result_folder, exist_ok=True)

# Run SAM segmentation on all images
for root, dirs, files_list in os.walk(img_folder):
    for f in files_list:
        if f.lower().endswith(('.png','.jpg','.jpeg')):
            run_sam_segmentation(os.path.join(root,f), result_folder)
```

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```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

```
# 7 Compute IoU if you have ground truth masks
def iou(pred_mask, true_mask):
    intersection = np.logical_and(pred_mask, true_mask).sum()
    union = np.logical_or(pred_mask, true_mask).sum()
    return intersection / union
```

```
# 8 Classification with transfer learning (cancer vs normal)
import torch
import torch.nn as nn
import torch.optim as optim
from torchvision import transforms, models, datasets
from torch.utils.data import DataLoader

# Transform & dataset
transform = transforms.Compose([
    transforms.Resize((224,224)),
    transforms.ToTensor()
])

dataset = datasets.ImageFolder("/kaggle/input/chest-ctscan-images", transform=transform)  # assumes subfolders per class
loader = DataLoader(dataset, batch_size=16, shuffle=True)
```

```
# Model setup
device = torch.device("cuda" if torch.cuda.is_available() else "cpu")
model = models.resnet18(pretrained=True)
model.fc = nn.Linear(model.fc.in_features, len(dataset.classes))
model = model.to(device)

criterion = nn.CrossEntropyLoss()
optimizer = optim.Adam(model.parameters(), lr=1e-4)
```

```
/usr/local/lib/python3.12/dist-packages/torchvision/models/_utils.py:208: UserWarning: The parameter 'pretrained' is deprecated since 0.13 and may be removed in the future, pleas
  warnings.warn(
/usr/local/lib/python3.12/dist-packages/torchvision/models/_utils.py:223: UserWarning: Arguments other than a weight enum or `None` for 'weights' are deprecated since 0.13 and
  warnings.warn(msg)
Downloading: "https://download.pytorch.org/models/resnet18-f37072fd.pth" to /root/.cache/torch/hub/checkpoints/resnet18-f37072fd.pth
100%|[illegible]| 44.7M/44.7M [00:00<00:00, 265MB/s]
```

```
# Quick 1-epoch training loop (demo)
for images, labels in loader:
    images, labels = images.to(device), labels.to(device)
    optimizer.zero_grad()
    outputs = model(images)
    loss = criterion(outputs, labels)
    loss.backward()
    optimizer.step()
```