```
from google.colab import drive
drive.mount('/content/drive', force_remount=True)
```

```
Mounted at /content/drive
```

```
!pip install nnunetv2
```

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The following block locates the nnUNet installation path for modifying source code parameters (e.g., epoch)

```
import nnunetv2
import os

# 1. use nnunetv2 module's __file__ to find the dir
package_init_file = nnunetv2.__file__

# 2. get dir ( nnunetv2 root)
package_root_directory = os.path.dirname(package_init_file)

print("nnUNetV2 Root Directory:")
print(package_root_directory)

# 3. find Trainer Directory
trainer_path = os.path.join(package_root_directory, 'training', 'nnUNetTrainer')

print("\nnnUNetTrainer Directory:")
print(trainer_path)
```

```
nnUNetV2 Root Directory:
/usr/local/lib/python3.12/dist-packages/nnunetv2

nnUNetTrainer Directory:
/usr/local/lib/python3.12/dist-packages/nnunetv2/training/nnUNetTrainer
```

The following block creates local paths to speed up processing and prevent cloud drive storage exhaustion

```
# 1. # Set nnUNet_raw to point to the parent directory of your Drive data
%env nnUNet_raw=/content/drive/MyDrive/JHPIEGO/data

# 2. # Set nnUNet_preprocessed and nnUNet_results to local storage (faster speed)
%env nnUNet_preprocessed=/content/nnUNet_data/nnUNet_preprocessed
%env nnUNet_results=/content/nnUNet_data/nnUNet_results
```

```
env: nnUNet_raw=/content/drive/MyDrive/JHPIEGO/data
env: nnUNet_preprocessed=/content/nnUNet_data/nnUNet_preprocessed
env: nnUNet_results=/content/nnUNet_data/nnUNet_results
```

```
# 1. Create nnUNet_preprocessed and nnUNet_results folders locally in Colab
!mkdir -p $nnUNet_preprocessed
!mkdir -p $nnUNet_results

# 2. Verify if the nnUNet_raw path correctly points to your Drive data
print("Verify nnUNet_raw:")
!ls $nnUNet_raw
```

```
Verify nnUNet_raw:
cervix                                  prediction002_output_final_resized20
Dataset001_cervix                       prediction002_output_fold01234
Dataset002_Lesion                       prediction002_output_fold01234_2
Dataset003_scj                          prediction002_output_fold01234_new
final_segmentation_002                  prediction002_output_fold01234_new_2
final_segmentation_002_new              prediction003_output_fold1
lesion                                  prediction_output_fold2
prediction001_output_fold01234_new      scj
prediction001_output_fold3              test
prediction002_output_final20
```

```
#  Verify  successful  installation
!nnUNetv2_train  -h
```

```
usage: nnUNetv2_train [-h] [-tr TR] [-p P]
                      [-pretrained_weights PRETRAINED_WEIGHTS]
                      [-num_gpus NUM_GPUS] [--npz] [--c] [--val] [--val_best]
                      [--disable_checkpointing] [-device DEVICE]
                      dataset_name_or_id configuration fold

positional arguments:
  dataset_name_or_id    Dataset name or ID to train with
  configuration         Configuration that should be trained
  fold                  Fold of the 5-fold cross-validation. Should be an int
                        between 0 and 4.

options:
  -h, --help            show this help message and exit
  -tr TR                [OPTIONAL] Use this flag to specify a custom trainer.
                        Default: nnUNetTrainer
  -p P                  [OPTIONAL] Use this flag to specify a custom plans
                        identifier. Default: nnUNetPlans
  -pretrained_weights PRETRAINED_WEIGHTS
                        [OPTIONAL] path to nnU-Net checkpoint file to be used
                        as pretrained model. Will only be used when actually
                        training. Beta. Use with caution.
  -num_gpus NUM_GPUS    Specify the number of GPUs to use for training
  --npz                 [OPTIONAL] Save softmax predictions from final
                        validation as npz files (in addition to predicted
                        segmentations). Needed for finding the best ensemble.
  --c                   [OPTIONAL] Continue training from latest checkpoint
  --val                 [OPTIONAL] Set this flag to only run the validation.
                        Requires training to have finished.
  --val_best            [OPTIONAL] If set, the validation will be performed
                        with the checkpoint_best instead of checkpoint_final.
                        NOT COMPATIBLE with --disable_checkpointing! WARNING:
                        This will use the same 'validation' folder as the
                        regular validation with no way of distinguishing the
                        two!
  --disable_checkpointing
                        [OPTIONAL] Set this flag to disable checkpointing.
                        Ideal for testing things out and you dont want to
                        flood your hard drive with checkpoints.
  -device DEVICE        Use this to set the device the training should run
                        with. Available options are 'cuda' (GPU), 'cpu' (CPU)
                        and 'mps' (Apple M1/M2). Do NOT use this to set which
                        GPU ID! Use CUDA_VISIBLE_DEVICES=X nnUNetv2_train
                        [...] instead!
```

```
#  Run  planning  and  preprocessing
!nnUNetv2_plan_and_preprocess  -d  1  2  3  --verify_dataset_integrity
```

```
If you didn't see any error messages then your dataset is most likely OK!
####################

Using <class 'nnunetv2.imageio.natural_image_reader_writer.NaturalImage2DIO'> as reader/writer
100% 154/154 [00:23<00:00,  6.56it/s]
Dataset003_scj
Using <class 'nnunetv2.imageio.natural_image_reader_writer.NaturalImage2DIO'> as reader/writer

####################
verify_dataset_integrity Done.
If you didn't see any error messages then your dataset is most likely OK!
####################

Using <class 'nnunetv2.imageio.natural_image_reader_writer.NaturalImage2DIO'> as reader/writer
100% 255/255 [00:26<00:00,  9.50it/s]
Experiment planning...

############################
INFO: You are using the old nnU-Net default planner. We have updated our recommendations. Please consider using those instead! Read mo
############################

2D U-Net configuration:
```

```
100% 301/301 [01:06<00:00,  4.53it/s]
Configuration: 3d_fullres...
INFO: Configuration 3d_fullres not found in plans file nnUNetPlans.json of dataset Dataset001_cervix. Skipping.
Configuration: 3d_lowres...
INFO: Configuration 3d_lowres not found in plans file nnUNetPlans.json of dataset Dataset001_cervix. Skipping.
Preprocessing dataset Dataset002_Lesion
Configuration: 2d...
100% 154/154 [00:40<00:00,  3.85it/s]
Configuration: 3d_fullres...
INFO: Configuration 3d_fullres not found in plans file nnUNetPlans.json of dataset Dataset002_Lesion. Skipping.
Configuration: 3d_lowres...
INFO: Configuration 3d_lowres not found in plans file nnUNetPlans.json of dataset Dataset002_Lesion. Skipping.
Preprocessing dataset Dataset003_scj
Configuration: 2d...
100% 255/255 [00:57<00:00,  4.40it/s]
Configuration: 3d_fullres...
INFO: Configuration 3d_fullres not found in plans file nnUNetPlans.json of dataset Dataset003_scj. Skipping.
Configuration: 3d_lowres...
INFO: Configuration 3d_lowres not found in plans file nnUNetPlans.json of dataset Dataset003_scj. Skipping.
```

Train

```
# Train Dataset002 with the 2D configuration (Fold 3)
# can repeat this block and change the fold number or dataset number to train what you want
!nnUNetv2_train 002 2d 3
```

This block attempts multi-GPU training (parallel execution failed); reuse the above single-GPU command and modify fold/dataset as needed

```
#Using multiple GPUs for training
!CUDA_VISIBLE_DEVICES=0 nnUNetv2_train 002 2d 2 &
!CUDA_VISIBLE_DEVICES=1 nnUNetv2_train 002 2d 3 &
```

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save to google drive

```
# # Copy Dataset002 results from local storage to Drive
!cp -r $nnUNet_results/Dataset002_Lesion /content/drive/MyDrive/JHPIEGO/nnUNet_Saved_Results_Backup/
```

postprocessing and predicting

```
!nnUNetv2_find_best_configuration 002 -c 2d
```

This block configures the paths for the model and input data. You can adjust the paths based on your specific setup. Use this to select the model you want to use.

```
%env nnUNet_raw=/content/drive/MyDrive/JHPIEGO/data
%env nnUNet_preprocessed=/content/nnUNet_data/nnUNet_preprocessed
%env nnUNet_results=/content/drive/MyDrive/JHPIEGO/nnUNet_Saved_Results_Backup
```

```
env: nnUNet_raw=/content/drive/MyDrive/JHPIEGO/data
env: nnUNet_preprocessed=/content/nnUNet_data/nnUNet_preprocessed
env: nnUNet_results=/content/drive/MyDrive/JHPIEGO/nnUNet_Saved_Results_Backup
```

```
print("--- Step 2: prediction ---")
!nnUNetv2_predict -d 002 -c 2d \
       -i /content/drive/MyDrive/JHPIEGO/mytest/images/ \
       -o /content/drive/MyDrive/JHPIEGO/data/prediction002_output_final_resized20/ \
       -f 0 1 2 3 4
```

```
100% 1/1 [00:00<00:00, 19.44it/s]
sending off prediction to background worker for resampling and export
done with Case-51_C51Aceto-4-_jpg

Predicting Case-54_C54Aceto-1-_jpg:
perform_everything_on_device: True
100% 1/1 [00:00<00:00, 20.43it/s]
100% 1/1 [00:00<00:00, 19.94it/s]
100% 1/1 [00:00<00:00, 20.40it/s]
100% 1/1 [00:00<00:00, 21.69it/s]
100% 1/1 [00:00<00:00, 28.07it/s]
sending off prediction to background worker for resampling and export
done with Case-54_C54Aceto-1-_jpg

Predicting Case-57_C57Aceto-1-_jpg:
perform_everything_on_device: True
100% 1/1 [00:00<00:00, 28.53it/s]
100% 1/1 [00:00<00:00, 30.61it/s]
100% 1/1 [00:00<00:00, 27.35it/s]
100% 1/1 [00:00<00:00, 24.89it/s]
100% 1/1 [00:00<00:00, 16.72it/s]
sending off prediction to background worker for resampling and export
done with Case-57_C57Aceto-1-_jpg

Predicting Case-57_C57Aceto-4-_jpg:
perform_everything_on_device: True
100% 1/1 [00:00<00:00, 21.61it/s]
100% 1/1 [00:00<00:00, 23.55it/s]
100% 1/1 [00:00<00:00, 14.49it/s]
100% 1/1 [00:00<00:00, 21.19it/s]
100% 1/1 [00:00<00:00, 23.62it/s]
sending off prediction to background worker for resampling and export
done with Case-57_C57Aceto-4-_jpg

Predicting Case-62_C62Aceto-2-_jpg:
perform_everything_on_device: True
100% 1/1 [00:00<00:00, 23.53it/s]
100% 1/1 [00:00<00:00, 23.50it/s]
100% 1/1 [00:00<00:00, 25.05it/s]
100% 1/1 [00:00<00:00, 17.98it/s]
100% 1/1 [00:00<00:00, 25.16it/s]
sending off prediction to background worker for resampling and export
done with Case-62_C62Aceto-2-_jpg
```

calculate Dice and IOU

```
import torch
import numpy as np
from PIL import Image
import os


import os
import torch
import numpy as np
from PIL import Image

def load_and_preprocess_images(predict_dir, target_dir, size=(256, 256)):

        predict_files = sorted([f for f in os.listdir(predict_dir) if f.endswith(('.png', '.jpg', '.jpeg'))])
        target_files = sorted([f for f in os.listdir(target_dir) if f.endswith(('.png', '.jpg', '.jpeg'))])

        if len(predict_files) != len(target_files):
                print(f"Warning: Number of prediction files ({len(predict_files)}) does not match target files ({len(target_

        predicts = []
        targets = []

        for pred_file, target_file in zip(predict_files, target_files):
                pred_path = os.path.join(predict_dir, pred_file)
                pred_img = Image.open(pred_path).convert('L')
                pred_array = np.array(pred_img.resize(size), dtype=np.float32)

                # normalize
                if pred_array.max() > 1.0:
                        pred_array = pred_array / 255.0

                pred_array = np.clip(pred_array, 0, 1)


                target_path = os.path.join(target_dir, target_file)
                target_img = Image.open(target_path).convert('L')
                target_array = np.array(target_img.resize(size), dtype=np.float32)
```

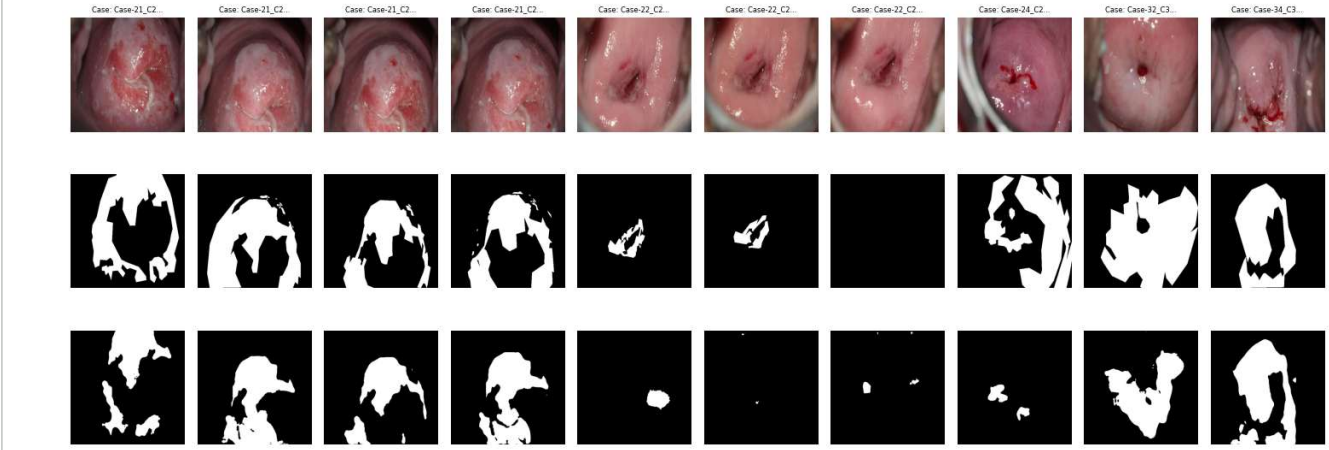
```
                # normalize
                if target_array.max() > 1.0:
                        target_array = target_array / 255.0

                target_array = np.clip(target_array, 0, 1)

                predicts.append(pred_array)
                targets.append(target_array)

        predicts_tensor = torch.from_numpy(np.array(predicts)).unsqueeze(1)
        targets_tensor = torch.from_numpy(np.array(targets)).unsqueeze(1)

        return predicts_tensor, targets_tensor


def compute_dice_iou_from_dirs(predict_dir, target_dir, threshold=0.5):
        """
        compute Dice and IoU scores from directories of images.
        """

        predicts, targets = load_and_preprocess_images(predict_dir, target_dir)


        pred = (predicts > threshold).float()

        eps = 1e-6
        intersect = (pred * targets).sum(dim=(1, 2, 3))
        union = (pred + targets - pred * targets).sum(dim=(1, 2, 3))

        dice = 2 * intersect / (pred.sum(dim=(1, 2, 3)) + targets.sum(dim=(1, 2, 3)) + eps)
        iou = intersect / (union + eps)

        return dice.mean().item(), iou.mean().item()



predict_dir = "/content/drive/MyDrive/JHPIEGO/data/prediction002_output_final_resized20/"
target_dir = "/content/drive/MyDrive/JHPIEGO/test/masks/lesion/"

dice_score, iou_score = compute_dice_iou_from_dirs(predict_dir, target_dir, threshold=0.5)

print(f"Dice Score: {dice_score:.4f}")
print(f"IoU Score: {iou_score:.4f}")
```

```
Dice Score: 0.4575
IoU Score: 0.3415
```

show the result

```
import os
import numpy as np
import matplotlib.pyplot as plt
from PIL import Image

# --- Define your directory paths ---
predict_dir = "/content/drive/MyDrive/JHPIEGO/data/prediction002_output_final_resized20/"
target_dir = "/content/drive/MyDrive/JHPIEGO/mytest/masks/lesion/"
rgb_dir = "/content/drive/MyDrive/JHPIEGO/mytest/rgbimages/"

# --- Parameter settings ---
NUM_CASES_TO_PLOT = 10
PLOT_SIZE = (15, 6) # Controls overall figure size

def plot_case_comparison(predict_dir, target_dir, rgb_dir, num_cases=10):
        """
        Load and display side-by-side: original RGB image, ground truth, and predicted segmentation.

        Uses Target directory filenames as reference, assuming Prediction filenames lack _0000.
        """

        # 1. Get file lists from all directories, using TARGET files as reference
        target_files = sorted([f for f in os.listdir(target_dir) if f.endswith(('.png', '.jpg', '.jpeg'))])

        if not target_files:
                print(f"Error: No image files found in ground truth directory '{target_dir}'.")
                return

        files_to_plot = target_files[:min(len(target_files), num_cases)]
```

```
        # 2. Create figure
        fig, axes = plt.subplots(3, len(files_to_plot), figsize=(PLOT_SIZE[0], PLOT_SIZE[1]))

        # Handle axes dimension issue for single file
        if len(files_to_plot) == 1:
                axes = np.array([axes]).T
        elif len(files_to_plot) > 1 and len(axes.shape) == 1:
                axes = np.expand_dims(axes, axis=0).T

        # Add labels on the left side
        row_labels = ['Original RGB', 'Ground Truth', 'Prediction']
        for row_idx, label in enumerate(row_labels):
                if len(files_to_plot) > 1:
                        axes[row_idx, 0].set_ylabel(label, fontsize=8, rotation=90, labelpad=20)
                else:
                        axes[row_idx, 0].set_ylabel(label, fontsize=8, rotation=90, labelpad=20)

        for i, target_filename in enumerate(files_to_plot):
                # Assume target_filename is 'case_001_0000.png'

                case_id = target_filename.rsplit('.', 1)[0] # 'case_001_0000'
                ext = target_filename.rsplit('.', 1)[1]          # 'png'

                # Ground truth / RGB file paths (assume same filename as Target)
                target_path = os.path.join(target_dir, target_filename)
                rgb_path = os.path.join(rgb_dir, target_filename) # Assume RGB filename also has _0000

                # Prediction result filename: remove "_0000" suffix
                if case_id.endswith('_0000'):
                        # case_001_0000 -> case_001
                        pred_case_id = case_id[:-5]
                else:
                        # If ground truth filename doesn't have _0000, use as is
                        pred_case_id = case_id

                pred_filename = f"{pred_case_id}.{ext}" # e.g., 'case_001.png'
                pred_path = os.path.join(predict_dir, pred_filename)

                # 5. Load images
                try:
                        # Check if all paths exist
                        if not os.path.exists(pred_path):
                                print(f"Warning: Prediction file {pred_path} not found. Skipping this case.")
                                continue
                        if not os.path.exists(rgb_path):
                                print(f"Warning: RGB file {rgb_path} not found. Skipping this case.")
                                continue

                        # Load original RGB image
                        img_rgb = Image.open(rgb_path).convert('RGB')
                        # Load ground truth (grayscale)
                        img_target = Image.open(target_path).convert('L')
                        # Load prediction result (grayscale)
                        img_predict = Image.open(pred_path).convert('L')

                except Exception as e:
                        print(f"Warning: Error loading file {target_filename}: {e}. Skipping this case.")
                        continue

                # 6. Plotting

                # Row 1: Original RGB
                axes[0, i].imshow(img_rgb)
                axes[0, i].set_title(f"Case: {pred_case_id[:10]}...", fontsize=6)

                # Row 2: Ground Truth
                axes[1, i].imshow(img_target, cmap='gray')

                # Row 3: Prediction Result
                axes[2, i].imshow(img_predict, cmap='gray')

                # Clear axis
                for row in range(3):
                        axes[row, i].axis('off')

        plt.tight_layout()
        plt.show()

# --- Execute function ---
plot_case_comparison(predict_dir, target_dir, rgb_dir, NUM_CASES_TO_PLOT)
```


Case: Case-21_C2...
Case: Case-21_C2...
Case: Case-21_C2...
Case: Case-21_C2...
Case: Case-22_C2...
Case: Case-22_C2...
Case: Case-22_C2...
Case: Case-24_C2...
Case: Case-32_C3...
Case: Case-34_C3...