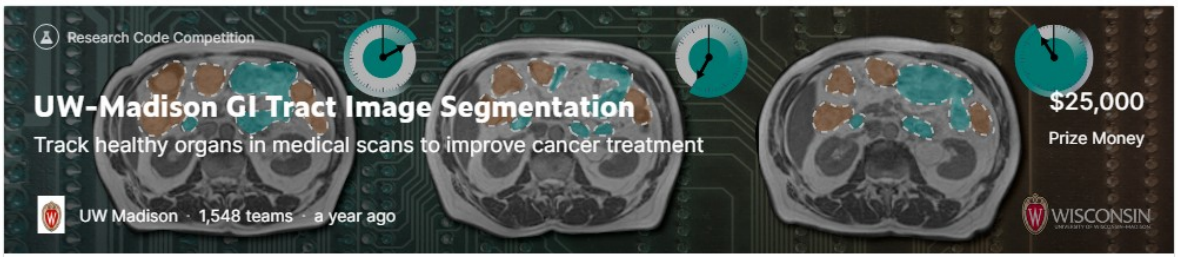
2.5D Medical Segmentation using Large Vision Models



Chris Winsor
9/15/2023

This is a demonstration of 2.5D medical image segmentation based on UNET.
The dataset is from https://www.kaggle.com/c/uw-madison-gi-tract-image-segmentation.
The training code is from user AWSAF (https://www.kaggle.com/awsaf49) with discussion at
https://www.kaggle.com/competitions/uw-madison-gi-tract-image-segmentation/discussion/322549

Additional background on medical segmentation tools/approaches is available at
https://github.com/cwinsor/medical_image_practice/blob/main/kaggle_UW_Madison_tech_review.pdf

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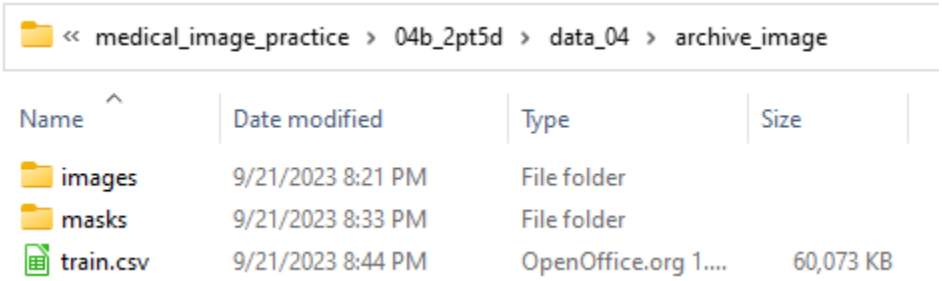
2.5D Training

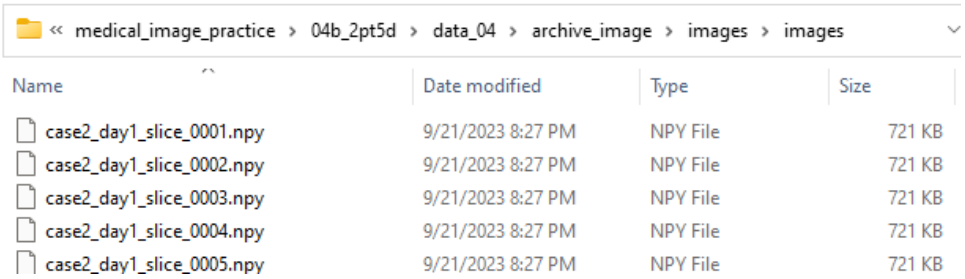
Download notebook and dataset:

- https://www.kaggle.com/code/awsaf49/uwmgi-2-5d-train-pytorch/notebook
- https://www.kaggle.com/datasets/awsaf49/uwmgi-25d-stride2-dataset

The dataset is 8GB. Extract the dataset revealing:



with .npy files under /images/images and /masks/masks.



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To run the training file it is necessary to remove 'class' from the df.drop() as that field is not in the train.csv.

```
# df = df.drop(columns=['segmentation', 'class', 'rle_len'])
df = df.drop(columns=['segmentation', 'rle_len'])
```

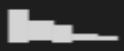
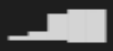
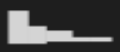
The runtime is about 30 minutes/epoch * 5 epochs = 2.5 hours.

The output of the "Training" section is model (best and last epochs)

```
(pytorch_r_cv2_u_madison) $ pwd
/mnt/d/code_medimg_practice/medical_image_practice/04b_2pt5d
(pytorch_r_cv2_u_madison) $ ll -t
total 7482348
-rwxrwxrwx 1 chris chris   25337117 Sep 23 18:15 last_epoch-00.bin*
-rwxrwxrwx 1 chris chris   25337117 Sep 23 17:50 best_epoch-00.bin*
```

Training stats are logged locally and on W&B. In five epochs we achieve Dice of 90.8, Jaccard 88.1. This is achieved in epoch 4.

Run history:

LR	
Train Loss	
Valid Dice	
Valid Jaccard	
Valid Loss	

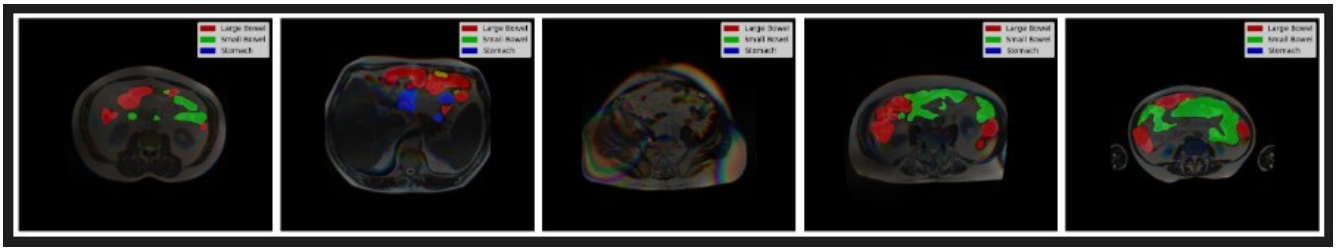
Run summary:

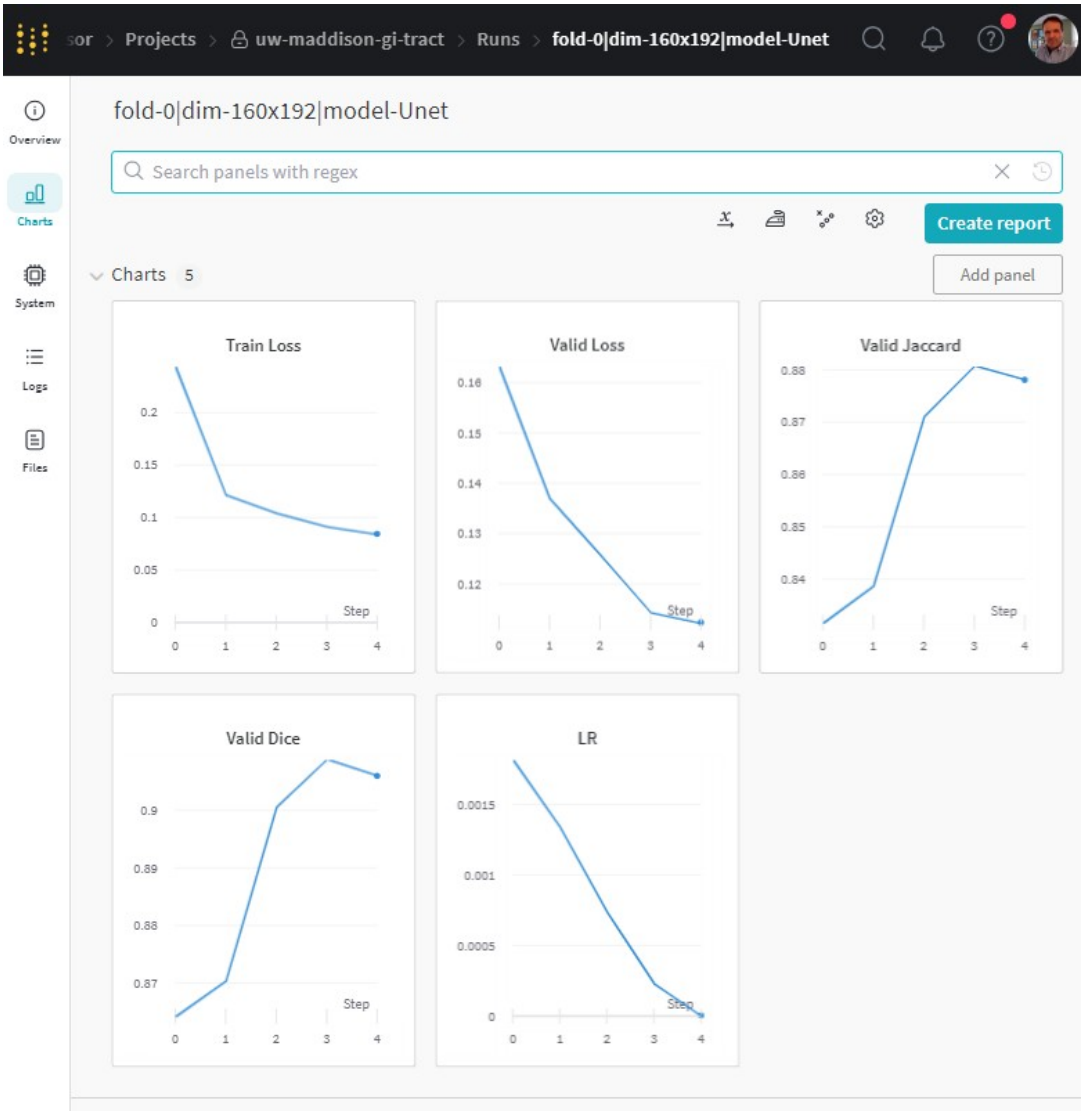
Best Dice	0.90886
Best Epoch	4
Best Jaccard	0.88077
LR	0.0
Train Loss	0.08444
Valid Dice	0.90599
Valid Jaccard	0.87808
Valid Loss	0.11234

View run **fold-0|dim-160x192|model-Unet** at: https://wandb.ai/cwinsor/uw-maddison-gi-tract/runs/pso1vfkn
Synced 6 W&B file(s), 0 media file(s), 0 artifact file(s) and 1 other file(s)

Find logs at: `./wandb/run-20230923_160011-pso1vfkn/logs`

Running "Prediction" allows us to visualize the segmentation.





Environment Setup (every time)

In WSL ubuntu environment:

- git clone https://github.com/cwinsor/medical_image_practice.git
- conda activate pytorch_r_cv2_u_madison
- <for details on the conda environment refer to next section>
- cd /medical_image_practice/
- code -n .

Environment Setup (first time)

Steps are in README.txt under 014_2pt5d folder. Both conda and pip are used.

04b_2pt5d > README.txt

```
following
https://www.kaggle.com/code/awsaf49/uwmgi-unet-train-pytorch

This notebook uses conda environment followed by pip installs
currently "pytorch_(N)_..." !!!

Creating conda environment...
export CONDA_ENV_VERSION=r
export CONDA_ENV_NAME="pytorch_"$CONDA_ENV_VERSION"_cv2_u_madison"
conda create -y -n $CONDA_ENV_NAME
conda activate $CONDA_ENV_NAME
conda install -y pytorch torchvision torchaudio pytorch-cuda=11.7 -c pytorch -c nvidia

pip install opencv-contrib-python==4.5.5.62
pip install -U ipykernel

when starting vscode:
ensure vscode python kernel points to the kernel (select via 'view' command pallet - select python kernel)
ensure vscode ipykernel points to the right venv (select ipykernel in upper right corner)

pip install pandas
pip install importlib-resources
pip install -q segmentation_models_pytorch
pip install -qU wandb
# pip install -q scikit-learn==1.0
pip install -q scikit-learn
pip install -q plotly
pip install -q matplotlib
pip install -q albumentations
pip install -q colorama
pip install -q nbformat

```