ARUNet-3D-Middle-StdDevExtended-ExtrudedNS-VFold-Test

November 30, 2021

[4]:
```
from monai.utils import first, set_determinism
from monai.transforms import (
    AddChanneld,
    AsChannelFirstd,
    AsDiscrete,
    AsDiscreted,
    Compose,
    EnsureChannelFirstd,
    EnsureTyped,
    EnsureType,
    Invertd,
    LoadImaged,
    RandFlipd,
    RandSpatialCropd,
    RandZoomd,
    Resized,
    ScaleIntensityRanged,
    SpatialCrop,
    SpatialCropd,
    ToTensord,
)
from monai.handlers.utils import from_engine
from monai.networks.nets import UNet
from monai.networks.layers import Norm
from monai.metrics import DiceMetric
from monai.losses import DiceLoss
from monai.inferers import sliding_window_inference
from monai.data import CacheDataset, DataLoader, Dataset, decollate_batch
from monai.config import print_config
from monai.apps import download_and_extract
import monai.utils as utils

import torch
import matplotlib.pyplot as plt
import tempfile
import shutil
import os
```

```
from glob import glob

import itk
from itk import TubeTK as ttk

import numpy as np

import site
site.addsitedir('../../ARGUS')
from ARGUSUtils_Transforms import *
```

[29]:
```
img1_dir = "../../Data/VFoldData/BAMC-PTX*Sliding-Annotations-Linear/"

all_images = sorted(glob(os.path.join(img1_dir, '*_?????.nii.gz')))
all_labels = sorted(glob(os.path.join(img1_dir, '*.extruded-overlay-NS.nii.
 ↪gz')))

gpu_device = 0

num_classes = 3

max_epochs = 500

net_in_dims = 2
net_in_channels = 4

net_channels=(32, 64, 128)
net_strides=(2, 2)

num_folds = 15

num_slices = 32
size_x = 160
size_y = 320

roi_size = (size_x,size_y)

num_workers_te = 0
batch_size_te = 1

model_filename_base = "./results/
 ↪BAMC_PTX_ARUNet-3D-Middle-StdDevExtended-ExtrudedNS"

num_images = len(all_images)
print(num_images, len(all_labels))

ns_prefix = ['025ns','026ns','027ns','035ns','048ns','055ns','117ns',
```

```
            '135ns','193ns','210ns','215ns','218ns','219ns','221ns','247ns']
s_prefix = ['004s','019s','030s','034s','037s','043s','065s','081s',
            '206s','208s','211s','212s','224s','228s','236s','237s']

fold_prefix_list = []
ns_count = 0
s_count = 0
for i in range(num_folds):
    if i%2 == 0:
        num_ns = 1
        num_s = 1
        if i > num_folds-3:
            num_s = 2
    else:
        num_ns = 1
        num_s = 1
    f = []
    for ns in range(num_ns):
        f.append([ns_prefix[ns_count+ns]])
    ns_count += num_ns
    for s in range(num_s):
        f.append([s_prefix[s_count+s]])
    s_count += num_s
    fold_prefix_list.append(f)

train_files = []
val_files = []
test_files = []
for i in range(num_folds):
    tr_folds = []
    for f in range(i,i+num_folds-2):
        tr_folds.append(fold_prefix_list[f%num_folds])
    tr_folds = list(np.concatenate(tr_folds).flat)
    va_folds = list(np.concatenate(fold_prefix_list[(i+num_folds-2) %␣
 ↪num_folds]).flat)
    te_folds = list(np.concatenate(fold_prefix_list[(i+num_folds-1) %␣
 ↪num_folds]).flat)
    train_files.append(
            [
                {"image": img, "label": seg}
                for img, seg in zip(
                    [im for im in all_images if any(pref in im for pref in␣
 ↪tr_folds)],
                    [se for se in all_labels if any(pref in se for pref in␣
 ↪tr_folds)])
            ]
        )
```

```
    val_files.append(
            [
                {"image": img, "label": seg}
                for img, seg in zip(
                    [im for im in all_images if any(pref in im for pref in va_folds)],
                    [se for se in all_labels if any(pref in se for pref in va_folds)])
            ]
        )
    test_files.append(
            [
                {"image": img, "label": seg}
                for img, seg in zip(
                    [im for im in all_images if any(pref in im for pref in te_folds)],
                    [se for se in all_labels if any(pref in se for pref in te_folds)])
            ]
        )
    print(len(train_files[i]),len(val_files[i]),len(test_files[i]))
```

```
62 62
53 4 5
53 5 4
54 4 4
54 4 4
54 4 4
55 4 3
55 3 4
54 4 4
54 4 4
54 4 4
53 4 5
53 5 4
53 4 5
53 5 4
54 4 4
```

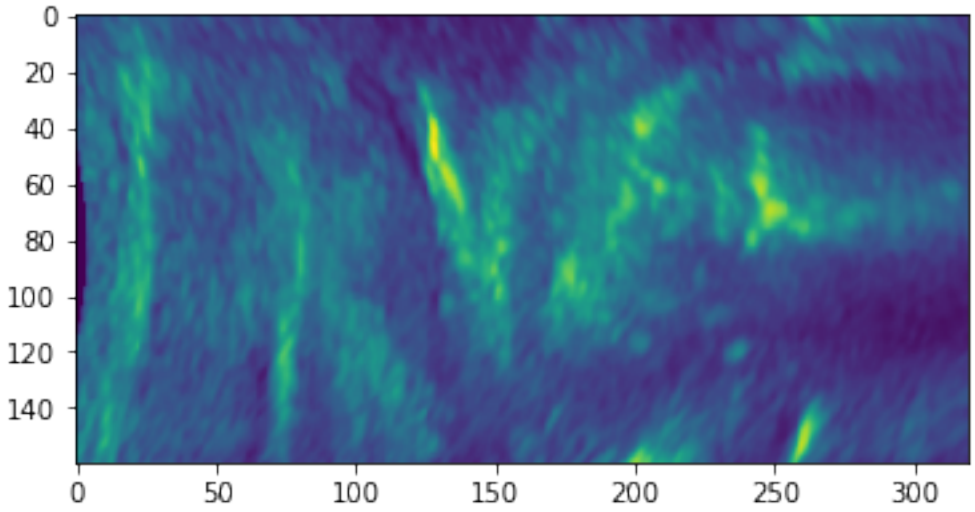
[37]:
```
train_shape = itk.GetArrayFromImage(itk.imread(train_files[0][0]["image"])).shape

test_transforms = Compose(
    [
        LoadImaged(keys=["image", "label"]),
        AsChannelFirstd(keys='image'),
        AsChannelFirstd(keys='label'),
```

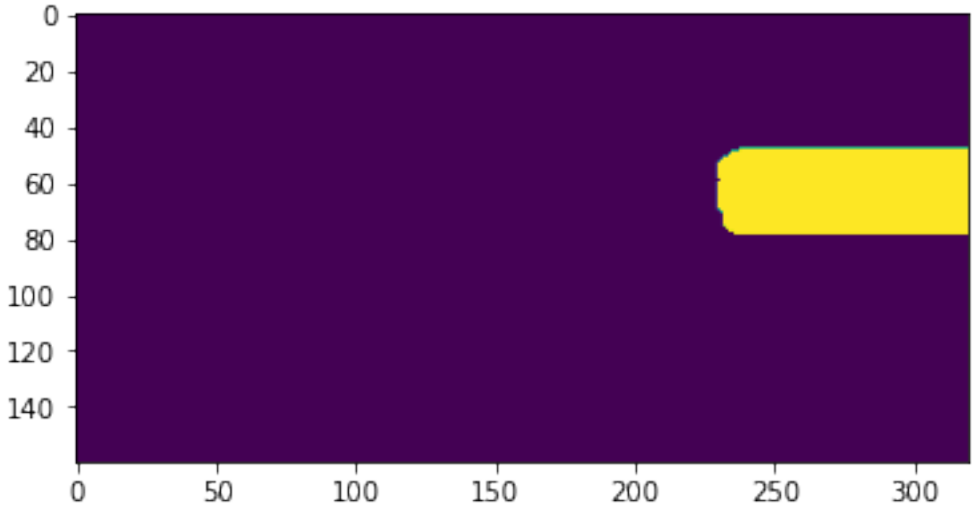
```
        ScaleIntensityRanged(
            a_min=0, a_max=255,
            b_min=0.0, b_max=1.0,
            keys=["image"]),
        SpatialCropd(
            roi_start=[80,0,1],
            roi_end=[240,320,61],
            keys=["image", "label"]),
        ARGUS_RandSpatialCropSlicesd(
            num_slices=[num_slices,1],
            axis=0,
            reduce_to_statistics=[True,False],
            extended=True,
            keys=['image', 'label']),
        ToTensord(keys=["image", "label"]),
    ]
)
```

[38]:
```
test_ds = [Dataset(data=test_files[i], transform=test_transforms)
           for i in range(num_folds)]
test_loader = [DataLoader(test_ds[i], batch_size=batch_size_te,␣
 ↪num_workers=num_workers_te)
               for i in range(num_folds)]
```

[39]:
```
batchnum = 0
imgnum = 0
lbl = utils.first(test_loader[batchnum])["label"]
m = lbl[imgnum,0,:,:].max()
print(m)
if m == 1:
    img = utils.first(test_loader[0])["image"]
    plt.subplots()
    plt.imshow(img[imgnum,0,:,:])
    plt.subplots()
    plt.imshow(lbl[imgnum,0,:,:])
print("Data Size =", lbl.shape)
```

```
tensor(1.)
Data Size = torch.Size([1, 1, 160, 320])
```





[40]:
```
# standard PyTorch program style: create UNet, DiceLoss and Adam optimizer
device = torch.device("cuda:"+str(gpu_device))
```

[47]:
```
def plot_vfold_training_curves(vfold_num, test_loader, min_size_comp,␣
 ↪min_portion_comp, p_prior, graph):
    if graph:
        print("   VFOLD =", vfold_num, "of", num_folds)

    correct = 0
    incorrect = 0
```

```
    slice_correct = 0
    slice_incorrect = 0

    false_negatives = 0
    slice_false_negatives = 0

    loss_file = model_filename_base+"_loss_"+str(vfold_num)+".npy"
    if os.path.exists(loss_file):
        epoch_loss_values = np.load(loss_file)

        metric_file = model_filename_base+"_val_dice_"+str(vfold_num)+".npy"
        metric_values = np.load(metric_file)

        if graph:
            plt.figure("train", (12, 6))
            plt.subplot(1, 2, 1)
            plt.title("Epoch Average Loss")
            x = [i + 1 for i in range(len(epoch_loss_values))]
            y = epoch_loss_values
            plt.xlabel("epoch")
            plt.plot(x, y)
            plt.ylim([0.2,0.8])
            plt.subplot(1, 2, 2)
            plt.title("Val Mean Dice")
            x = [2 * (i + 1) for i in range(len(metric_values))]
            y = metric_values
            plt.xlabel("epoch")
            plt.plot(x, y)
            plt.ylim([0.2,0.8])
            plt.show()

    model_file = model_filename_base+'.best_model.vfold_'+str(vfold_num)+'.pth'
    if os.path.exists(model_file):
        model = UNet(
            dimensions=net_in_dims,
            in_channels=net_in_channels,
            out_channels=num_classes,
            channels=net_channels,
            strides=net_strides,
            num_res_units=2,
            norm=Norm.BATCH,
        ).to(device)
        model.load_state_dict(torch.load(model_file))
        model.eval()
        with torch.no_grad():
            i = 0
            fname = os.path.basename(test_files[vfold_num][i]["image"])
```

```
            prevfname = fname
            count1 = 0
            count = 0
            for b,test_data in enumerate(test_loader):
                test_outputs = sliding_window_inference(
                    test_data["image"].to(device), roi_size, batch_size_te,␣
↪model
                )
                for j in range(test_outputs.shape[0]):
                    prevfname = fname
                    fname = os.path.basename(test_files[vfold_num][i]["image"])

                    if fname[:22]!=prevfname[:22]:
                        #print("  ", prevfname[:22], "Count of slidings =",␣
↪count1, "of", count)
                        if count1 == count:
                            if graph:
                                print("  Winner = Sliding")
                            if prevfname[3] == 's':
                                correct += 1
                            else:
                                incorrect += 1
                                false_negatives += 1
                                print(" FN Patient =", prevfname)
                        else:
                            if graph:
                                print("  Winner = Not Sliding")
                            if prevfname[3] == 'n':
                                correct += 1
                            else:
                                incorrect += 1
                                print(" FP Patient =", prevfname)
                        if graph:
                            print()
                            print()
                        count1 = 0
                        count = 0

                    prob_shape = test_outputs[j,:,:,:].shape
                    prob = np.empty(prob_shape)
                    for c in range(num_classes):
                        itkProb = itk.GetImageFromArray(test_outputs[j,c,:,:].
↪cpu())

                        imMathProb = ttk.ImageMath.New(itkProb)
                        imMathProb.Blur(5)
                        itkProb = imMathProb.GetOutput()
                        prob[c] = itk.GetArrayFromImage(itkProb)
```

```
                    arrc1 = np.zeros(prob[0].shape)
                    if False:
                        arrc1 = np.argmax(prob,axis=0)
                    else:
                        pmin = prob[0].min()
                        pmax = prob[0].max()
                        for c in range(1,num_classes):
                            pmin = min(pmin, prob[c].min())
                            pmax = min(pmax, prob[c].max())
                        prange = pmax - pmin
                        prob = (prob - pmin) / prange
                        for c in range(num_classes):
                            prob[c] = prob[c] * p_prior[c]
                        arrc1 = np.argmax(prob,axis=0)

                    max_size = np.count_nonzero(test_data["label"][j, 0, :, :].
↪cpu()>0)
                    min_thresh = max(min_size_comp, max_size*min_portion_comp)

                    itkc1 = itk.GetImageFromArray(arrc1.astype(np.float32))
                    imMathC1 = ttk.ImageMath.New(itkc1)
                    for c in range(num_classes):
                        imMathC1.Erode(10,c,0)
                        imMathC1.Dilate(10,c,0)
                    itkc1 = imMathC1.GetOutputUChar()
                    arrc1 = itk.GetArrayFromImage(itkc1)
                    slice_count1 = np.count_nonzero(arrc1==1)
                    slice_count2 = np.count_nonzero(arrc1==2)
                    slice_decision = "Unknown"
                    slice_message = "Correct"
                    if slice_count2>slice_count1 and slice_count2>min_thresh:
                        count1 += 1
                        slice_decision = "Sliding"
                        if fname[3] == 's':
                            slice_correct += 1
                        else:
                            slice_incorrect += 1
                            slice_false_negatives += 1
                            slice_message = "False Negative"
                    else:
                        slice_decision = "Not Sliding"
                        if fname[3] == 'n':
                            slice_correct += 1
                        else:
                            slice_incorrect += 1
                            slice_message = "Fales Positive"
                    count += 1
```

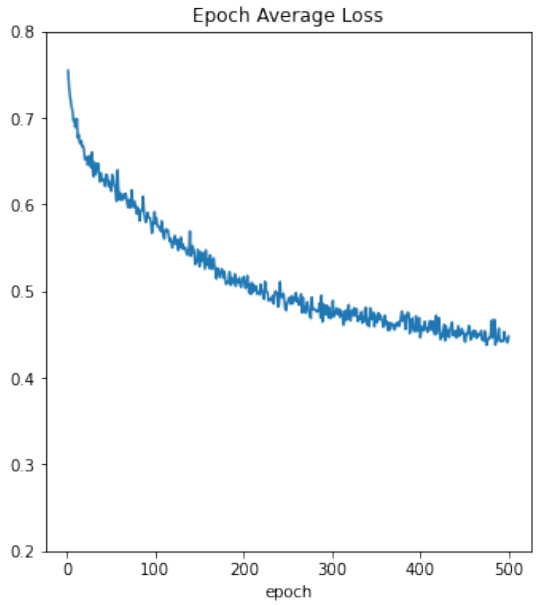
```
                    if graph:
                        print(fname)

                        plt.figure("check", (18, 6))
                        plt.subplot(1, 3, 1)
                        plt.title(f"image {i}")
                        tmpV = test_data["image"][j, 0, :, :]
                        plt.imshow(tmpV, cmap="gray")
                        plt.subplot(1, 3, 2)
                        plt.title(f"label {i}")
                        tmpV = test_data["label"][j, 0, :, :]
                        tmpV[0,0]=1
                        tmpV[0,1]=2
                        plt.imshow(tmpV)
                        plt.subplot(1, 3, 3)
                        plt.title(f"output {i}")
                        arrc1[0,0]=1
                        arrc1[0,1]=2
                        plt.imshow(arrc1[:,:])
                        plt.show()

                        print("Number of not-sliding / sliding pixel =",␣
↪slice_count1, slice_count2)
                        print("    Min thresh =", min_thresh)
                        print("   ", slice_decision, "=", slice_message)
                        print()
                        print()

                        for c in range(num_classes):
                            arrimg = test_outputs.detach().cpu()[j,c,:,:]
                            itkimg = itk.GetImageFromArray(arrimg)
                            filename =␣
↪model_filename_base+"_f"+str(vfold_num)+"_i"+str(i)+"_c"+str(c)+".nii.gz"
                            itk.imwrite(itkimg, filename)

                    i += 1

            #print("  ", prevfname[:22], "Count of slidings =", count1, "of",␣
↪count)
            if count1 == count:
                if graph:
                    print("  Winner = Sliding")
                if prevfname[3] == 's':
                    correct += 1
                else:
```

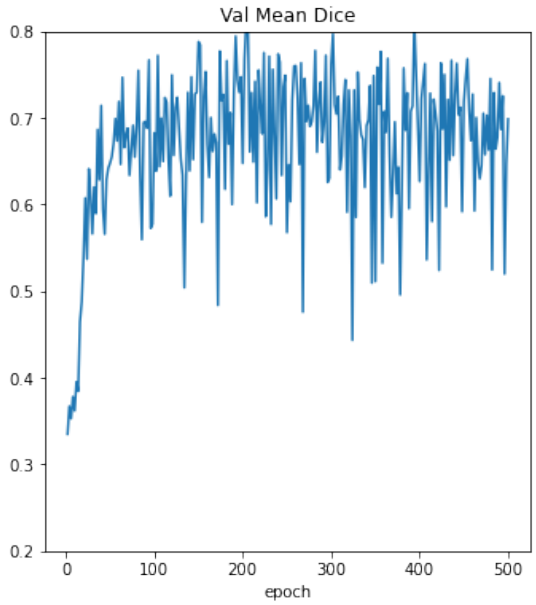
```
                    incorrect += 1
                    false_negatives += 1
                    print(" FN Patient =", fname)
            else:
                if graph:
                    print("  Winner = Not Sliding")
                if prevfname[3] == 'n':
                    correct += 1
                else:
                    incorrect += 1
                    print(" FP Patient =", fname)
            if graph:
                print()
                print()

    return correct, incorrect, false_negatives, slice_correct, slice_incorrect,␣
↪slice_false_negatives
```

[48]:
```
min_size = 1000
min_portion = 0.0

for prior in [[1.3,1.0,0.85]]: #[0.3, 0.35, 0.4, 0.45, 0.5, 0.55, 0.6]:
    print('**************')
    print("Prior =", prior)
    correct = 0
    incorrect = 0
    false_negatives = 0
    slice_correct = 0
    slice_incorrect = 0
    slice_false_negatives = 0
    for i in range(num_folds):
        (fcorrect, fincorrect, ffalse_negatives, fslice_correct,␣
↪fslice_incorrect, fslice_false_negatives) = plot_vfold_training_curves(i,␣
↪test_loader[i],
            min_size, min_portion, prior, True)
        correct += fcorrect
        incorrect += fincorrect
        false_negatives += ffalse_negatives
        slice_correct += fslice_correct
        slice_incorrect += fslice_incorrect
        slice_false_negatives += fslice_false_negatives
    print()
    print()
    print("Patients: Correct =", correct, "Incorrect =", incorrect, "Not␣
↪Sliding as Sliding =", false_negatives)
    print("Slices: Correct =", slice_correct, "Incorrect = ", slice_incorrect,␣
↪"Not Sliding as Sliding =", slice_false_negatives)
```

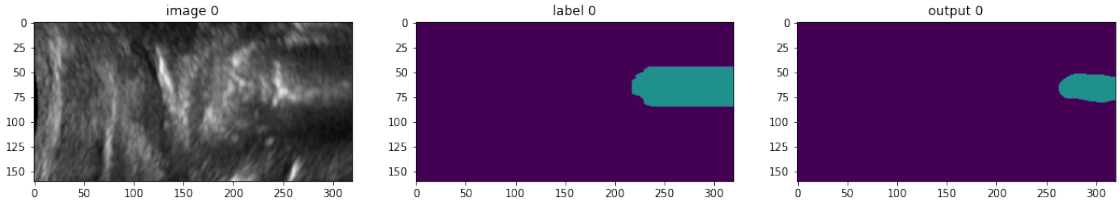
```
    print('*************')
```

```
*************
Prior = [1.3, 1.0, 0.85]
   VFOLD = 0 of 15
```



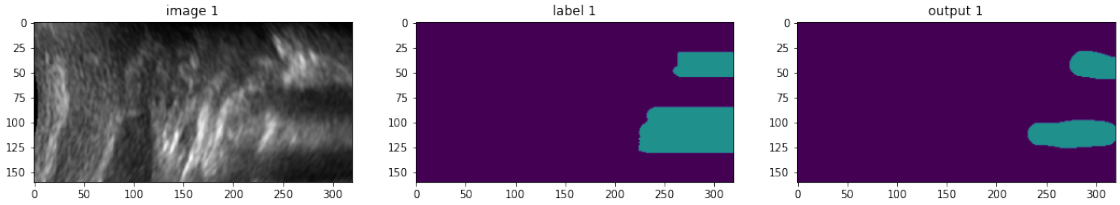


247ns_image_2734882394424_CLEAN.nii.gz



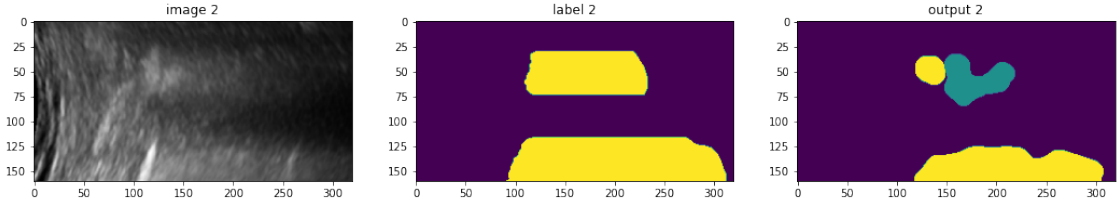

```
Number of not-sliding / sliding pixel = 1389 0
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

247ns_image_2743083265515_CLEAN.nii.gz



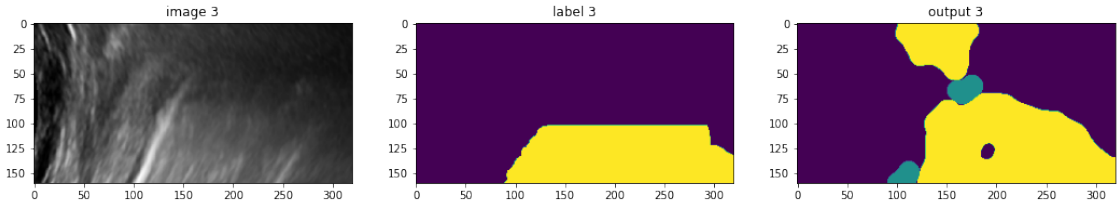

```
Number of not-sliding / sliding pixel = 3184 0
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

236s_iimage_1139765223418_CLEAN.nii.gz



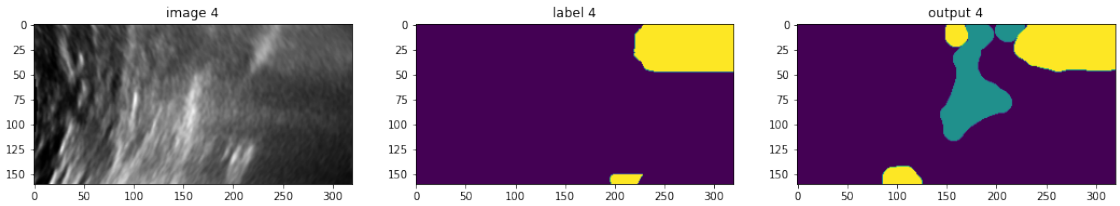

```
Number of not-sliding / sliding pixel = 2218 5957
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding
```

236s_iimage_1327616672148_clean.nii.gz

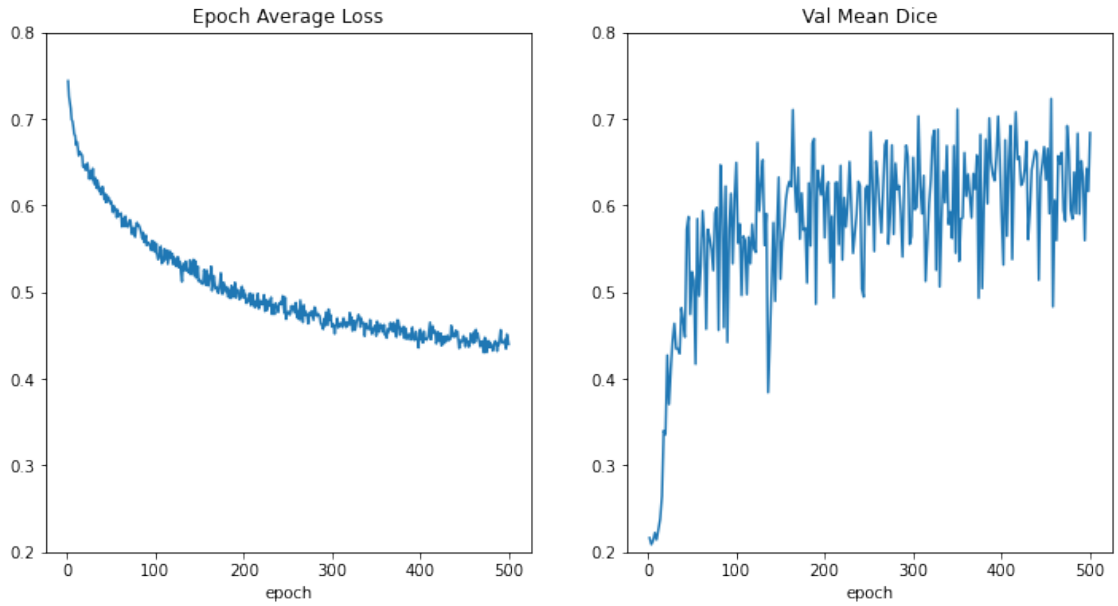



```
Number of not-sliding / sliding pixel = 1262 16928
```

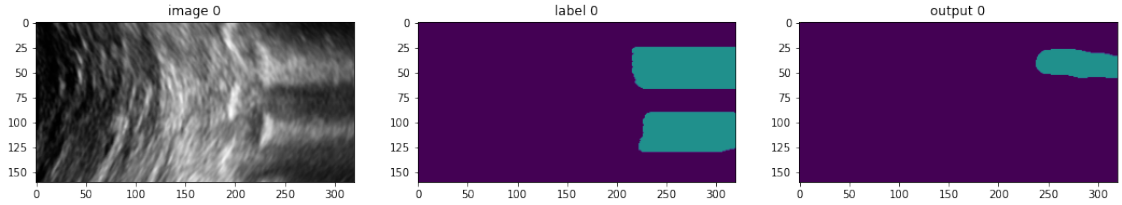
```
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding


237s_iimage_24164968068436_CLEAN.nii.gz
```




```
Number of not-sliding / sliding pixel = 4536 5433
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding


   VFOLD = 1 of 15
```

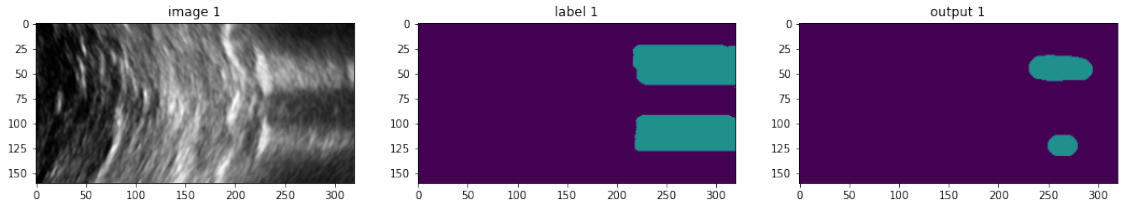


025ns_Image_262499828648_clean.nii.gz



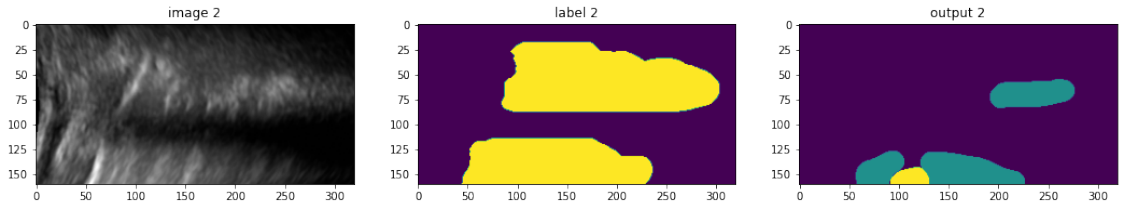

```
Number of not-sliding / sliding pixel = 1998 0
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

025ns_image_267456908021_clean.nii.gz



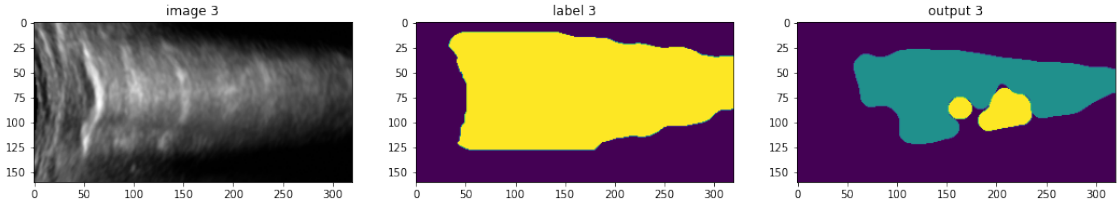

```
Number of not-sliding / sliding pixel = 1942 0
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

004s_iimage_73815992352100_clean.nii.gz

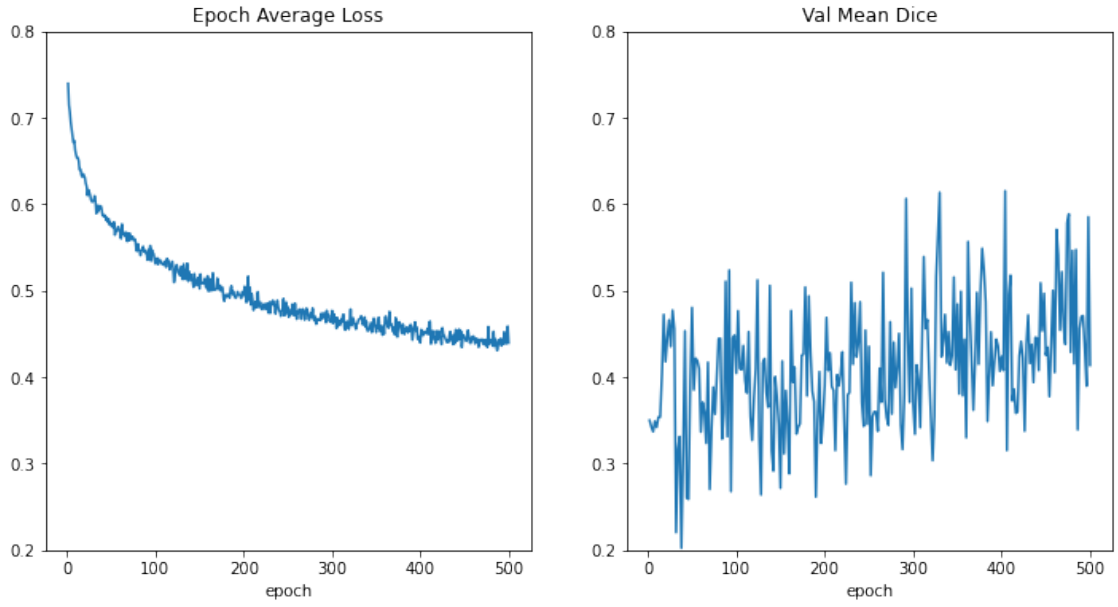


```
Number of not-sliding / sliding pixel = 5582 528
    Min thresh = 1000
    Not Sliding = Fales Positive


  Winner = Not Sliding
 FP Patient = 004s_iimage_73815992352100_clean.nii.gz
```

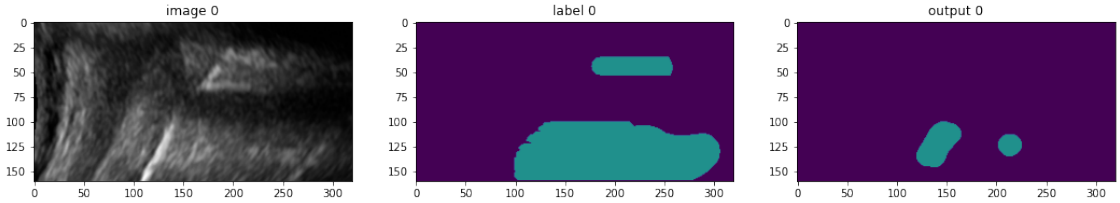
004s_iimage_74132233134844_clean.nii.gz




```
Number of not-sliding / sliding pixel = 14276 2031
    Min thresh = 1000
    Not Sliding = Fales Positive


  Winner = Not Sliding
 FP Patient = 004s_iimage_74132233134844_clean.nii.gz


   VFOLD = 2 of 15
```

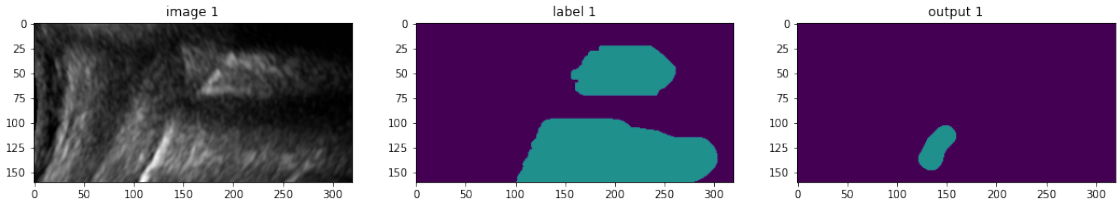


026ns_image_1083297968960_clean.nii.gz



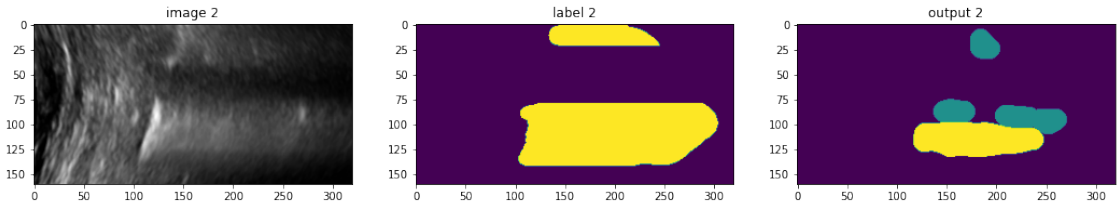

```
Number of not-sliding / sliding pixel = 1743 0
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

026ns_image_1087766719219_clean.nii.gz

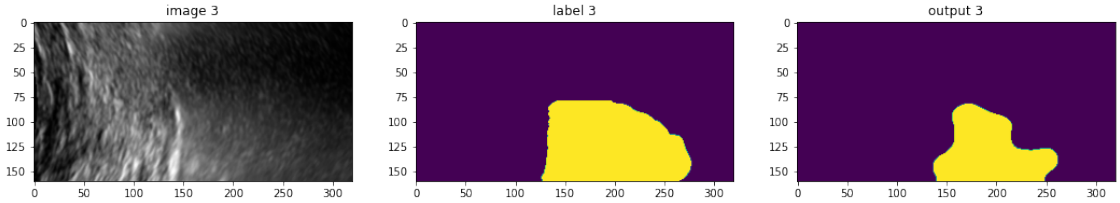



```
Number of not-sliding / sliding pixel = 1019 0
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

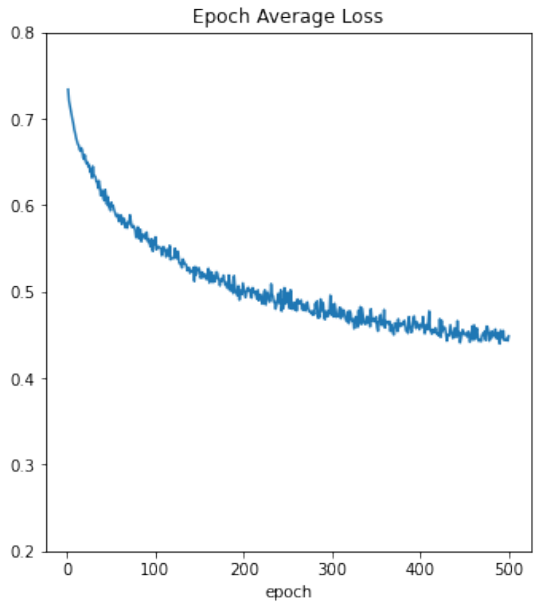
019s_iimage_10705997566592_CLEAN.nii.gz

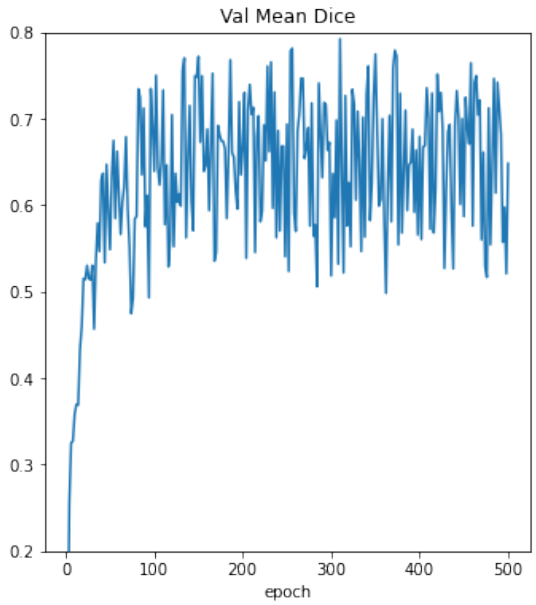


```
Number of not-sliding / sliding pixel = 3011 3783
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding


019s_iimage_10891015221417_clean.nii.gz
```

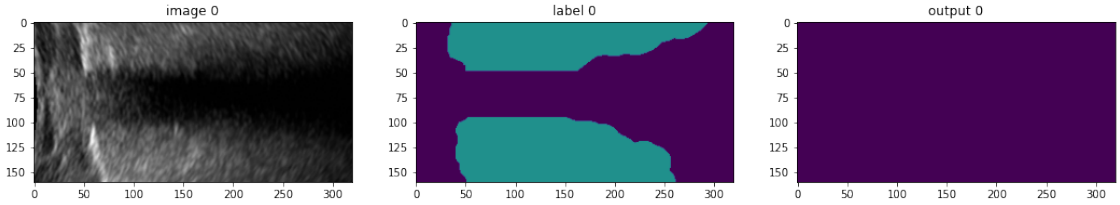



```
Number of not-sliding / sliding pixel = 0 6083
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding


   VFOLD = 3 of 15
```





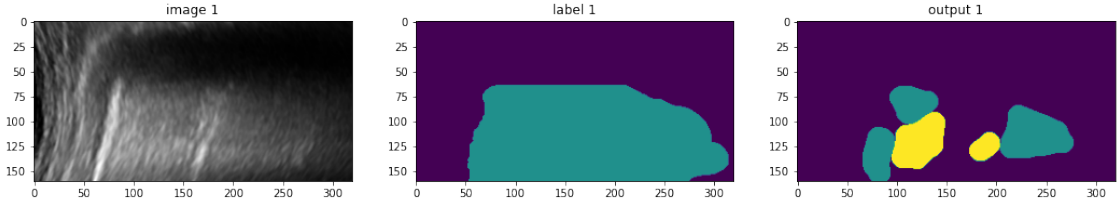
027ns_image_4641643404894_CLEAN.nii.gz



Number of not-sliding / sliding pixel = 0 0
Min thresh = 1000
Not Sliding = Correct

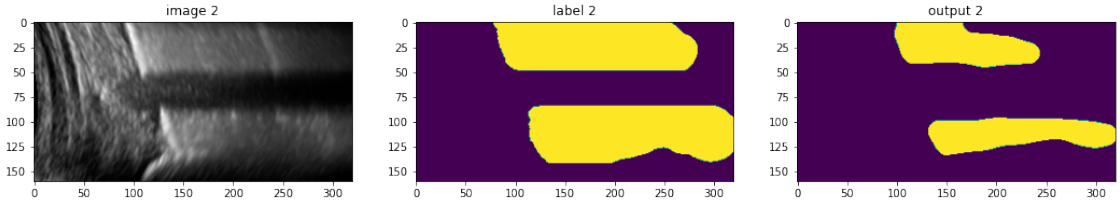
Winner = Not Sliding

027ns_image_4743880599022_clean.nii.gz



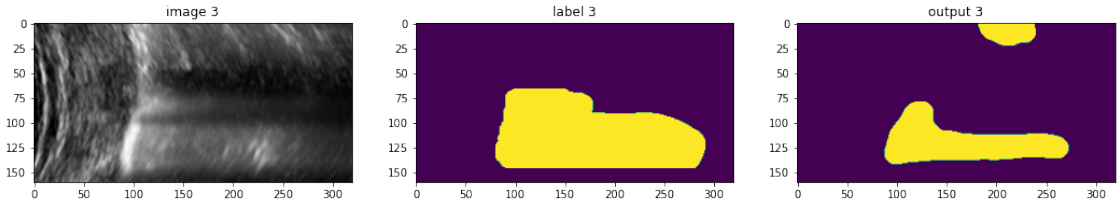
```
Number of not-sliding / sliding pixel = 5557 2859
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

```
030s_iimage_1180496934444_clean.nii.gz
```



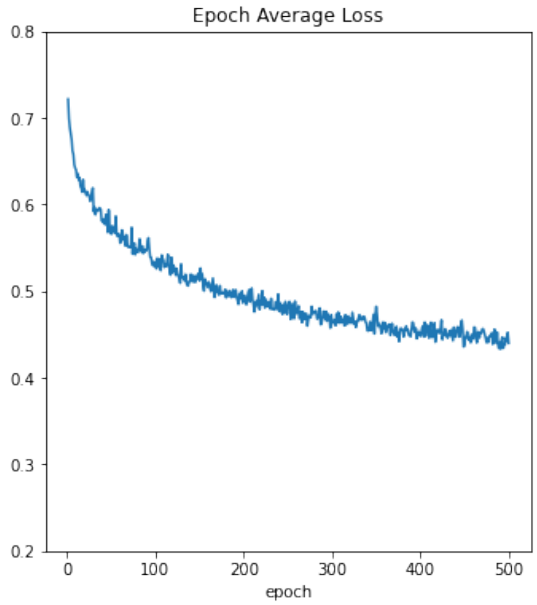

```
Number of not-sliding / sliding pixel = 0 9898
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding
```

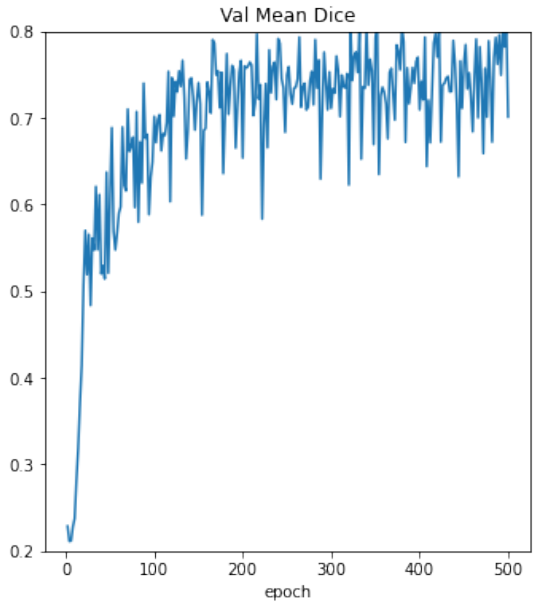
```
030s_iimage_677741729740_clean.nii.gz
```



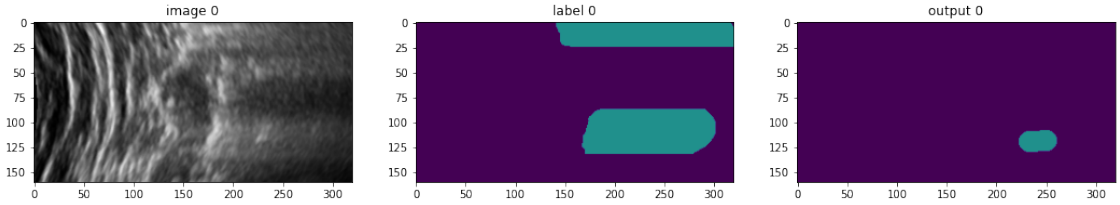

```
Number of not-sliding / sliding pixel = 0 6989
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding
```

VFOLD = 4 of 15





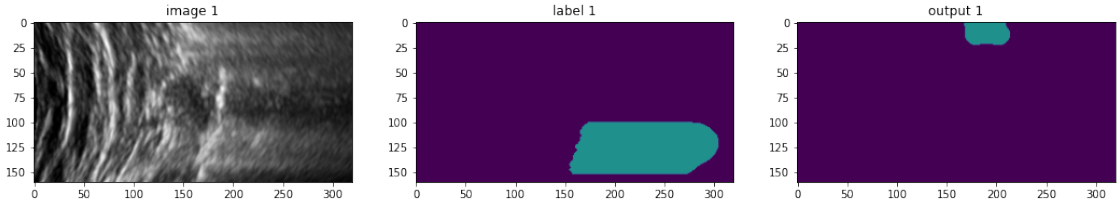
035ns_image_1394469579519_clean.nii.gz



Number of not-sliding / sliding pixel = 704 0
Min thresh = 1000
Not Sliding = Correct

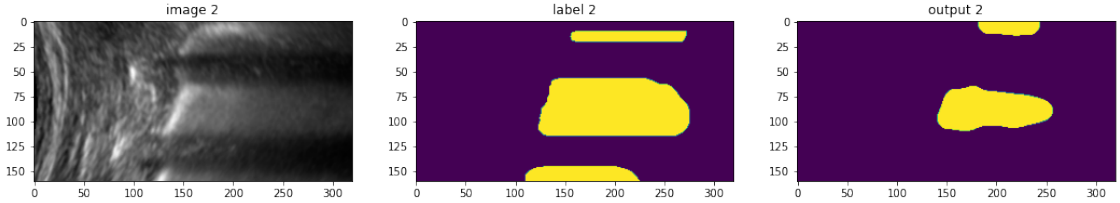
Winner = Not Sliding

035ns_image_1404802450036_clean.nii.gz



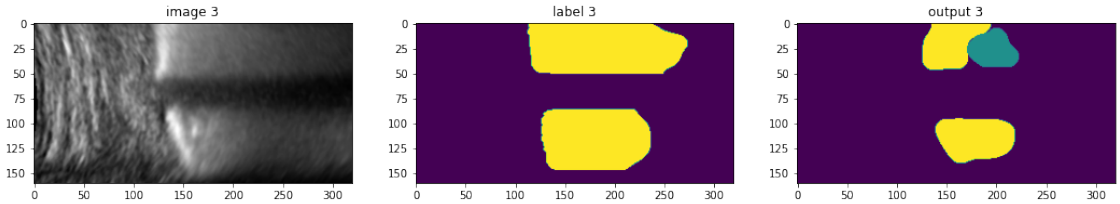

```
Number of not-sliding / sliding pixel = 954 0
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

034s_iimage_3368391807672_clean.nii.gz



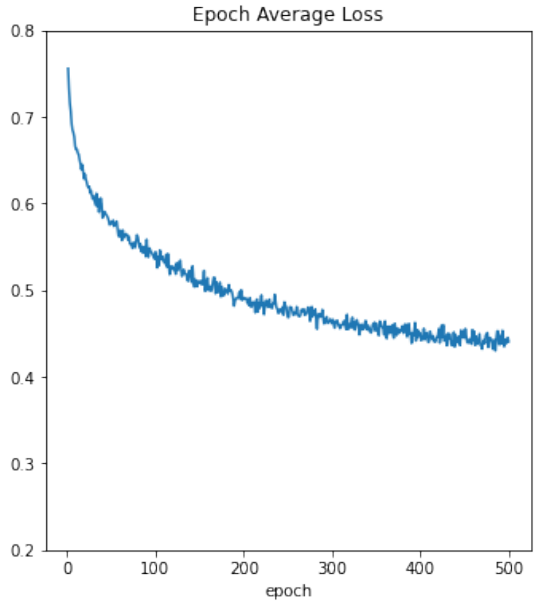

```
Number of not-sliding / sliding pixel = 0 4644
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding
```

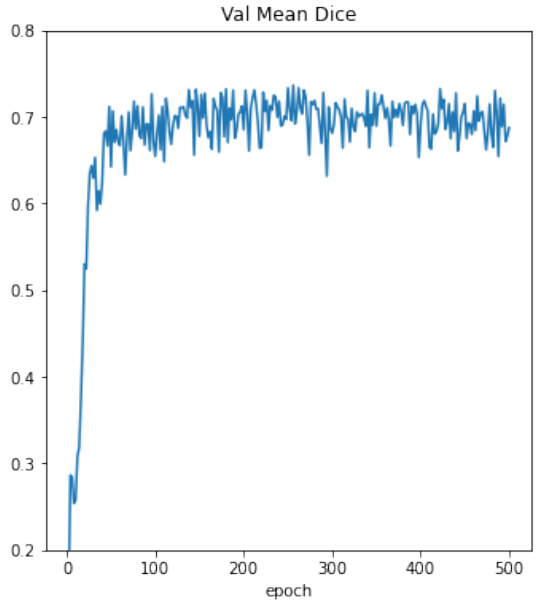
034s_iimage_3401832241774_clean.nii.gz



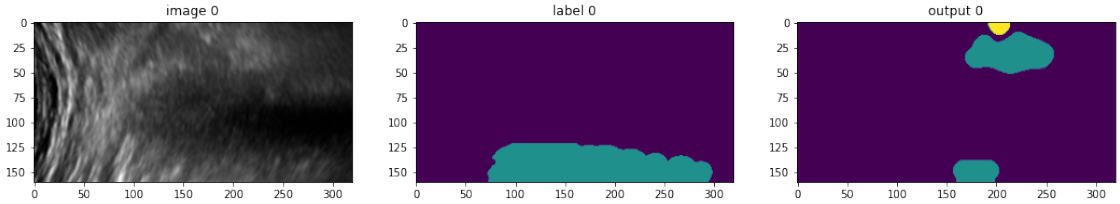

```
Number of not-sliding / sliding pixel = 1485 5126
```

```
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding


   VFOLD = 5 of 15
```



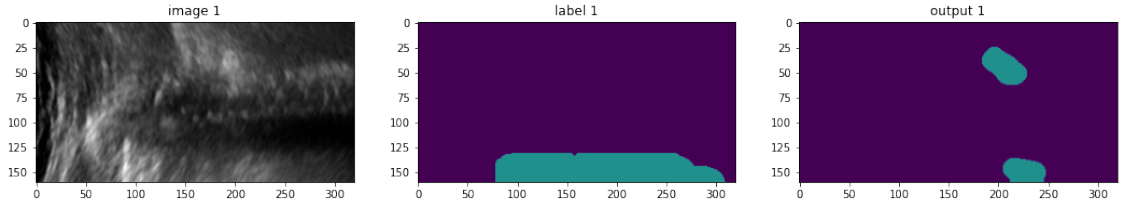



```
048ns_image_1543571117118_clean.nii.gz
```



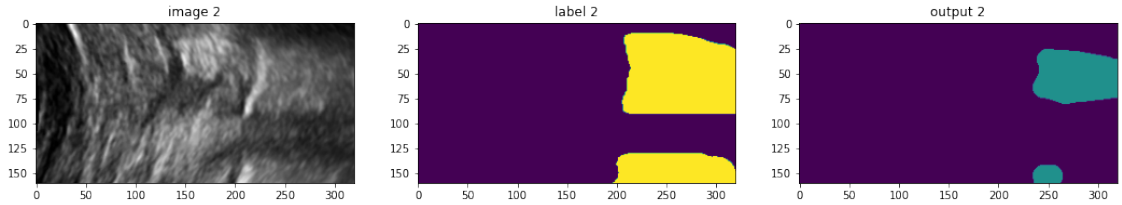

```
Number of not-sliding / sliding pixel = 3569 231
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

048ns_image_1749559540112_clean.nii.gz

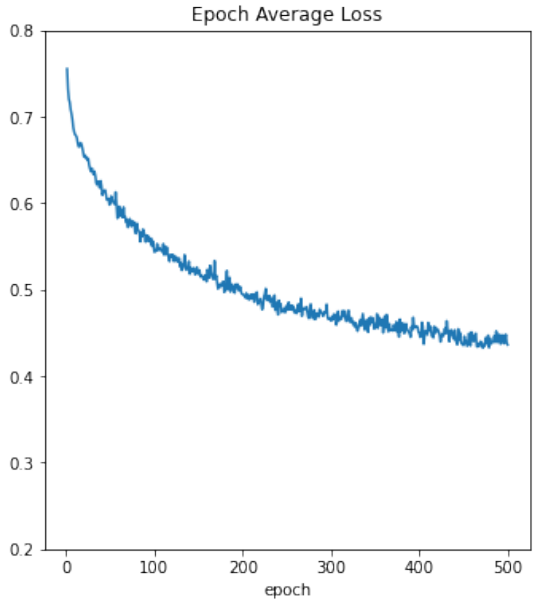


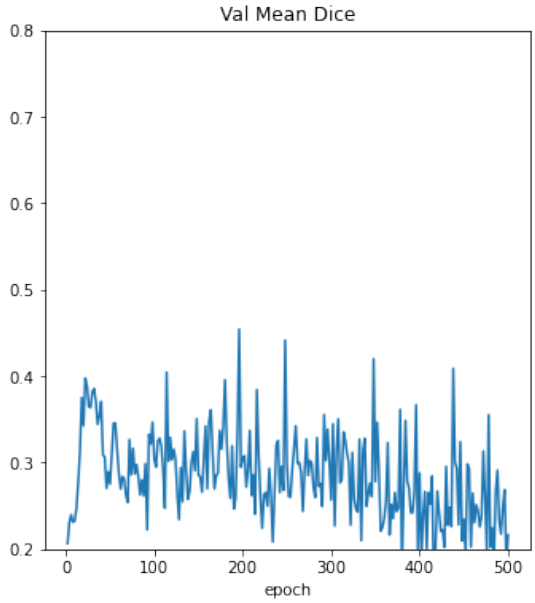

```
Number of not-sliding / sliding pixel = 1959 0
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

037s_iimage_588413346180_CLEAN.nii.gz

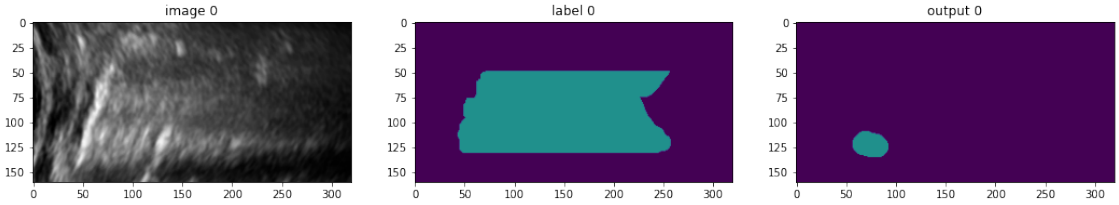



```
Number of not-sliding / sliding pixel = 4400 0
    Min thresh = 1000
    Not Sliding = Fales Positive


  Winner = Not Sliding


   VFOLD = 6 of 15
```





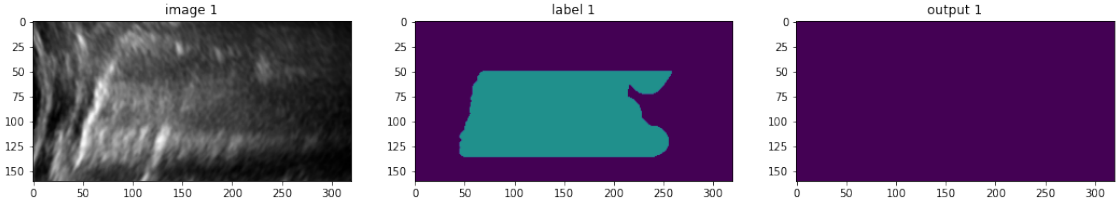
055ns_image_27180764486244_CLEAN.nii.gz



Number of not-sliding / sliding pixel = 739 0
Min thresh = 1000
Not Sliding = Correct

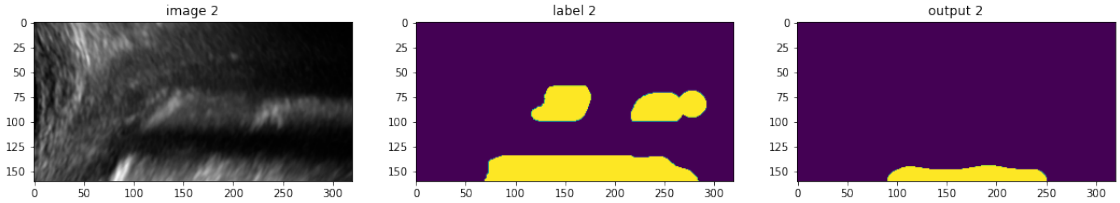
Winner = Not Sliding

055ns_image_27185428518326_CLEAN.nii.gz



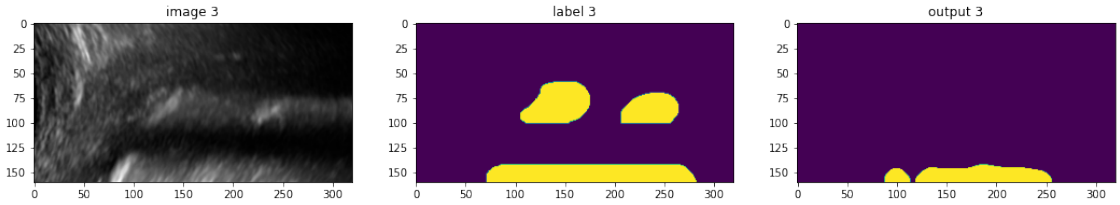
```
Number of not-sliding / sliding pixel = 0 0
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

043s_iimage_10391571128899_CLEAN.nii.gz



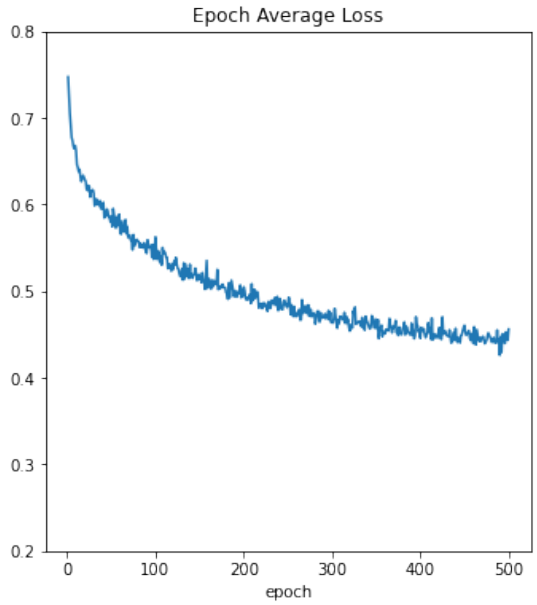

```
Number of not-sliding / sliding pixel = 0 2051
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding
```

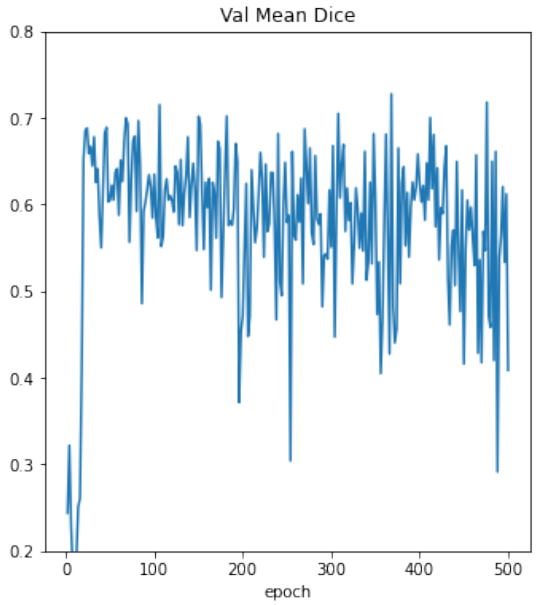
043s_iimage_10395655826502_CLEAN.nii.gz



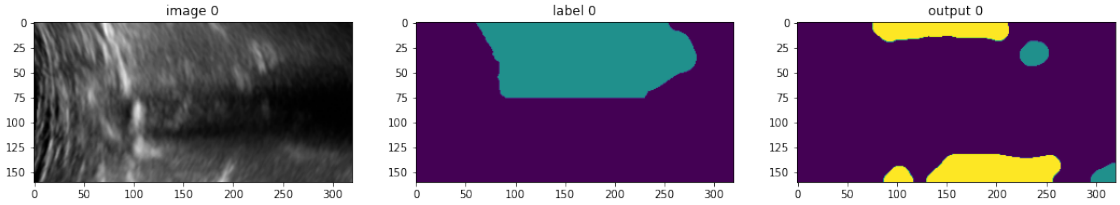

```
Number of not-sliding / sliding pixel = 0 2213
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding
```

VFOLD = 7 of 15





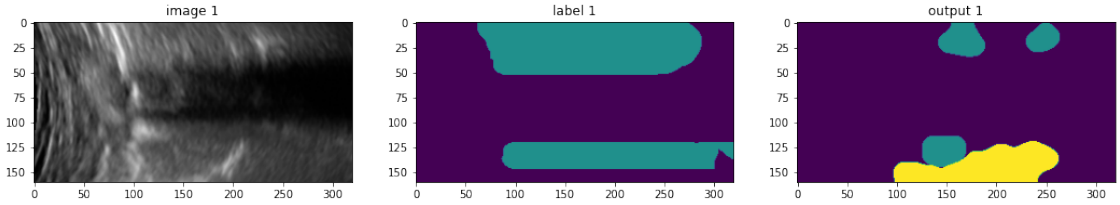
117ns_image_417221672548_CLEAN.nii.gz



Number of not-sliding / sliding pixel = 926 5842
Min thresh = 1000
Sliding = False Negative

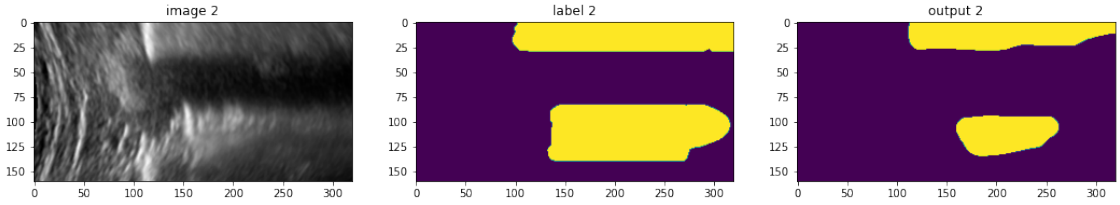
Winner = Sliding
FN Patient = 117ns_image_417221672548_CLEAN.nii.gz

117ns_image_426794579576_CLEAN.nii.gz



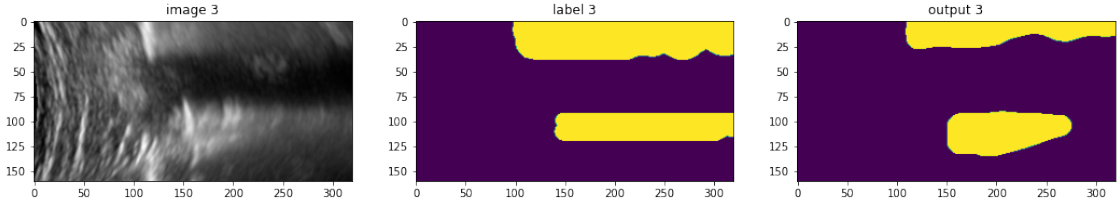

```
Number of not-sliding / sliding pixel = 3131 4381
    Min thresh = 1000
    Sliding = False Negative


  Winner = Sliding
 FN Patient = 117ns_image_426794579576_CLEAN.nii.gz
```

065s_iimage_1896534330004_clean.nii.gz

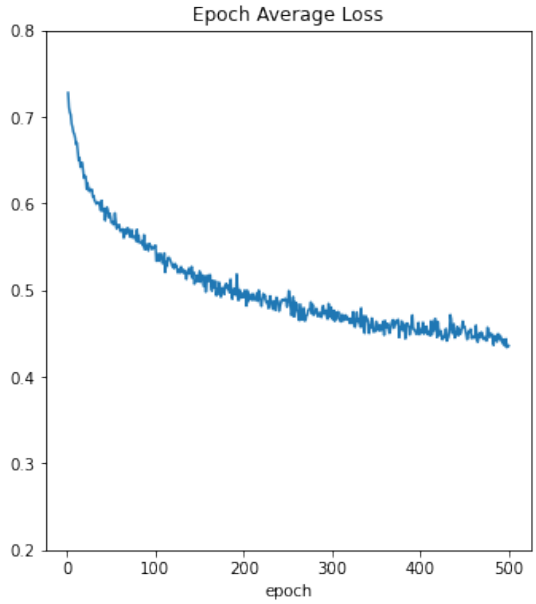


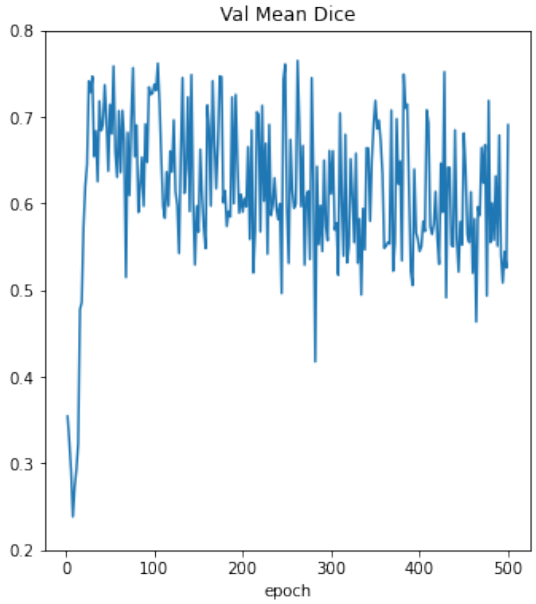

```
Number of not-sliding / sliding pixel = 0 8352
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding
```

065s_iimage_1901852337971_clean.nii.gz

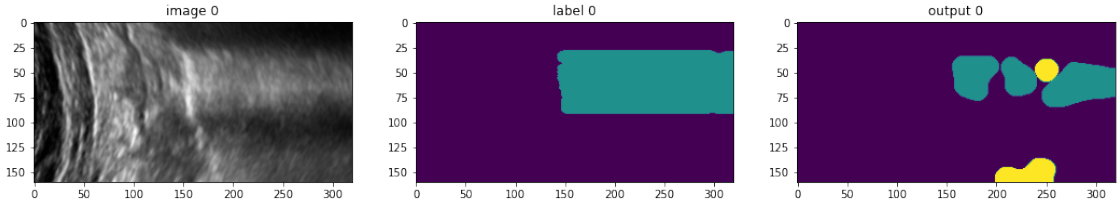


```
Number of not-sliding / sliding pixel = 0 8806
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding


   VFOLD = 8 of 15
```



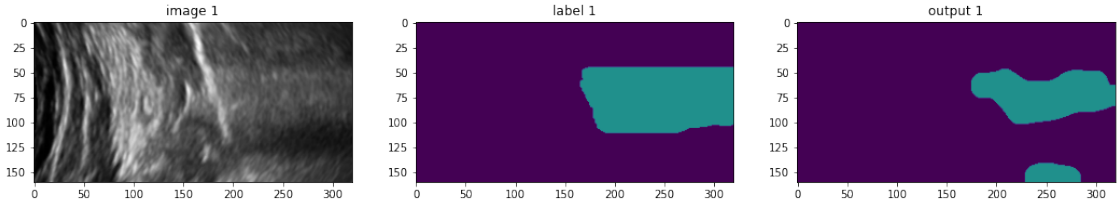



```
135ns_image_2418161753608_clean.nii.gz
```



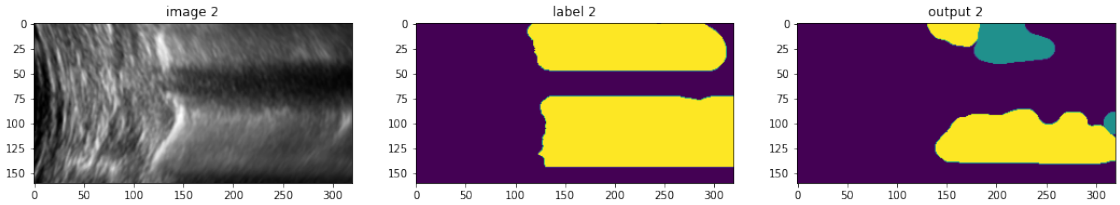

```
Number of not-sliding / sliding pixel = 5109 1494
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

135ns_image_2454526567135_CLEAN.nii.gz



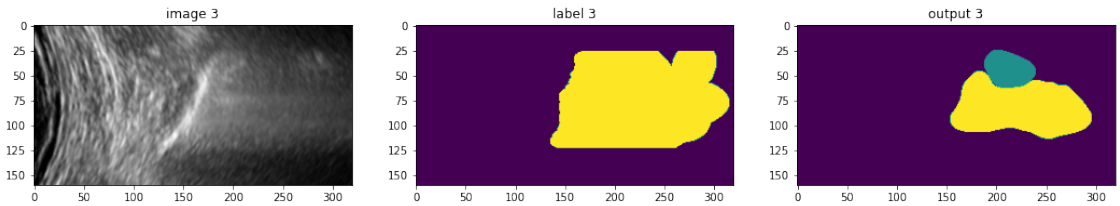

```
Number of not-sliding / sliding pixel = 6415 0
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

081s_iimage_2959672151786_clean.nii.gz

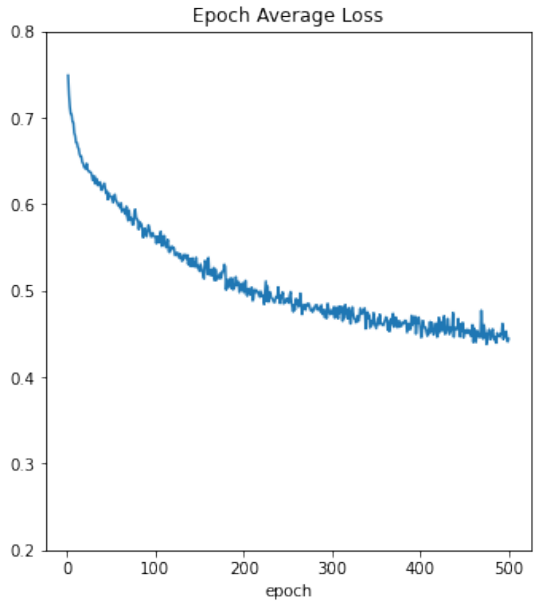


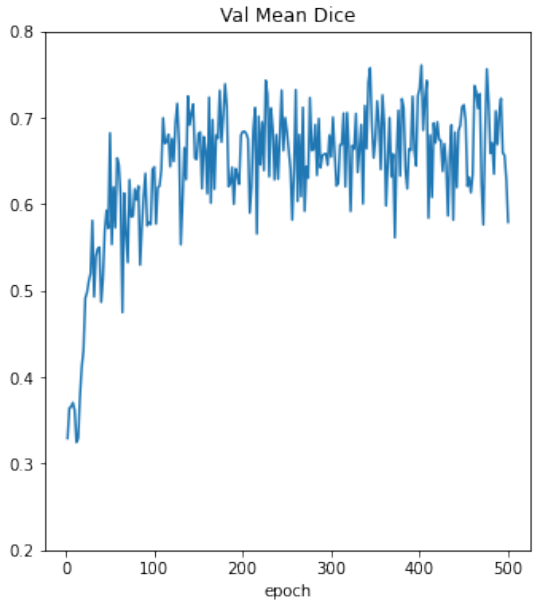

```
Number of not-sliding / sliding pixel = 2805 8936
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding
```

081s_iimage_3320344386805_clean.nii.gz

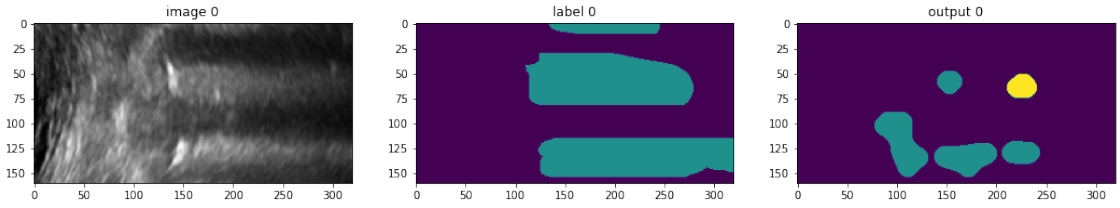


```
Number of not-sliding / sliding pixel = 1478 6433
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding


   VFOLD = 9 of 15
```





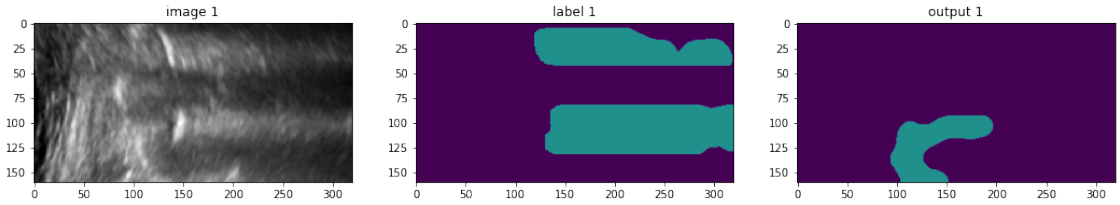

```
193ns_image_634125159704_CLEAN.nii.gz
```




```
Number of not-sliding / sliding pixel = 4659 583
    Min thresh = 1000
    Not Sliding = Correct
```

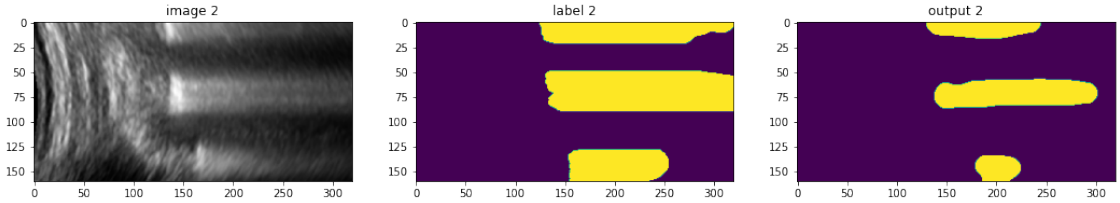
```
  Winner = Not Sliding
```

193ns_image_642169070951_clean.nii.gz



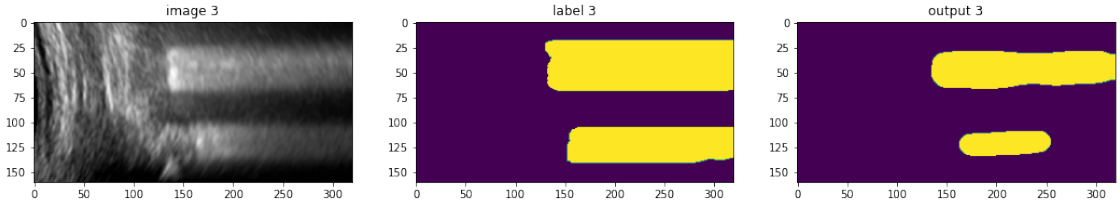

```
Number of not-sliding / sliding pixel = 3554 0
    Min thresh = 1000
    Not Sliding = Correct

  Winner = Not Sliding
```

206s_iimage_1499268364374_clean.nii.gz

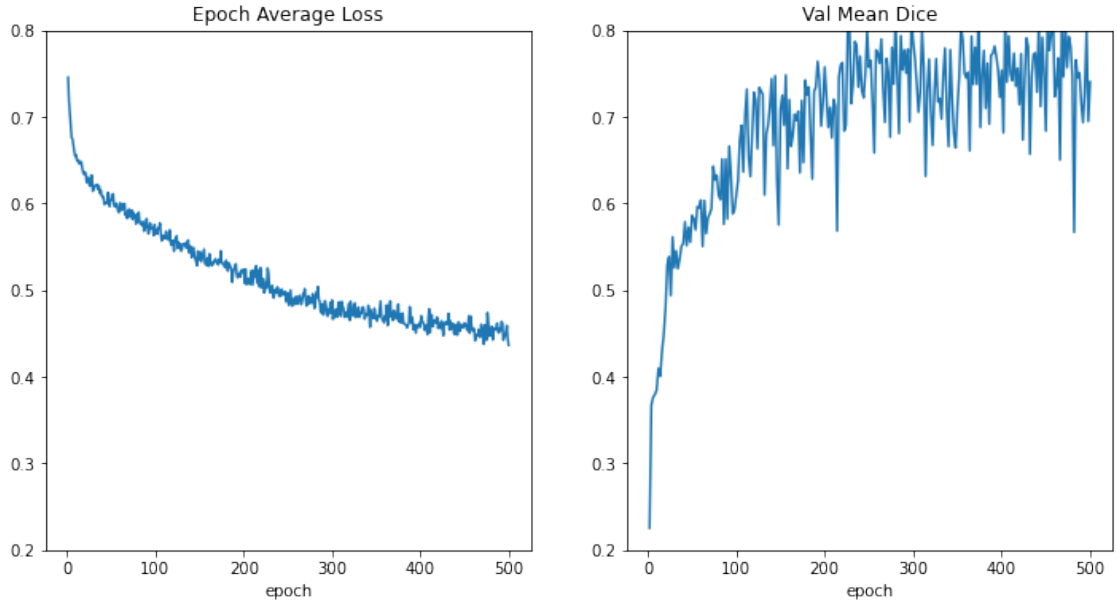



```
Number of not-sliding / sliding pixel = 0 6693
    Min thresh = 1000
    Sliding = Correct

  Winner = Sliding
```

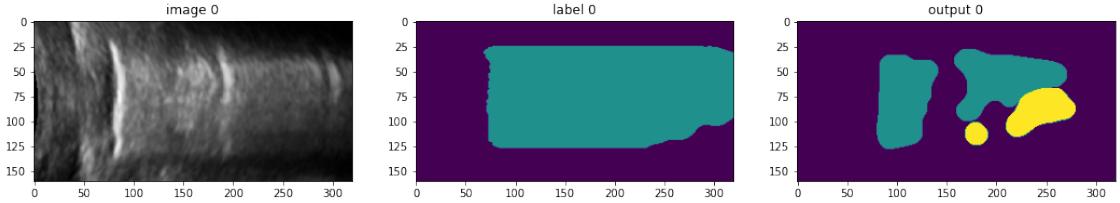
206s_iimage_1511338287338_clean.nii.gz




```
Number of not-sliding / sliding pixel = 0 8216
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding


   VFOLD = 10 of 15
```

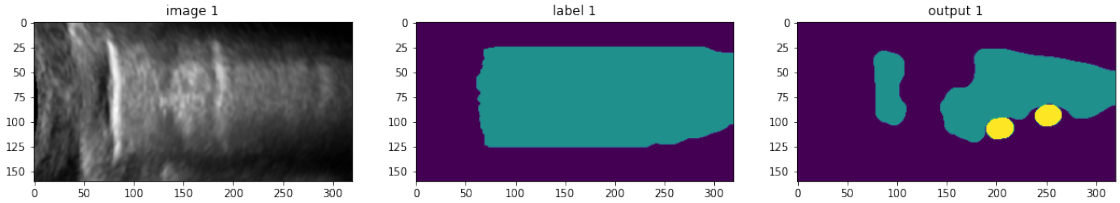



```
210ns_image_603665940081_clean.nii.gz
```



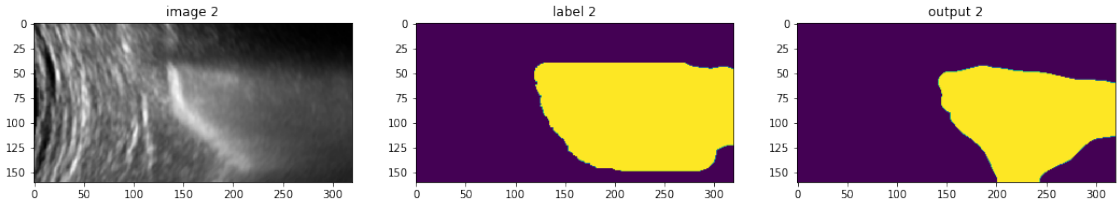
```
Number of not-sliding / sliding pixel = 9183 2572
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

```
210ns_image_614587120545_clean.nii.gz
```



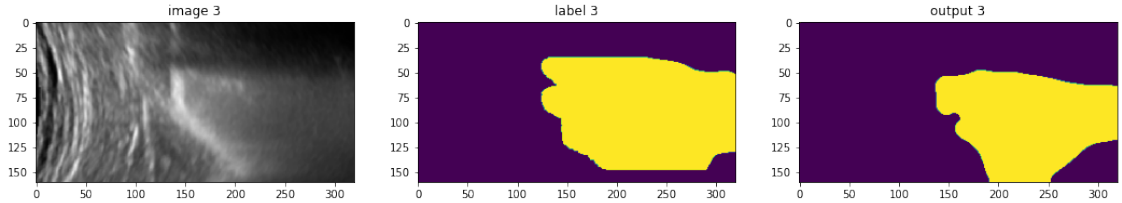

```
Number of not-sliding / sliding pixel = 11820 983
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

```
208s_iimage_104543812690743_CLEAN.nii.gz
```




```
Number of not-sliding / sliding pixel = 0 14502
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding
```

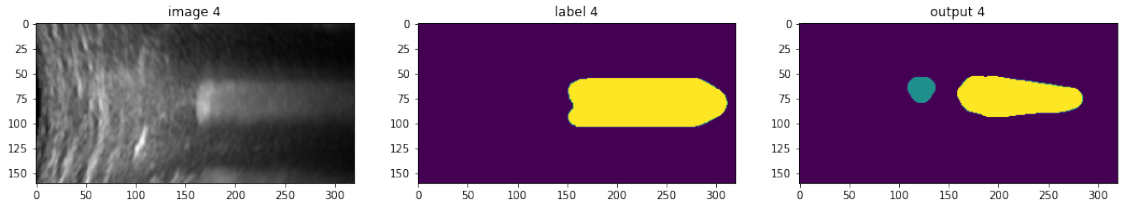
208s_iimage_104548309385533_CLEAN.nii.gz



Number of not-sliding / sliding pixel = 0 14674
Min thresh = 1000
Sliding = Correct

Winner = Sliding

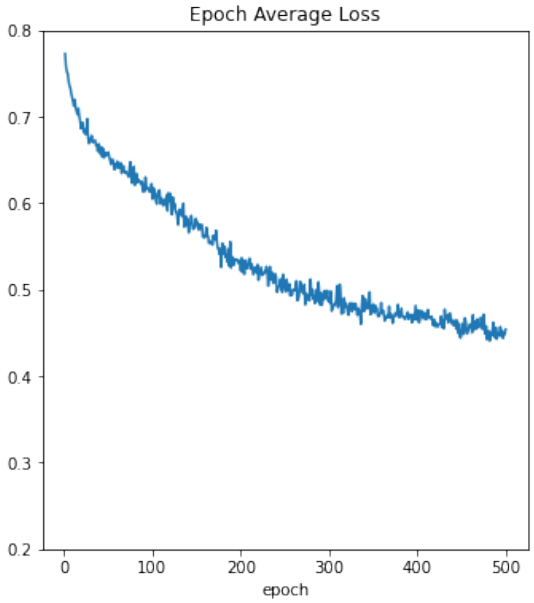
208s_iimage_104932526155699_CLEAN.nii.gz

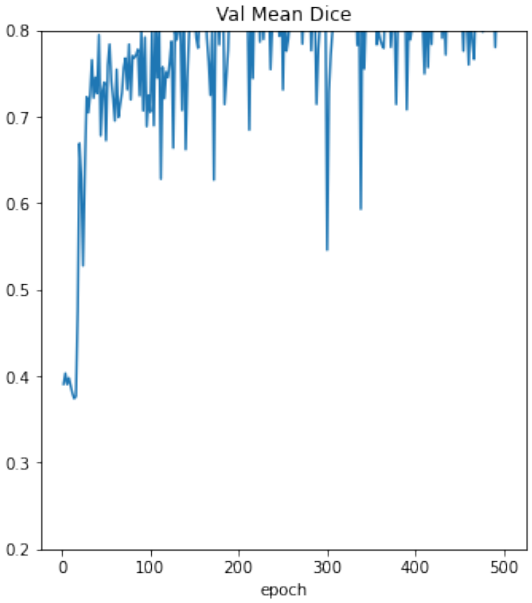


Number of not-sliding / sliding pixel = 574 3944
Min thresh = 1000
Sliding = Correct

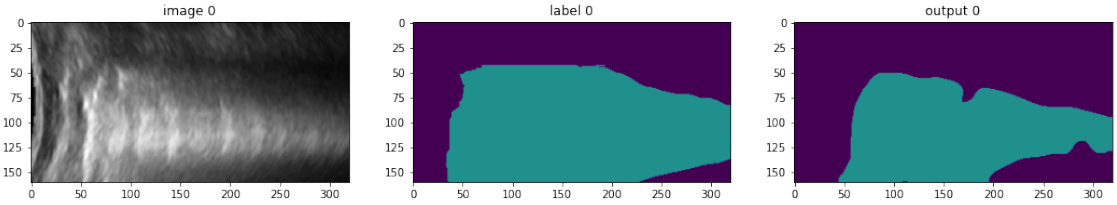
Winner = Sliding

VFOLD = 11 of 15





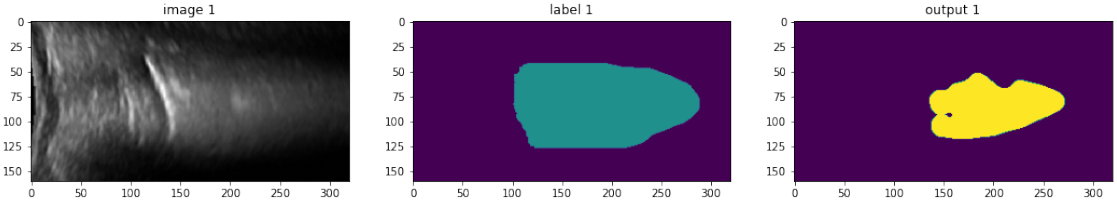
215ns_image_573611404207_CLEAN.nii.gz



Number of not-sliding / sliding pixel = 20300 0
    Min thresh = 1000
    Not Sliding = Correct

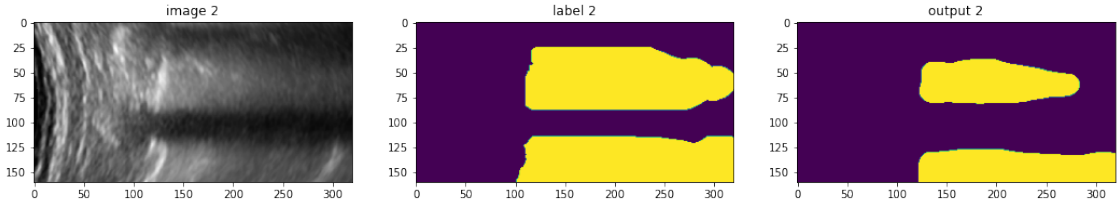
  Winner = Not Sliding

215ns_image_610066411380_CLEAN.nii.gz



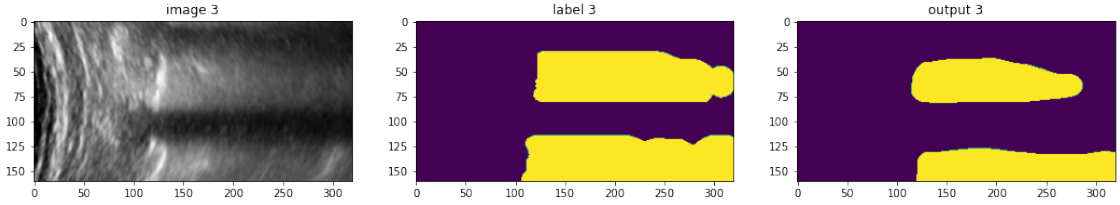
```
Number of not-sliding / sliding pixel = 0 6139
    Min thresh = 1000
    Sliding = False Negative


  Winner = Sliding
 FN Patient = 215ns_image_610066411380_CLEAN.nii.gz
```

211s_iimage_3925135436261_clean.nii.gz



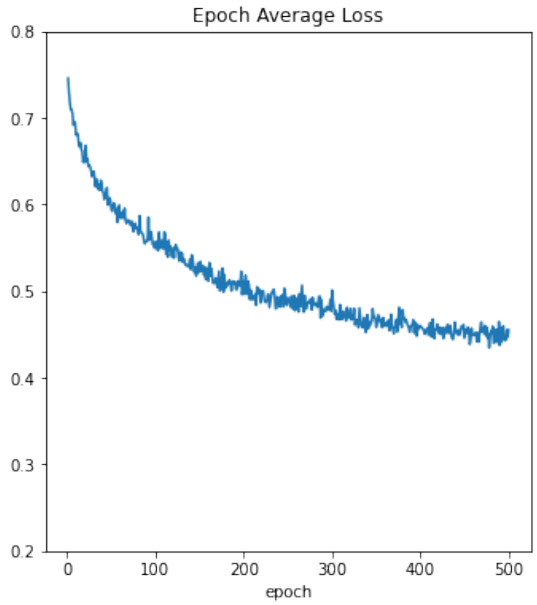

```
Number of not-sliding / sliding pixel = 0 11661
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding
```

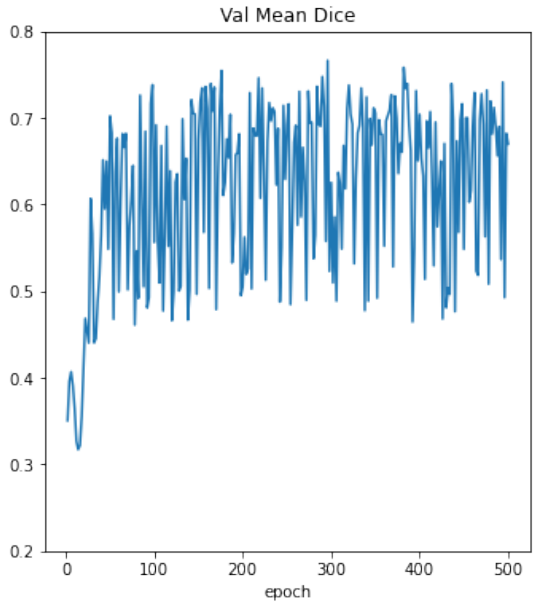
211s_iimage_3929217595322_clean.nii.gz



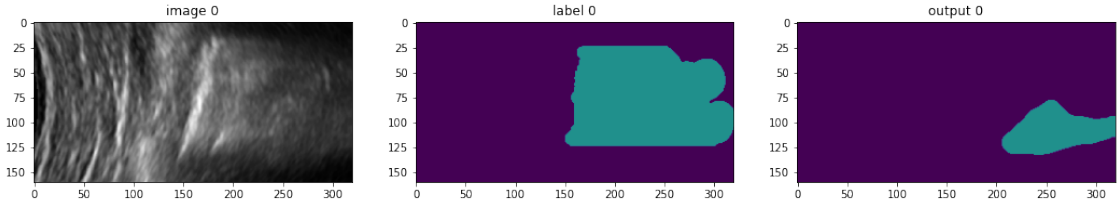

```
Number of not-sliding / sliding pixel = 0 12077
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding
```

VFOLD = 12 of 15





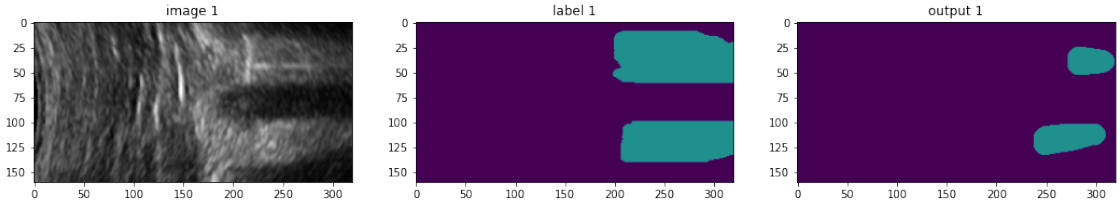
218ns_image_6056976176281_CLEAN.nii.gz



Number of not-sliding / sliding pixel = 3817 0
Min thresh = 1000
Not Sliding = Correct

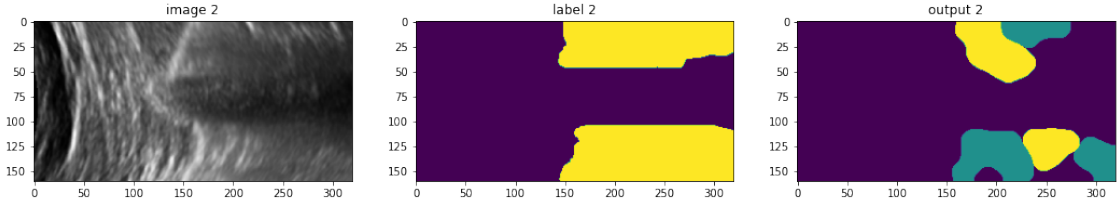
Winner = Not Sliding

218ns_image_6370410622099_CLEAN.nii.gz



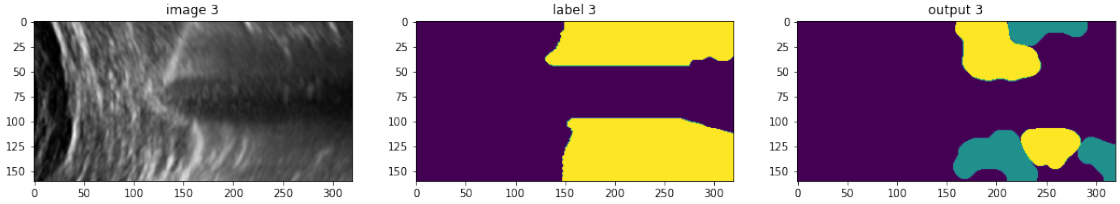

```
Number of not-sliding / sliding pixel = 2865 0
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

212s_iimage_128683942015128_CLEAN.nii.gz

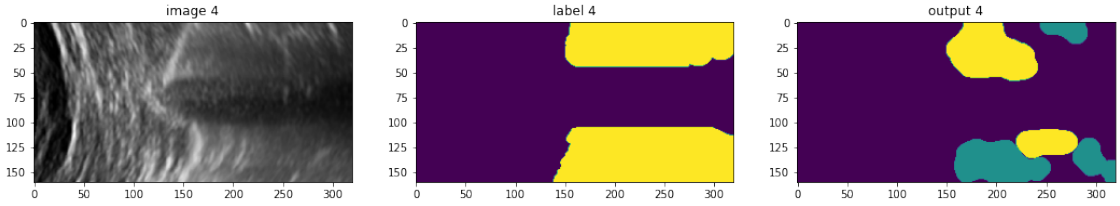



```
Number of not-sliding / sliding pixel = 6005 4868
    Min thresh = 1000
    Not Sliding = Fales Positive


  Winner = Not Sliding
 FP Patient = 212s_iimage_128683942015128_CLEAN.nii.gz
```

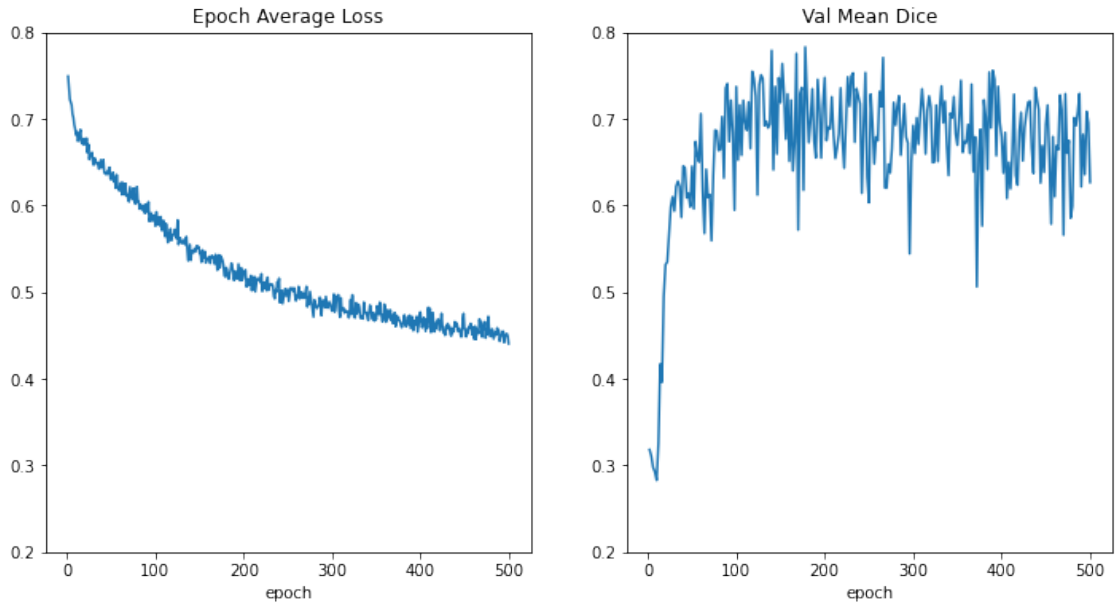
212s_iimage_128688523296793_CLEAN.nii.gz



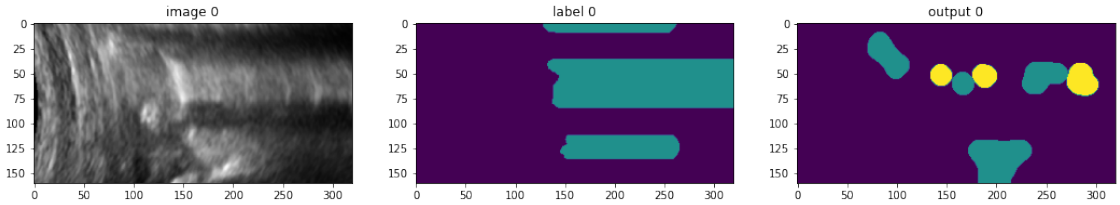
```
Number of not-sliding / sliding pixel = 5400 5596
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding


212s_iimage_128692595484031_CLEAN.nii.gz
```




```
Number of not-sliding / sliding pixel = 5158 5427
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding


   VFOLD = 13 of 15
```

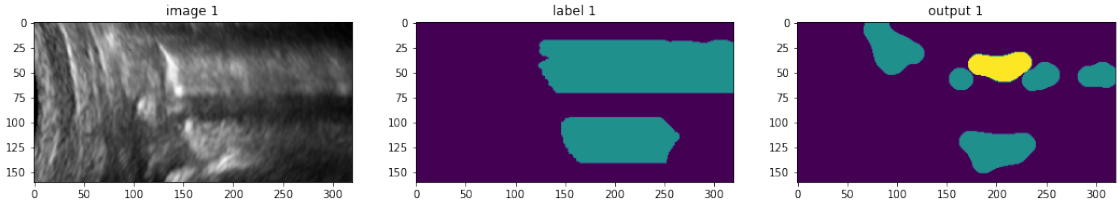


219ns_image_1884162273498_clean.nii.gz



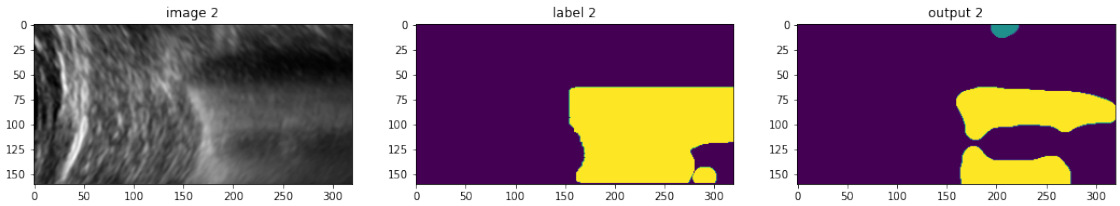

```
Number of not-sliding / sliding pixel = 4758 1668
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

219ns_image_1895283541879_clean.nii.gz



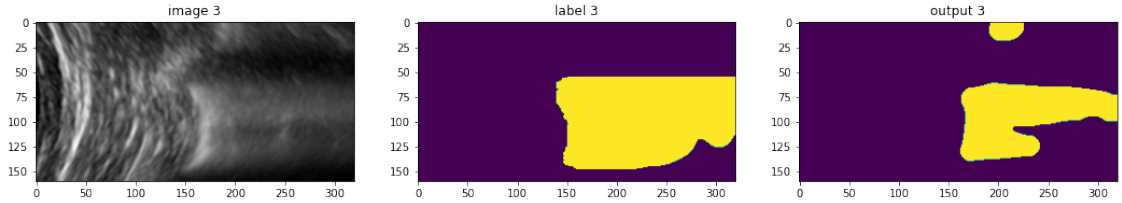

```
Number of not-sliding / sliding pixel = 6314 1412
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

224s_iimage_3308406916756_clean.nii.gz

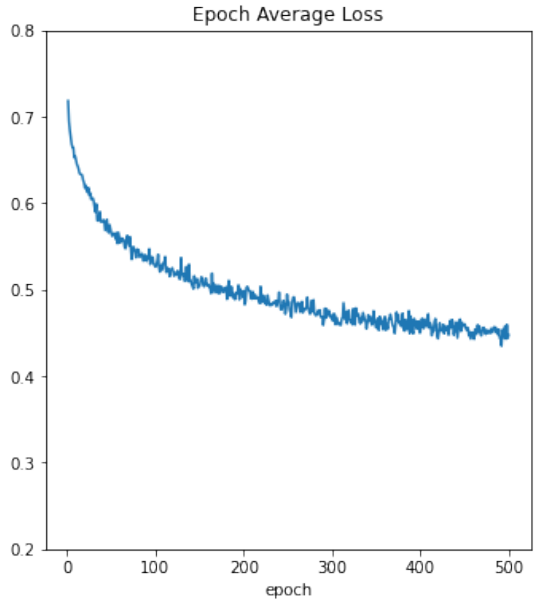


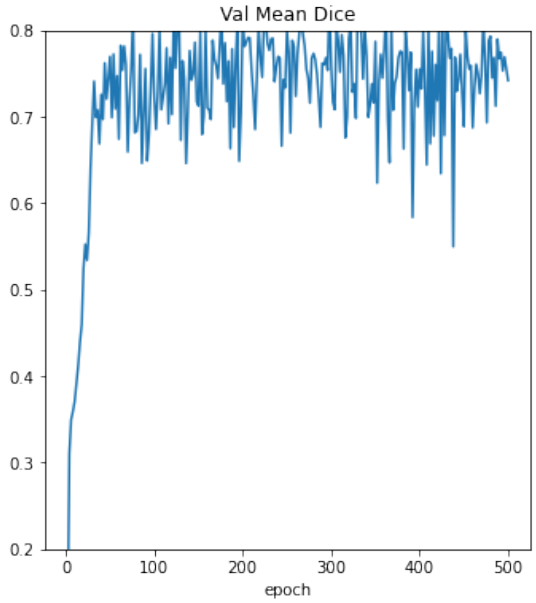
```
Number of not-sliding / sliding pixel = 313 8705
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding
```

```
224s_iimage_3315947589826_clean.nii.gz
```

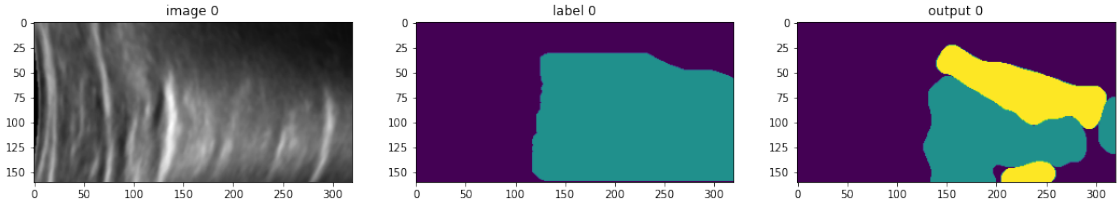



```
Number of not-sliding / sliding pixel = 0 8503
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding


   VFOLD = 14 of 15
```





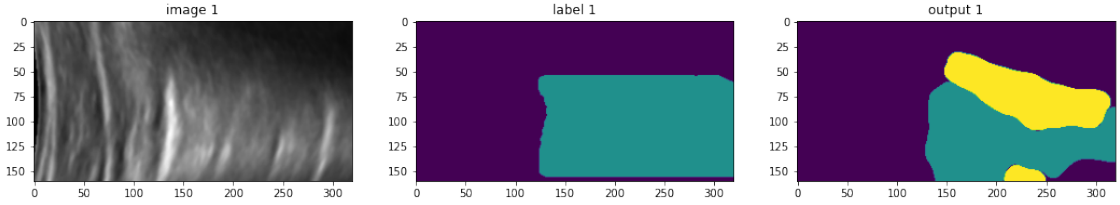
221ns_image_584357289931_clean.nii.gz



Number of not-sliding / sliding pixel = 11364 7469
Min thresh = 1000
Not Sliding = Correct

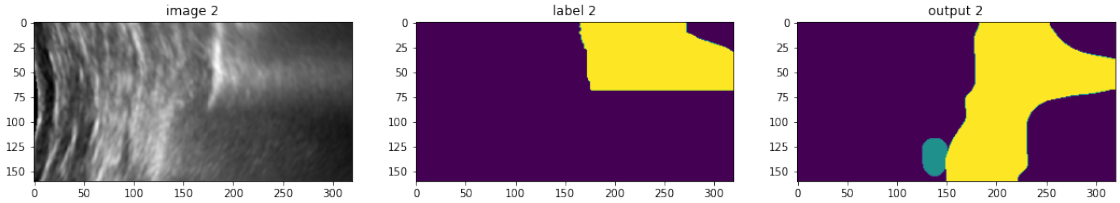
Winner = Not Sliding

221ns_image_588695055398_clean.nii.gz



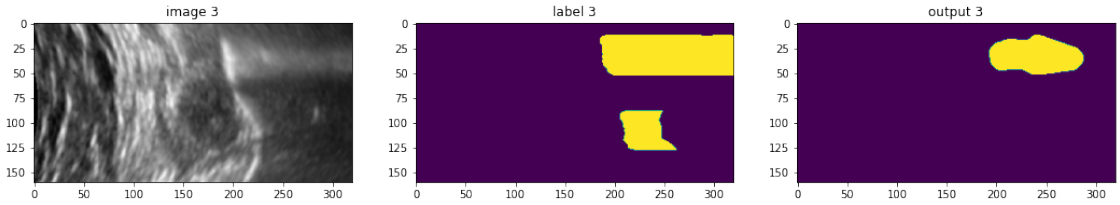
```
Number of not-sliding / sliding pixel = 11301 7332
    Min thresh = 1000
    Not Sliding = Correct


  Winner = Not Sliding
```

```
228s_iimage_3321463845606_clean.nii.gz
```




```
Number of not-sliding / sliding pixel = 798 15010
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding
```

```
228s_iimage_3384882513134_clean.nii.gz
```




```
Number of not-sliding / sliding pixel = 0 2837
    Min thresh = 1000
    Sliding = Correct


  Winner = Sliding
```

```
Patients: Correct = 56 Incorrect = 6 Not Sliding as Sliding = 3
Slices: Correct = 55 Incorrect =  7 Not Sliding as Sliding = 3
**********
```

[ ]:

[ ]: