TTA - joint finteuning of segmentation and reconstruction

Klára Janoušková

Datasets
Healthy Training Curves Example:
On the importance of pre-trained model and loading weights properly
Different subset cross evaluation + aspect ratio impact

TODO: the experiment on different lr of freezed encoder model part has disappeared, fix it

Datasets

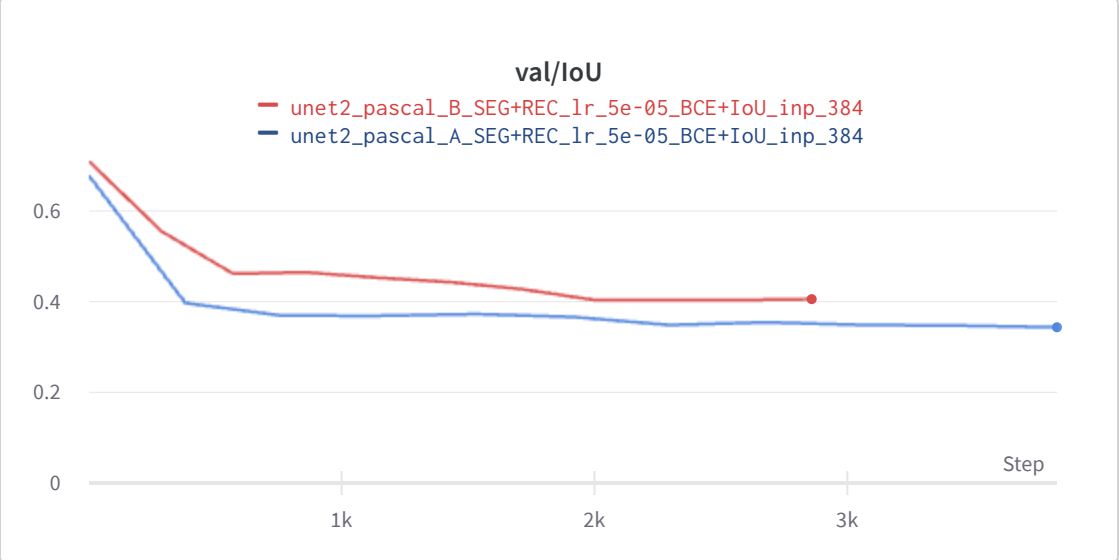
Models here are trained on the Pascal VOC segmentation dataset. The segmentation model is class-agnostic, trained on images cropped around ground truth objects.

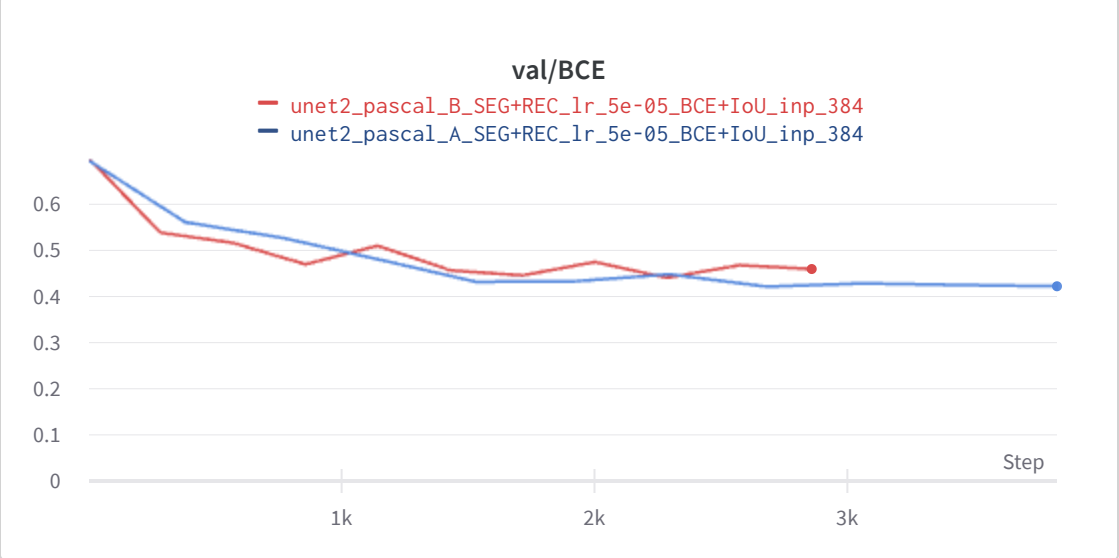
There are two datasets subsets, called A and B. Those were created by sorting the classes according to the number of trianing examples. When ranked from 1 to 20, even classes are put to subset A, odd to subset B.

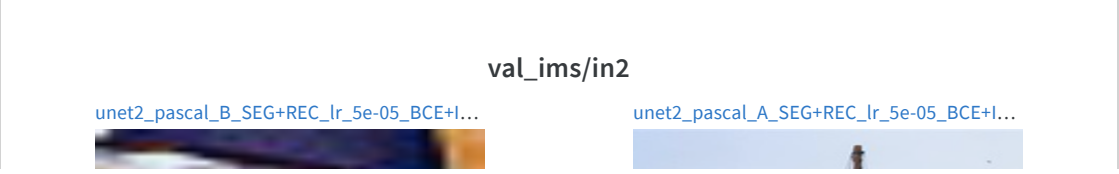
A = ['person', 'car', 'cat', 'bottle', 'tvmonitor', 'train', 'pottedplant', 'boat', 'horse', 'sheep']

B = ['dog', 'chair', 'bird', 'aeroplane', 'bicycle', 'diningtable', 'motorbike', 'sofa', 'bus', 'cow']

Healthy Training Curves Example:







val_ims/in1

unet2_pascal_B_SEG+REC_lr_5e-05_BCE+I...

unet2_pascal_A_SEG+REC_lr_5e-05_BCE+I...

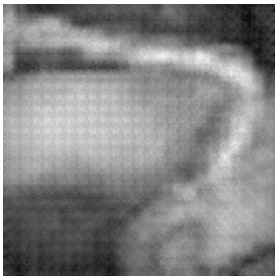
val_ims/in0

unet2_pascal_B_SEG+REC_lr_5e-05_BCE+I...

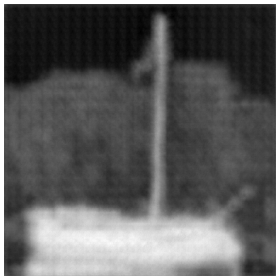
unet2_pascal_A_SEG+REC_lr_5e-05_BCE+I...

val_ims/out2

unet2_pascal_B_SEG+REC_lr...



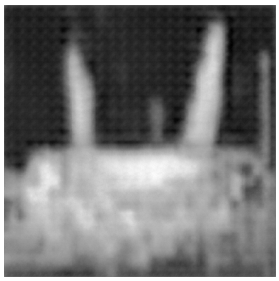
unet2_pascal_A_SEG+REC_lr...



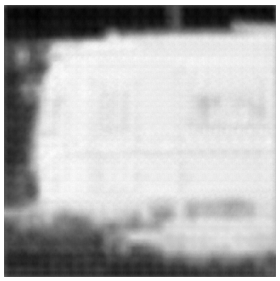
Step 3829

val_ims/out1

unet2_pascal_B_SEG+REC_lr...



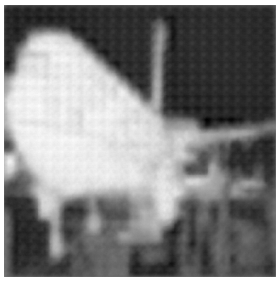
unet2_pascal_A_SEG+REC_lr...



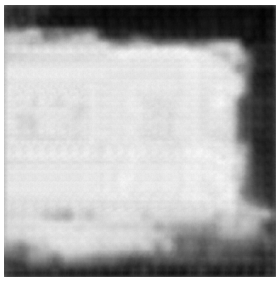
Step 3829

val_ims/out0

unet2_pascal_B_SEG+REC_lr...

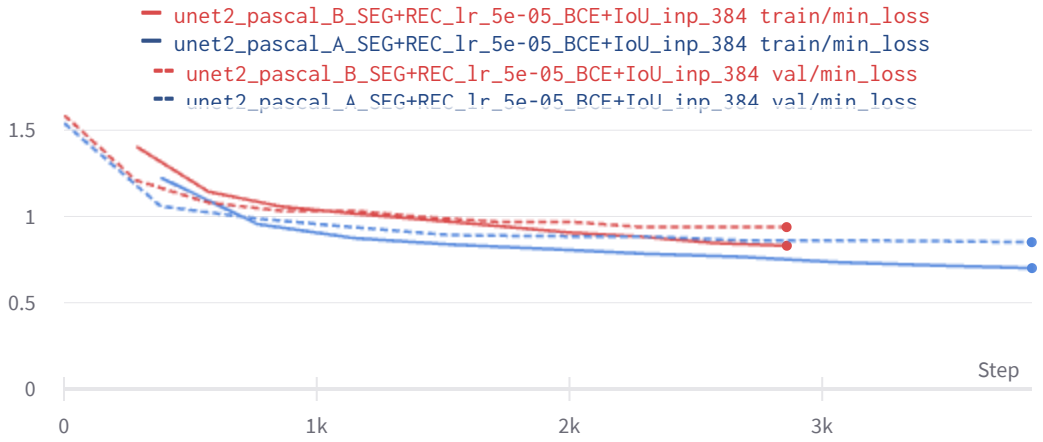


unet2_pascal_A_SEG+REC_lr...



Step 3829

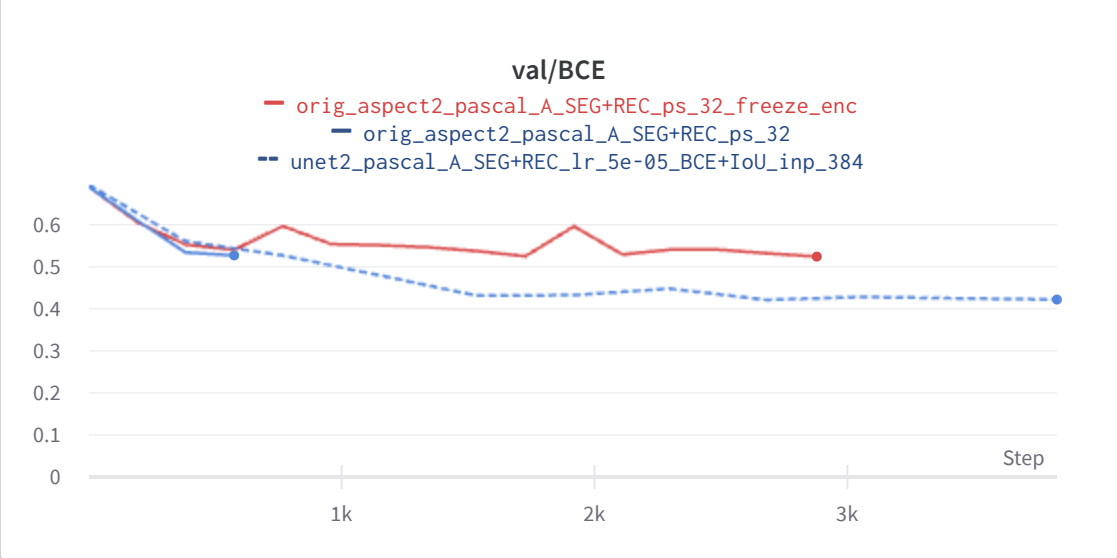
train/min_loss, val/min_loss

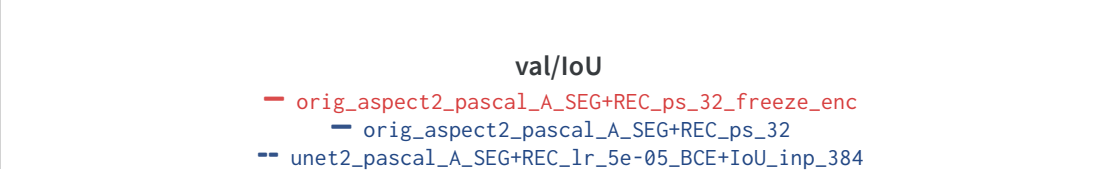


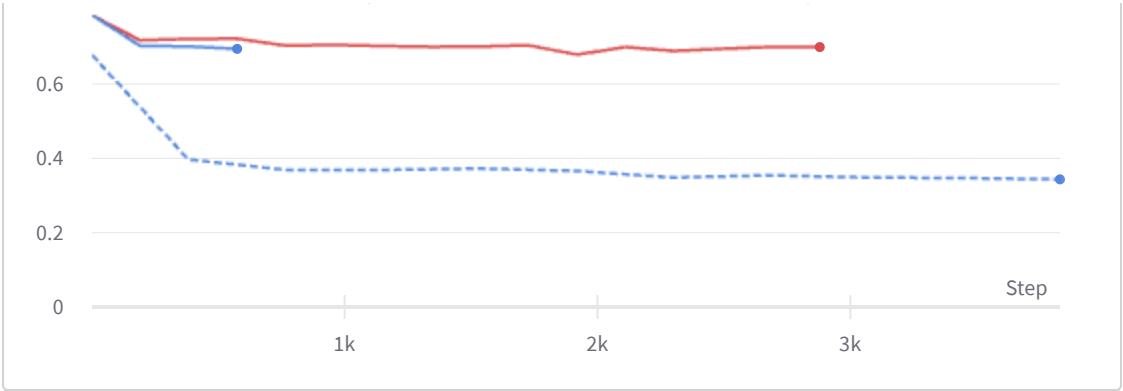
On the importance of pre-trained model and loading weights properly

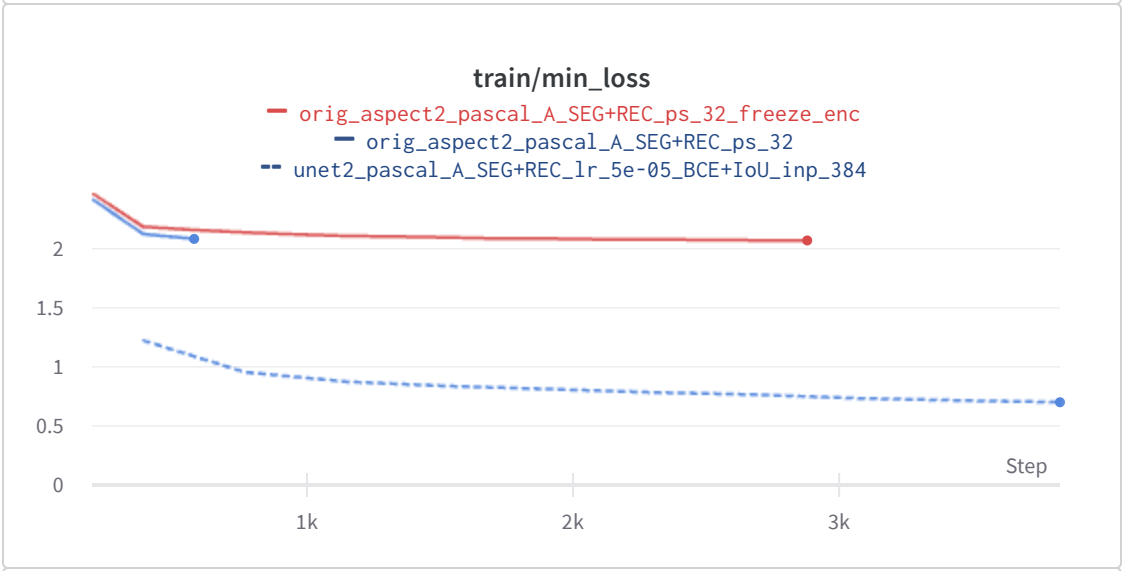
When we do not load the positional encoding:

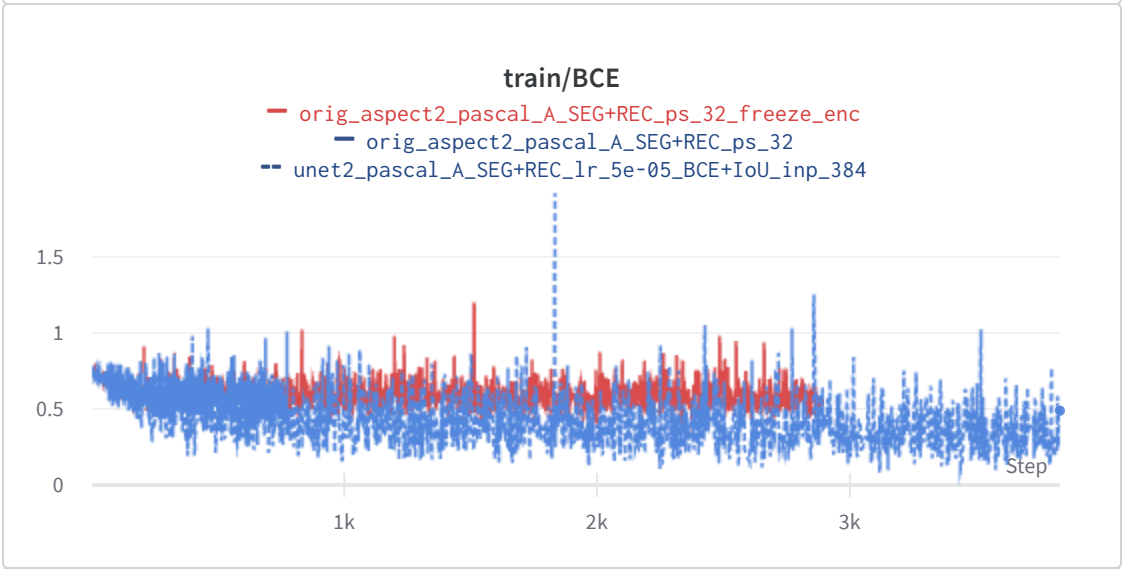
When we change patch size and thus need to train patch embedding vs loading pre-trained weights:

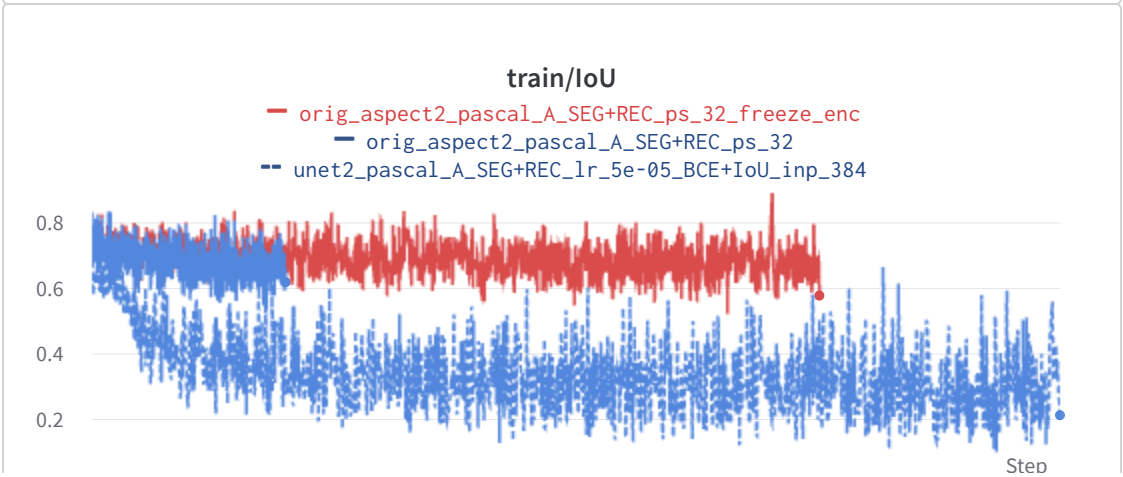


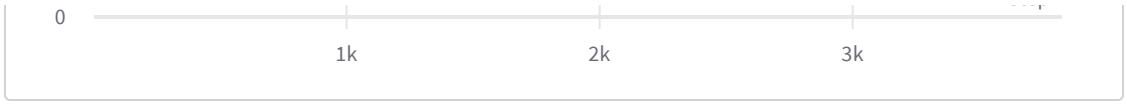



0.6
0.4
0.2
0
Step
1k
2k
3k

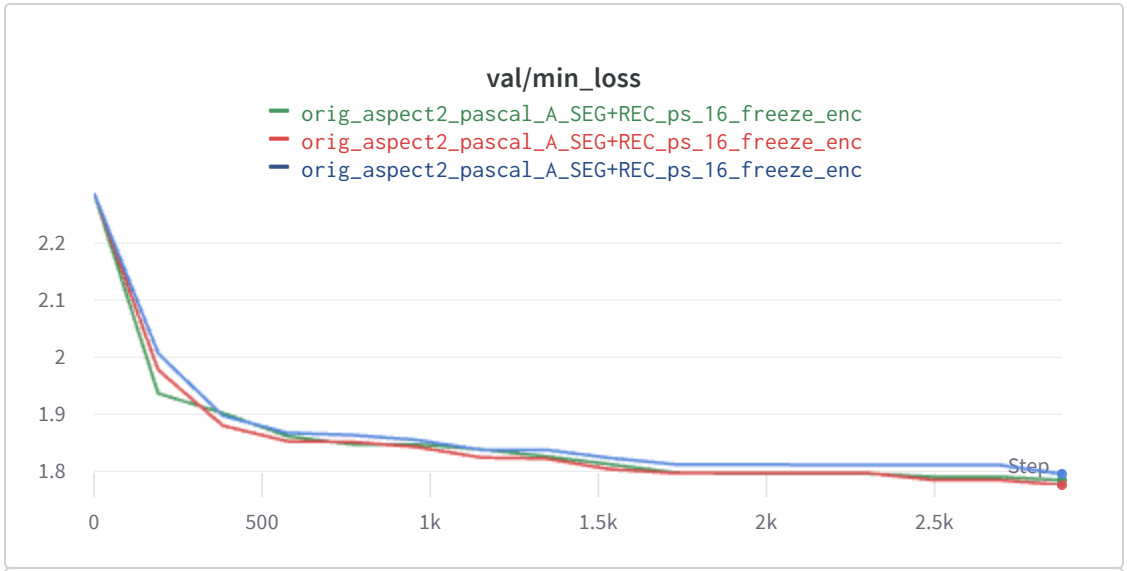

train/min_loss
orig_aspect2_pascal_A_SEG+REC_ps_32_freeze_enc
orig_aspect2_pascal_A_SEG+REC_ps_32
unet2_pascal_A_SEG+REC_lr_5e-05_BCE+IoU_inp_384
2
1.5
1
0.5
0
Step
1k
2k
3k

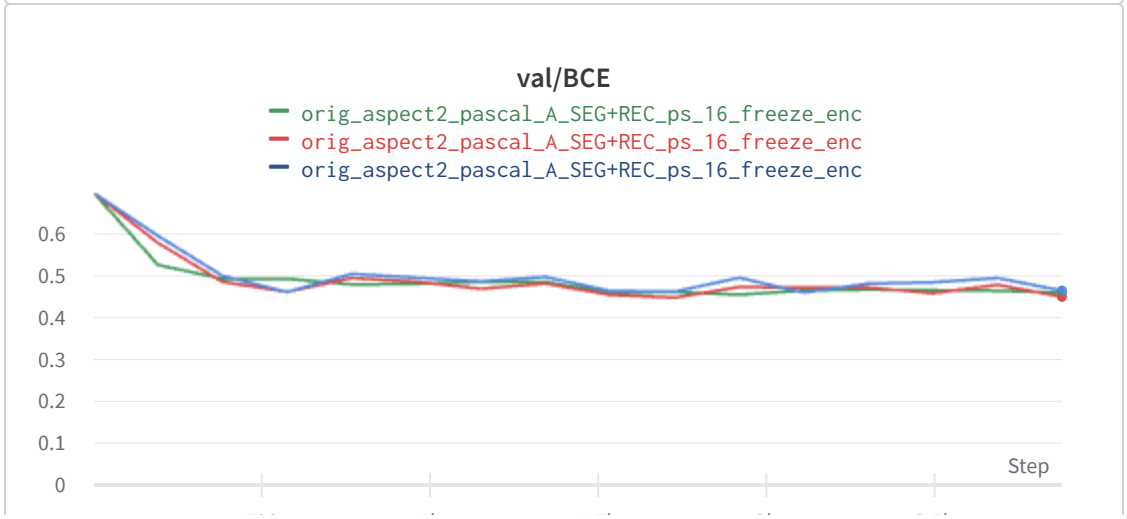

train/BCE
orig_aspect2_pascal_A_SEG+REC_ps_32_freeze_enc
orig_aspect2_pascal_A_SEG+REC_ps_32
unet2_pascal_A_SEG+REC_lr_5e-05_BCE+IoU_inp_384
1.5
1
0.5
0
Step
1k
2k
3k


train/IoU
orig_aspect2_pascal_A_SEG+REC_ps_32_freeze_enc
orig_aspect2_pascal_A_SEG+REC_ps_32
unet2_pascal_A_SEG+REC_lr_5e-05_BCE+IoU_inp_384
0.8
0.6
0.4
0.2
Step



Experimenting with different learning rates when altering patch size - doesn't really help:

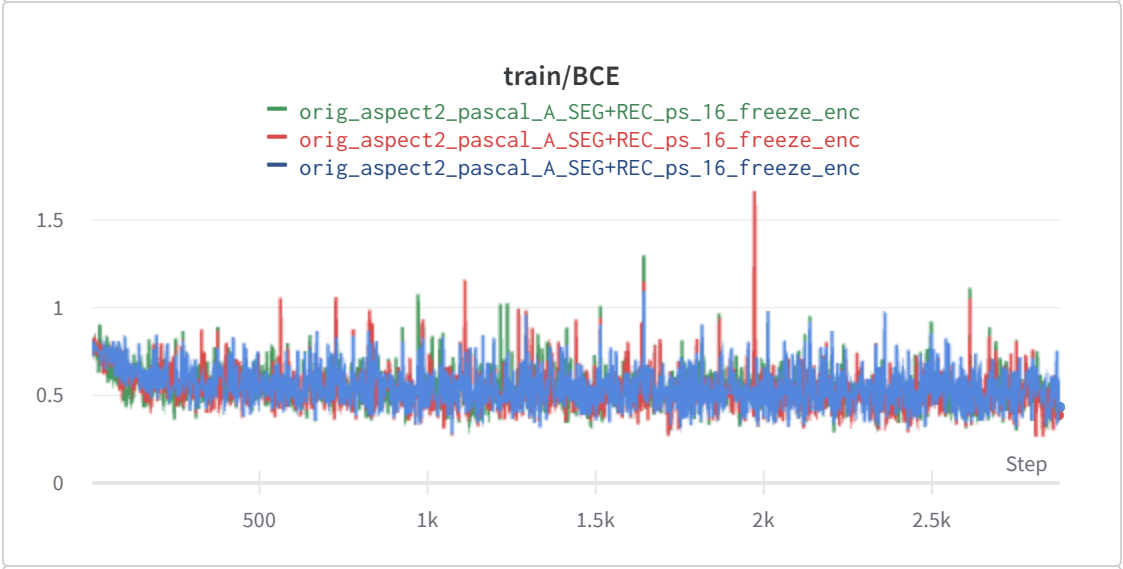


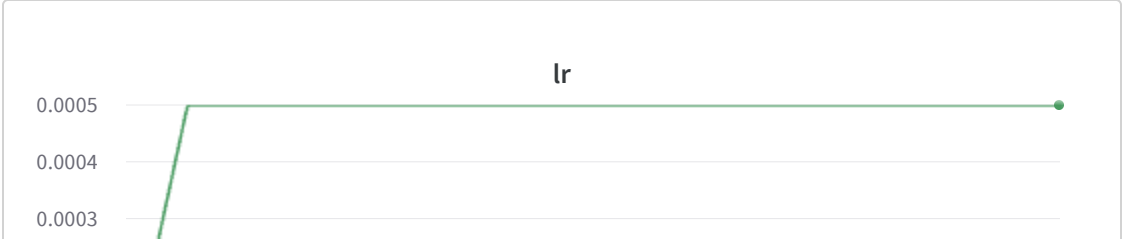


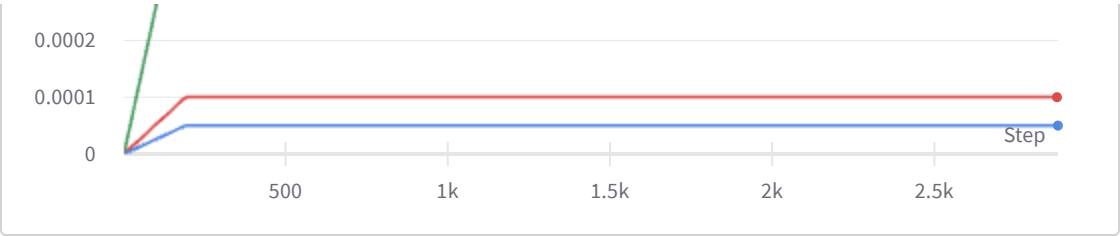
500
1k
1.5k
2k
2.5k

train/min_loss
orig_aspect2_pascal_A_SEG+REC_ps_16_freeze_enc
orig_aspect2_pascal_A_SEG+REC_ps_16_freeze_enc
orig_aspect2_pascal_A_SEG+REC_ps_16_freeze_enc
2.15
2.1
2.05
2
1.95
1.9
Step
500
1k
1.5k
2k
2.5k

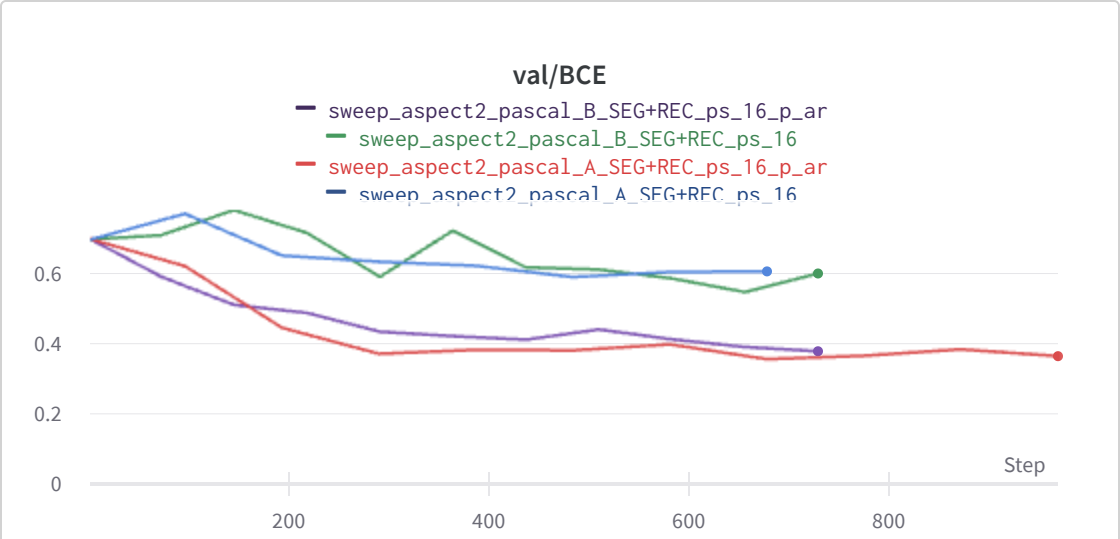
train/IoU
orig_aspect2_pascal_A_SEG+REC_ps_16_freeze_enc
orig_aspect2_pascal_A_SEG+REC_ps_16_freeze_enc
orig_aspect2_pascal_A_SEG+REC_ps_16_freeze_enc
0.8
0.6
0.4
0.2
0
Step
500
1k
1.5k
2k
2.5k

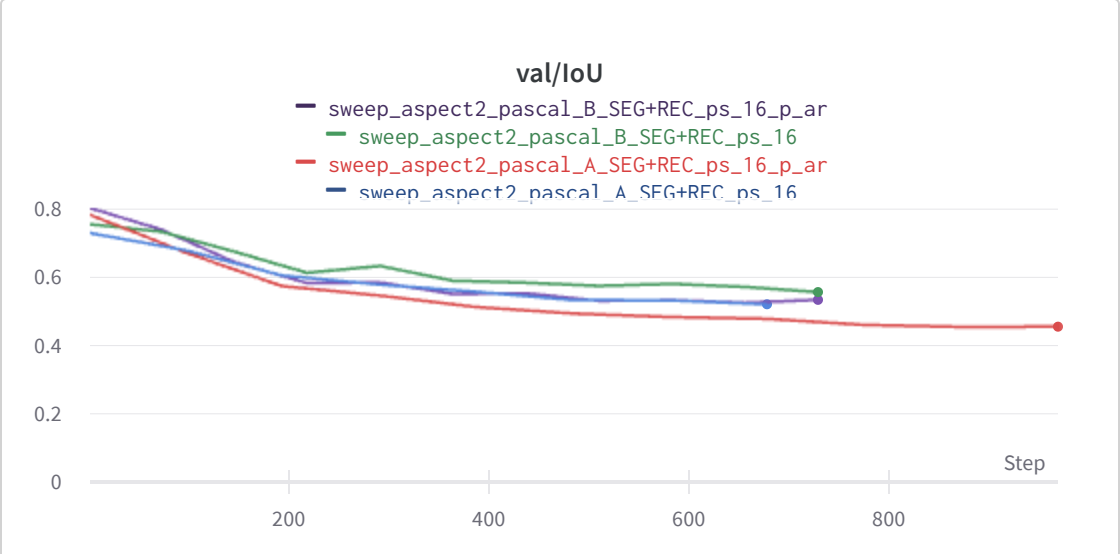

train/BCE
orig_aspect2_pascal_A_SEG+REC_ps_16_freeze_enc
orig_aspect2_pascal_A_SEG+REC_ps_16_freeze_enc
orig_aspect2_pascal_A_SEG+REC_ps_16_freeze_enc
1.5
1
0.5
0
Step
500
1k
1.5k
2k
2.5k

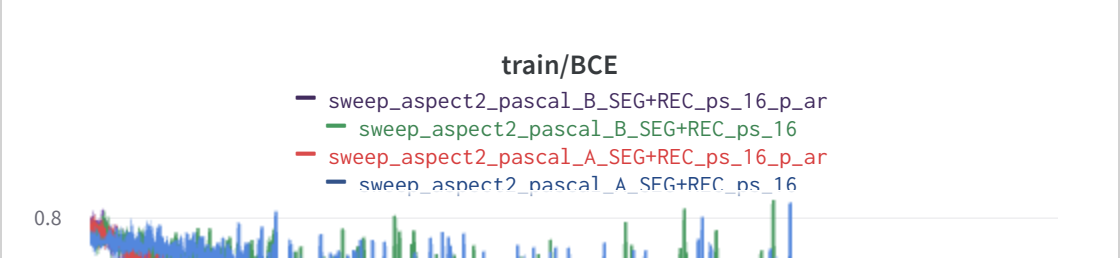

lr
0.0005
0.0004
0.0003

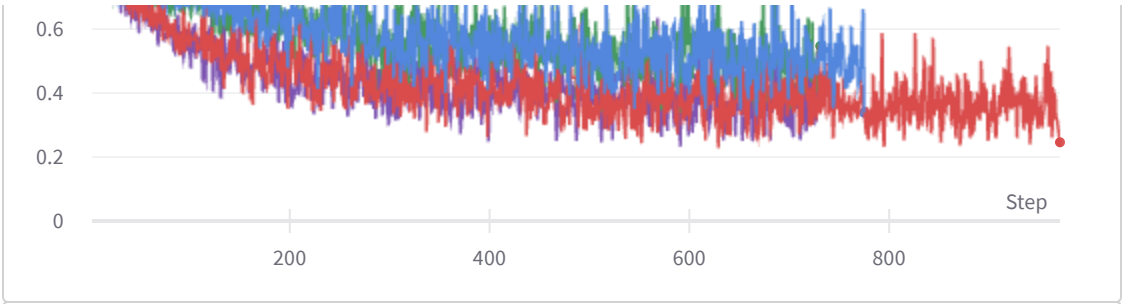


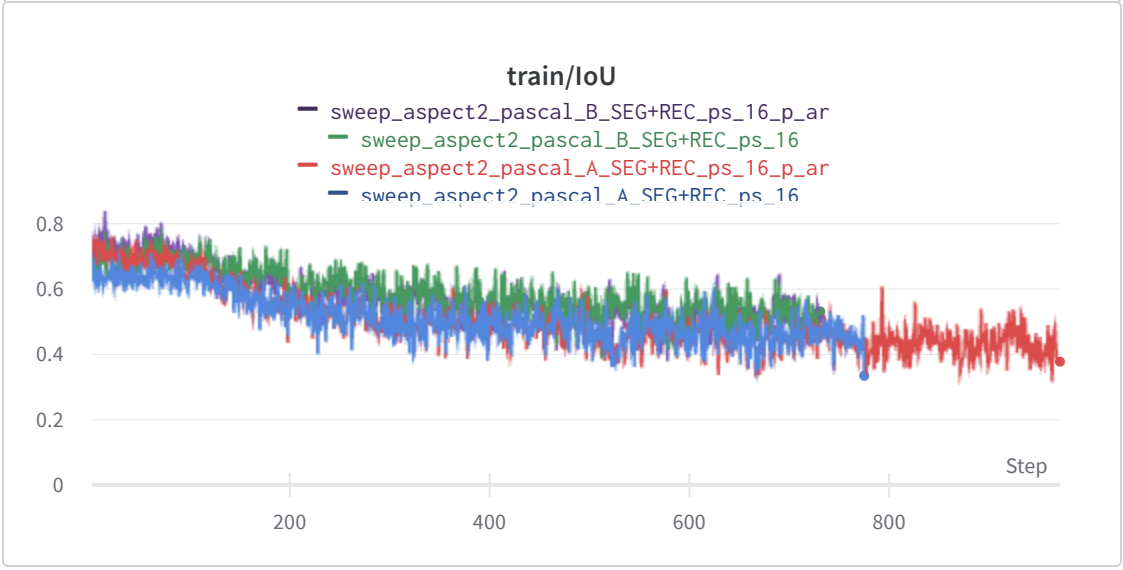
When there was a mistake in facebook-pretrained to our model weight name matching and the positional encoding didn't get loaded - the weights of the positional encoding were set to require_grad=False so not trained.



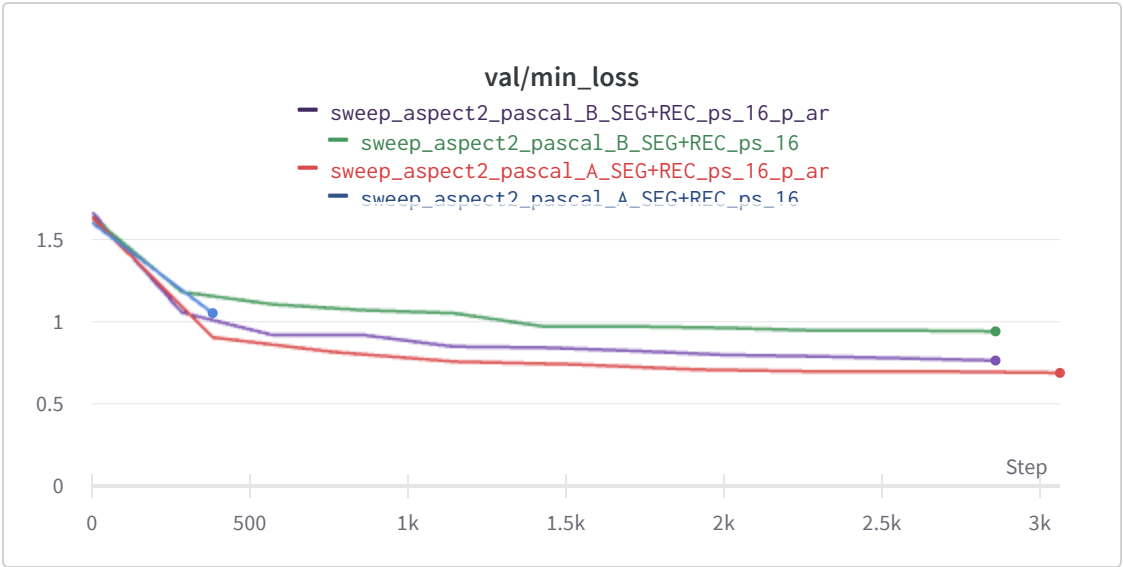


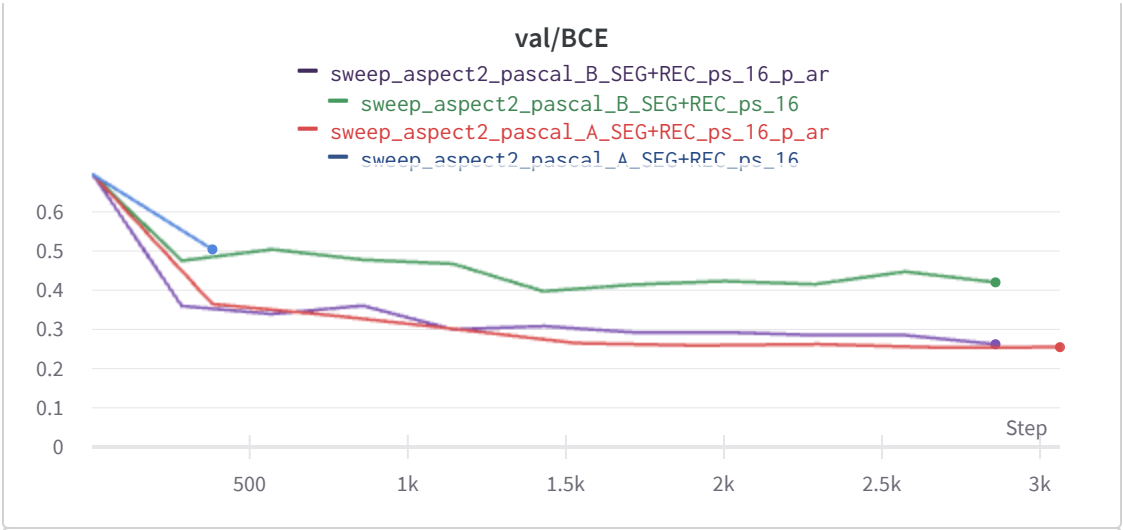


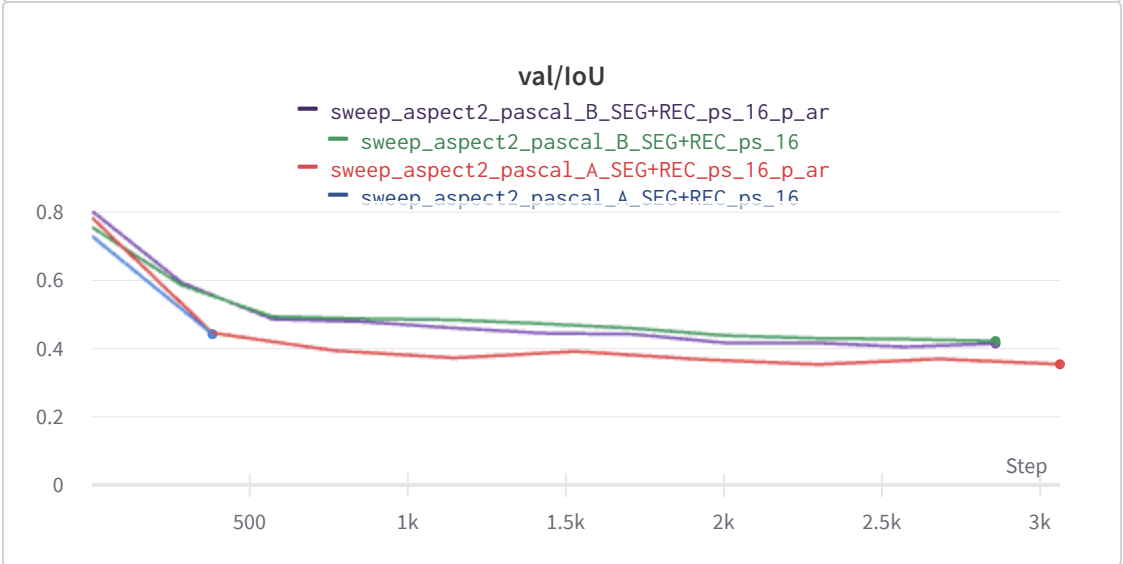


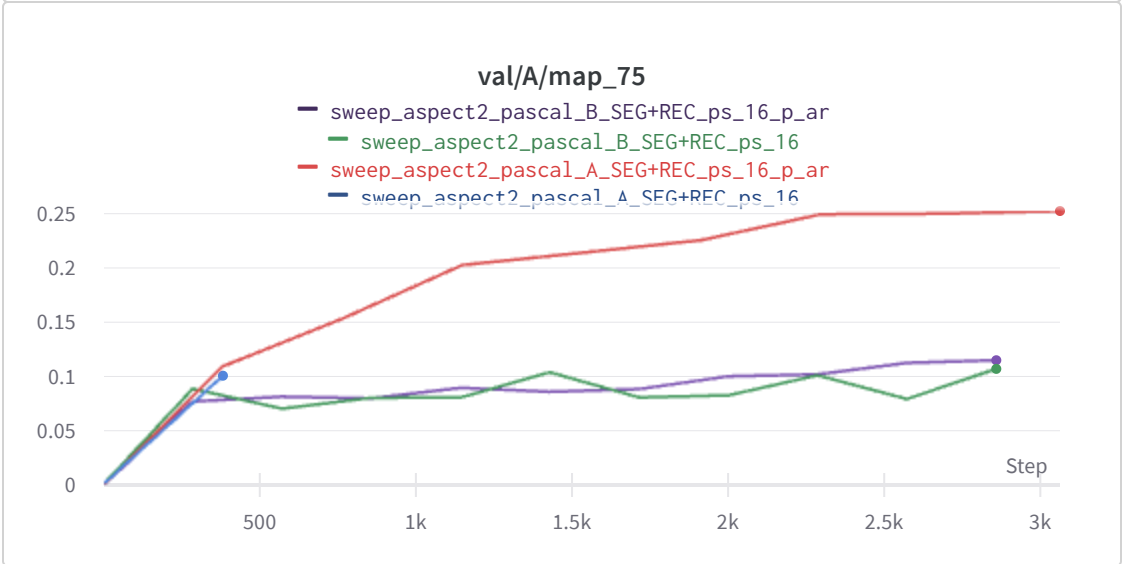


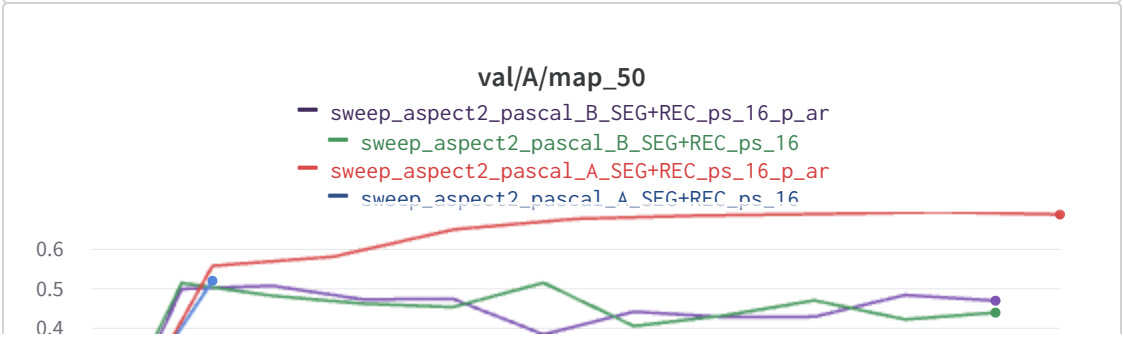
Different subset cross evaluation + aspect ratio impact

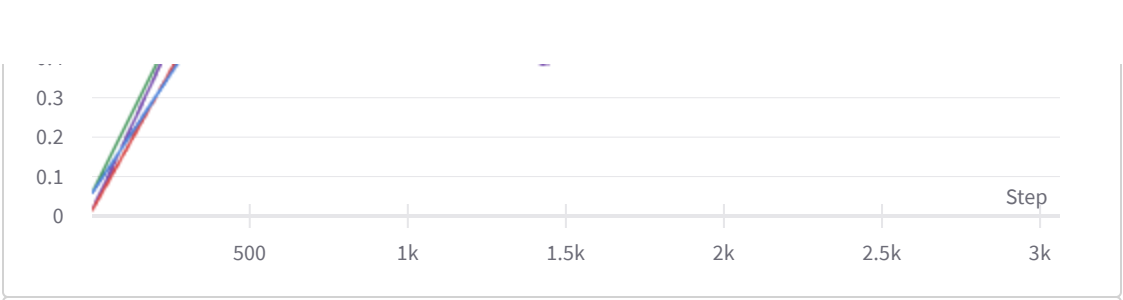


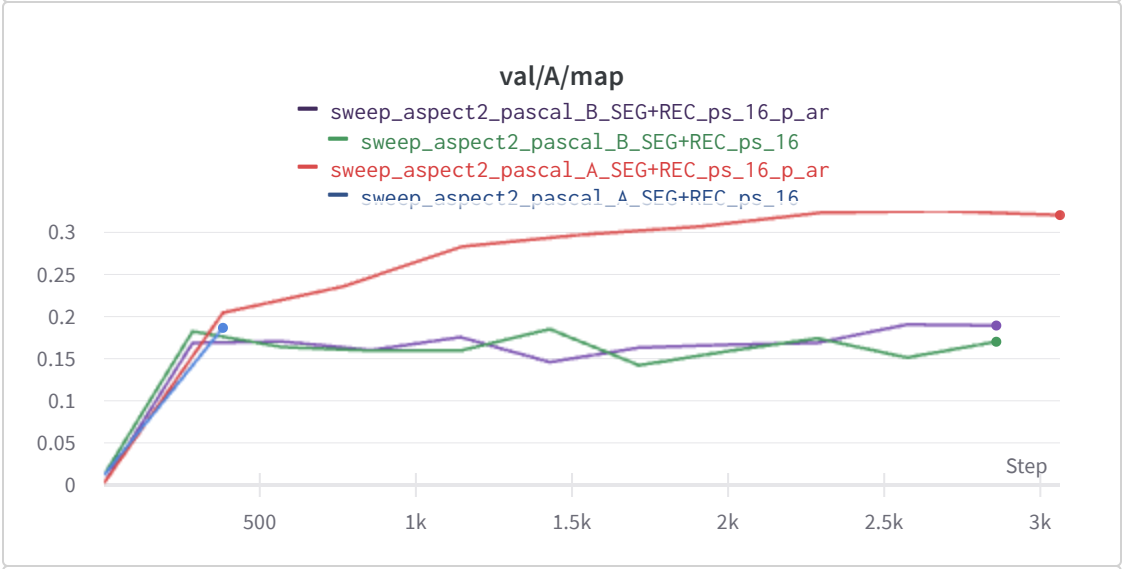

val/BCE
sweep_aspect2_pascal_B_SEG+REC_ps_16_p_ar
sweep_aspect2_pascal_B_SEG+REC_ps_16
sweep_aspect2_pascal_A_SEG+REC_ps_16_p_ar
sweep_aspect2_pascal_A_SEG+REC_ps_16
0.6
0.5
0.4
0.3
0.2
0.1
0
Step
500
1k
1.5k
2k
2.5k
3k

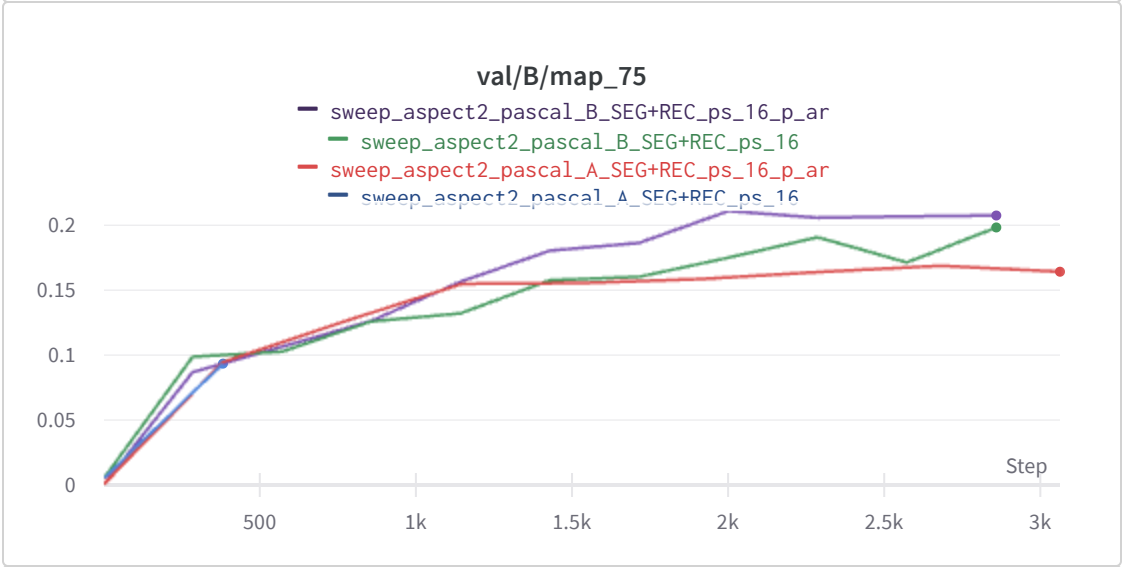

val/IoU
sweep_aspect2_pascal_B_SEG+REC_ps_16_p_ar
sweep_aspect2_pascal_B_SEG+REC_ps_16
sweep_aspect2_pascal_A_SEG+REC_ps_16_p_ar
sweep_aspect2_pascal_A_SEG+REC_ps_16
0.8
0.6
0.4
0.2
0
Step
500
1k
1.5k
2k
2.5k
3k

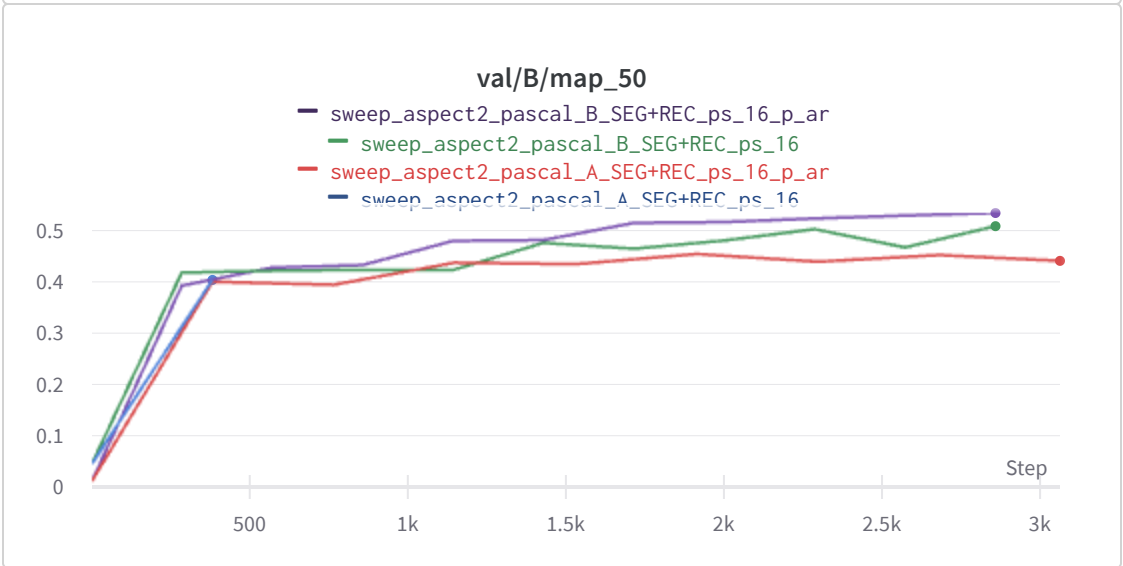

val/A/map_75
sweep_aspect2_pascal_B_SEG+REC_ps_16_p_ar
sweep_aspect2_pascal_B_SEG+REC_ps_16
sweep_aspect2_pascal_A_SEG+REC_ps_16_p_ar
sweep_aspect2_pascal_A_SEG+REC_ps_16
0.25
0.2
0.15
0.1
0.05
0
Step
500
1k
1.5k
2k
2.5k
3k

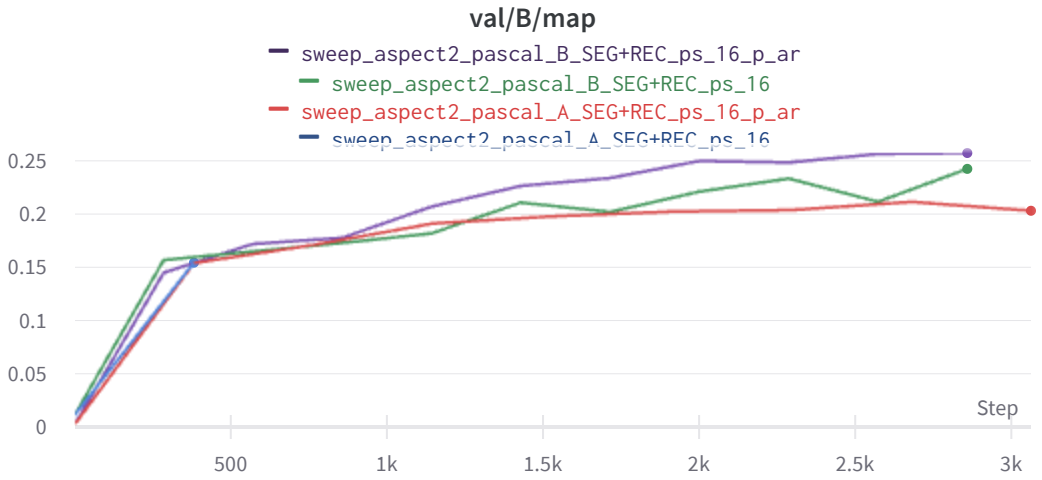

val/A/map_50
sweep_aspect2_pascal_B_SEG+REC_ps_16_p_ar
sweep_aspect2_pascal_B_SEG+REC_ps_16
sweep_aspect2_pascal_A_SEG+REC_ps_16_p_ar
sweep_aspect2_pascal_A_SEG+REC_ps_16
0.6
0.5
0.4


0.3
0.2
0.1
0
Step
500
1k
1.5k
2k
2.5k
3k


val/A/map
sweep_aspect2_pascal_B_SEG+REC_ps_16_p_ar
sweep_aspect2_pascal_B_SEG+REC_ps_16
sweep_aspect2_pascal_A_SEG+REC_ps_16_p_ar
0.3
0.25
0.2
0.15
0.1
0.05
0
Step
500
1k
1.5k
2k
2.5k
3k


val/B/map_75
sweep_aspect2_pascal_B_SEG+REC_ps_16_p_ar
sweep_aspect2_pascal_B_SEG+REC_ps_16
sweep_aspect2_pascal_A_SEG+REC_ps_16_p_ar
0.2
0.15
0.1
0.05
0
Step
500
1k
1.5k
2k
2.5k
3k


val/B/map_50
sweep_aspect2_pascal_B_SEG+REC_ps_16_p_ar
sweep_aspect2_pascal_B_SEG+REC_ps_16
sweep_aspect2_pascal_A_SEG+REC_ps_16_p_ar
0.5
0.4
0.3
0.2
0.1
0
Step
500
1k
1.5k
2k
2.5k
3k


val/B/map
sweep_aspect2_pascal_B_SEG+REC_ps_16_p_ar
sweep_aspect2_pascal_B_SEG+REC_ps_16
sweep_aspect2_pascal_A_SEG+REC_ps_16_p_ar
sweep_aspect2_pascal_A_SEG+REC_ps_16
0.25
0.2
0.15
0.1
0.05
0
Step
500
1k
1.5k
2k
2.5k
3k

Run set 4

Created with ❤️ on Weights & Biases.

https://wandb.ai/klara/TTA-finetune/reports/TTA-joint-finteuning-of-segmentation-and-reconstruction--VmlldzozNzIxMDc0