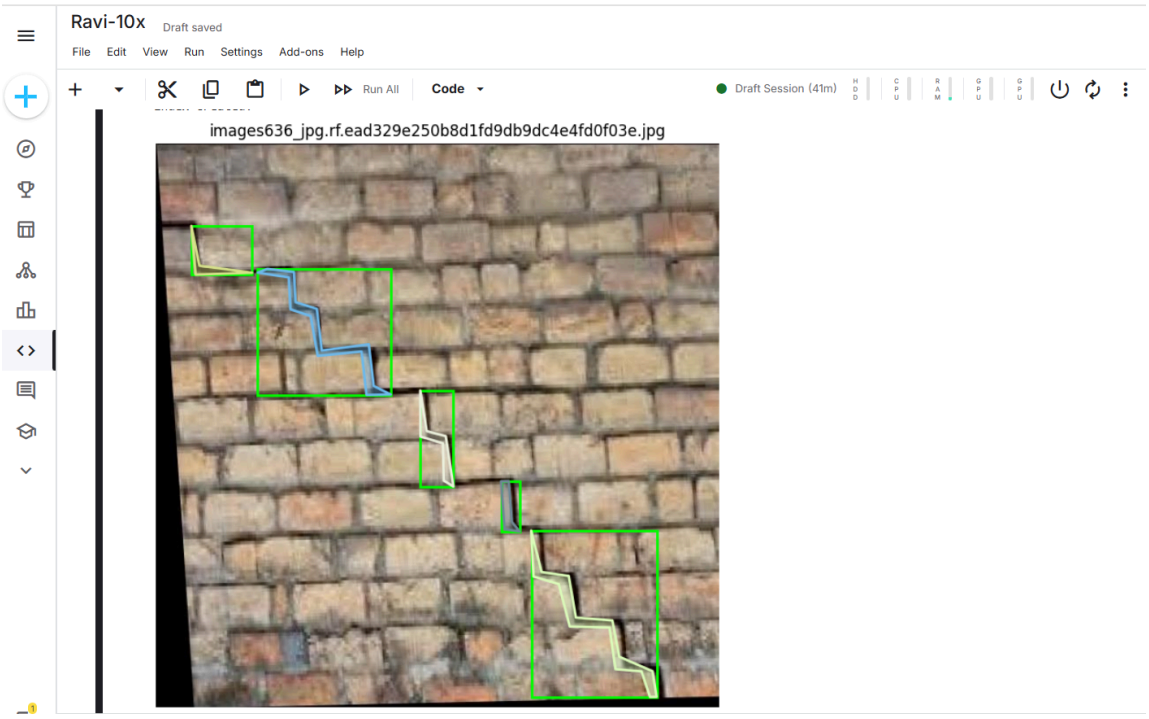
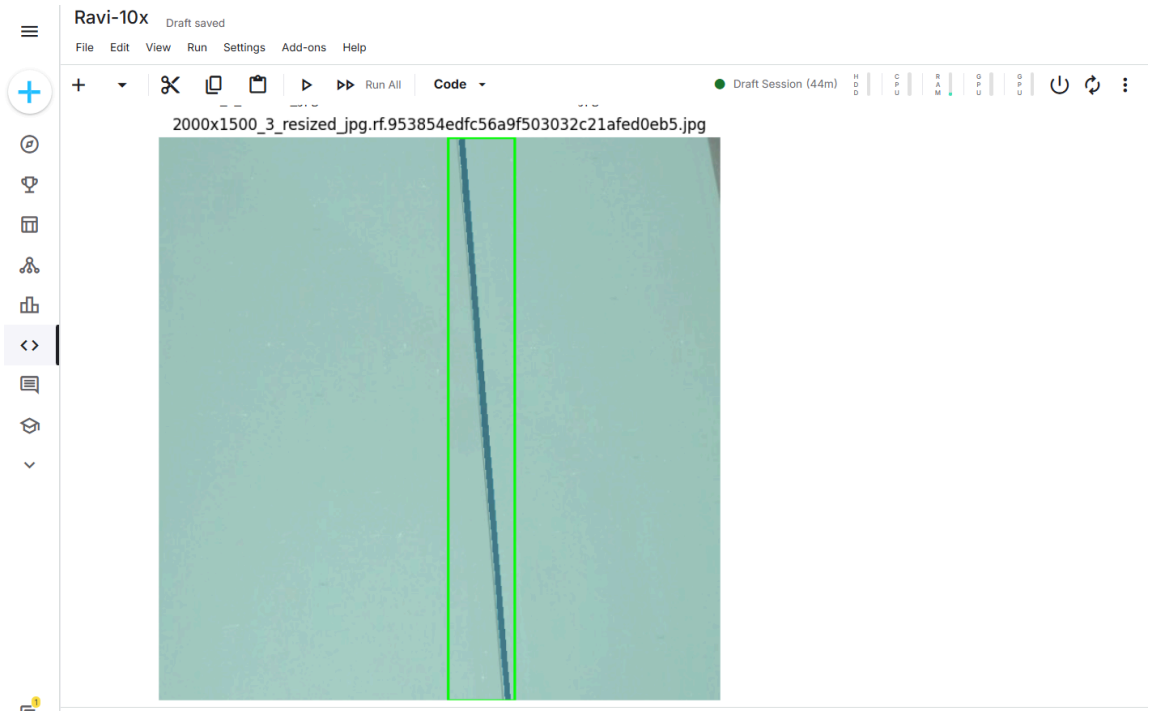
# Project: Steps to train a text-guided segmentation model on custom data

1. Visualize data from roboflow:
   Crack - seg masks + bbox masks
   Taping area - bbox masks

   Have annotation information in coco format




2. Using SAM model to generate seg masks for taping area
   Saved masks as coco format

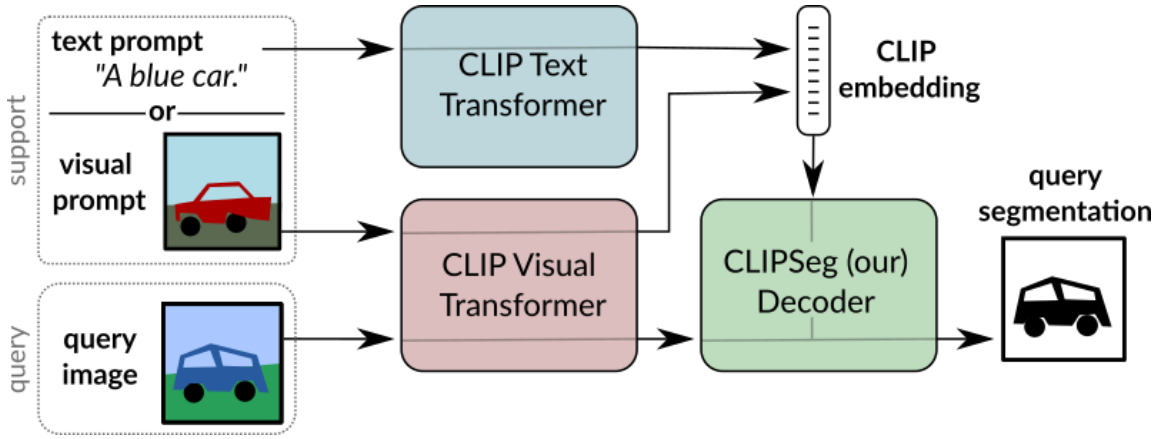



3. Data preprocessing and DataLoader
   Data Augmentation done in Roboflow, while extracting dataset
   Using Train/Val split as provided in the dataset

4. Using CLIPSeg model:
   https://huggingface.co/docs/transformers/en/model_doc/clipseg

   In warmup epochs, training only the decoder (SEG head) and, clip.text_projection, clip.visual_projection to align text embedding and vision embedding to decoder space

   Then, training all params
   Model Size: Total params: 150.75M




5. Training Strategy and loss func:
   Started with BCE (binary cross-entropy) and dice loss
   Added Focal loss later

   Changed image input dimension from 352 to 576

6. Model Training:

   Warmup epochs - 5
   Full training epochs - 15

   Runtime per epoch - 20 min
   Avg inference time/image - 1 second

```
Epoch 1/40:   0%|          | 0/1858 [00:00<?, ?it/s]huggingface/tokenizers: The current process just got forked, after parallelism has already been used. Disabling par
allelism to avoid deadlocks...
To disable this warning, you can either:
        - Avoid using `tokenizers` before the fork if possible
        - Explicitly set the environment variable TOKENIZERS_PARALLELISM=(true | false)
huggingface/tokenizers: The current process just got forked, after parallelism has already been used. Disabling parallelism to avoid deadlocks...
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/tmp/ipykernel_114/4208557573.py:42: FutureWarning: `torch.cuda.amp.autocast(args...)` is deprecated. Please use `torch.amp.autocast('cuda', args...)` instead.
  with torch.cuda.amp.autocast(enabled=scaler is not None):
Epoch 1/40:  54%|█████     | 1000/1858 [09:53<08:28,  1.69it/s]
  Batch 1000/1858
Epoch 1/40: 100%|██████████| 1858/1858 [18:22<00:00,  1.68it/s]
Epoch 1/40 | Train loss: 0.4540
Validation Epoch 1:   0%|          | 0/68 [00:00<?, ?it/s]huggingface/tokenizers: The current process just got forked, after parallelism has already been used. Disabli
ng parallelism to avoid deadlocks...
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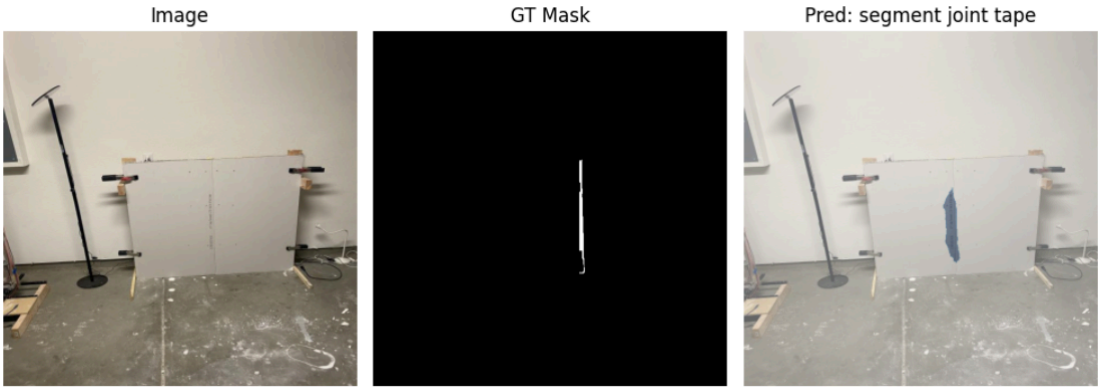
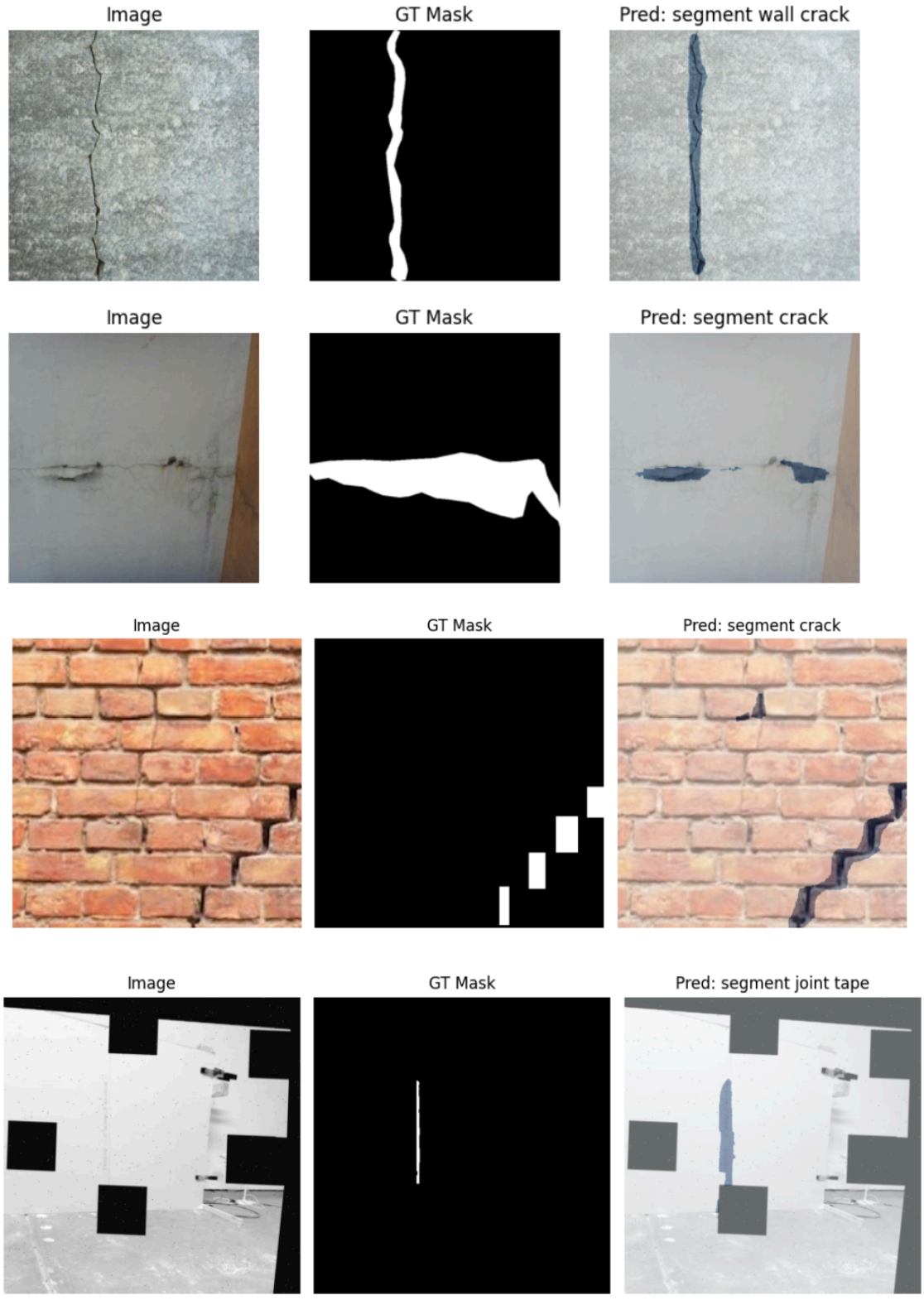
Validation Epoch 1: 100%|██████████| 68/68 [01:09<00:00,  1.02s/it]
Unused or unrecognized kwargs: truncation, padding.
/tmp/ipykernel_114/1531635077.py:21: UserWarning: To copy construct from a tensor, it is recommended to use sourceTensor.clone().detach() or sourceTensor.clone().detac
h().requires_grad_(True), rather than torch.tensor(sourceTensor).
  mask_t = torch.tensor(mask).unsqueeze(0).to(device)
Val Loss: 0.5281 | Val mIoU: 0.3858 | Val Dice: 0.5265
```

Some results while training








7. Loss plots and metrics on validation set:

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================================================================================
TRAINING COMPLETE - Generating Plots
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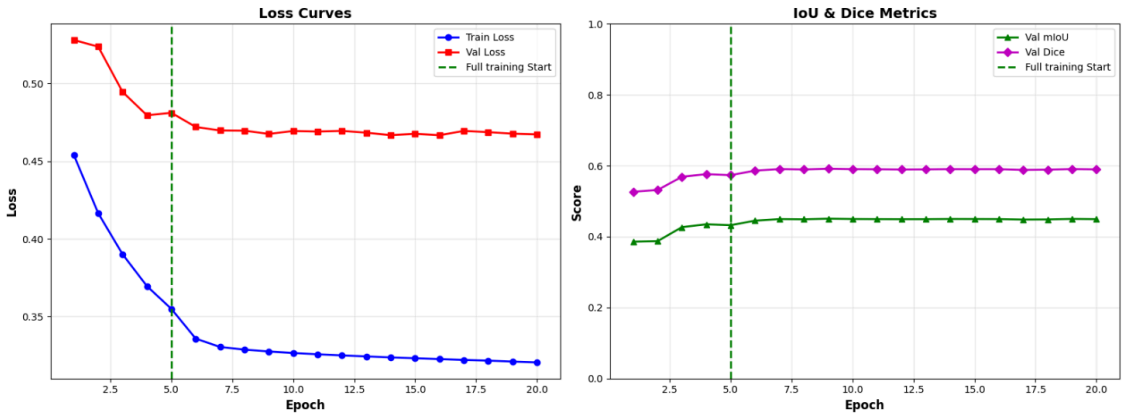





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BEST VALIDATION METRICS
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Best mIoU:       0.4507 at epoch 9
Best Dice:       0.5916 at epoch 9
Lowest Val Loss: 0.4668 at epoch 16
```

- Ravi Kumar Kushawaha