

DRONE LAB TASK

Task 2: Train a Brain Tumor Detection Model

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Documentation

Preprocessing Steps:

I used a brain tumor dataset from roboflow to train my model. Here is the link - <https://universe.roboflow.com/brain-tumor-jolxi/brain-tumor-detection-o0ggc>

Model Architecture:

For this project, I decided to use the yolov8 model.

Training Process:

To check for the best combination of hyper parameters, I ran 3 for loops to check and train in all combinations of the following hyperparameters.

`learning_rates=[0.01,0.001,0.0001]`

`batch_sizes=[16,32]`

`epochs=[50,100]`

I used f1 score as a criteria of how well the model was performing. The best results had the batch size 16 in common and the learning rate did not make much of a difference.

So I decided to train another model which had the hyper parameters

`learning_rates=[0.001]`

`batch_sizes=[16]`

epochs=[200]

This turned out to be the best model so I considered this as my final trained model.

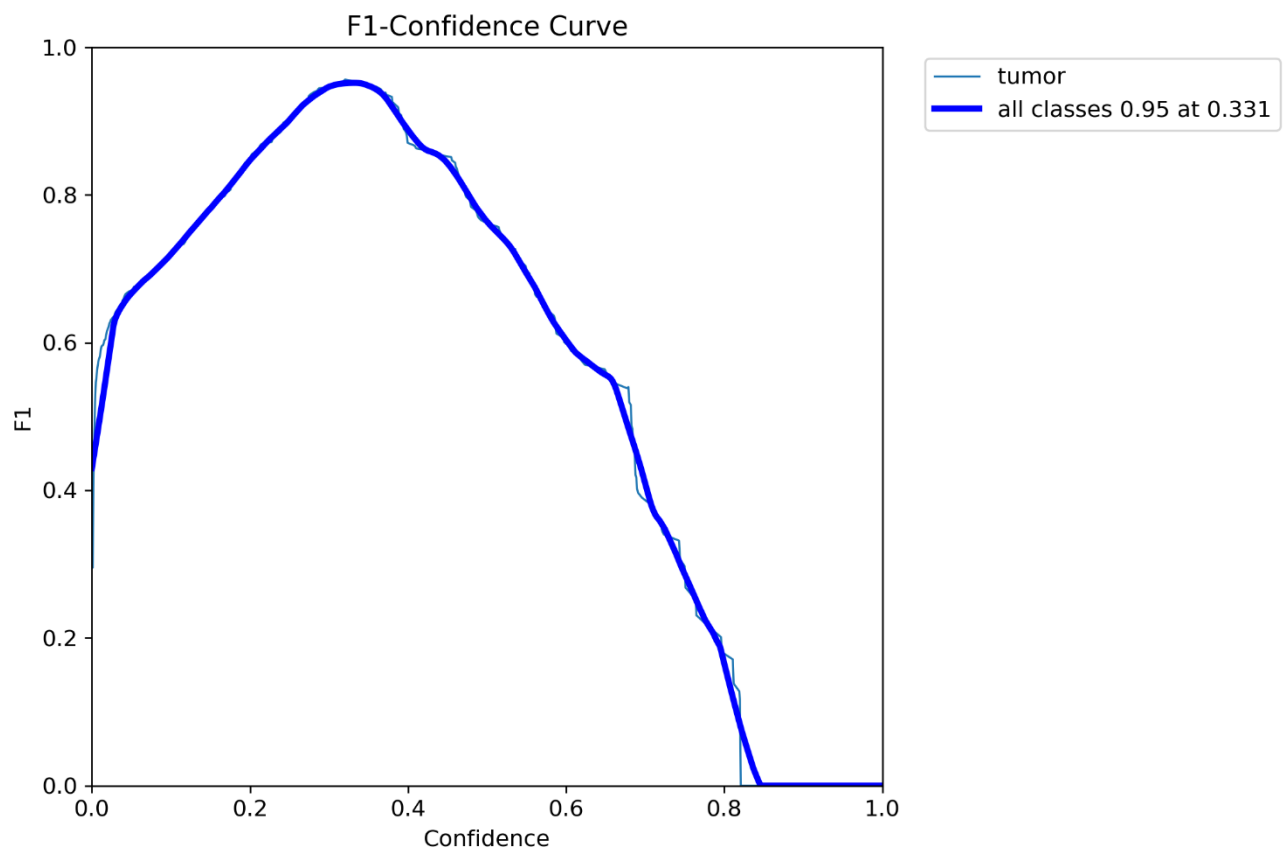
Evaluation Metrics:

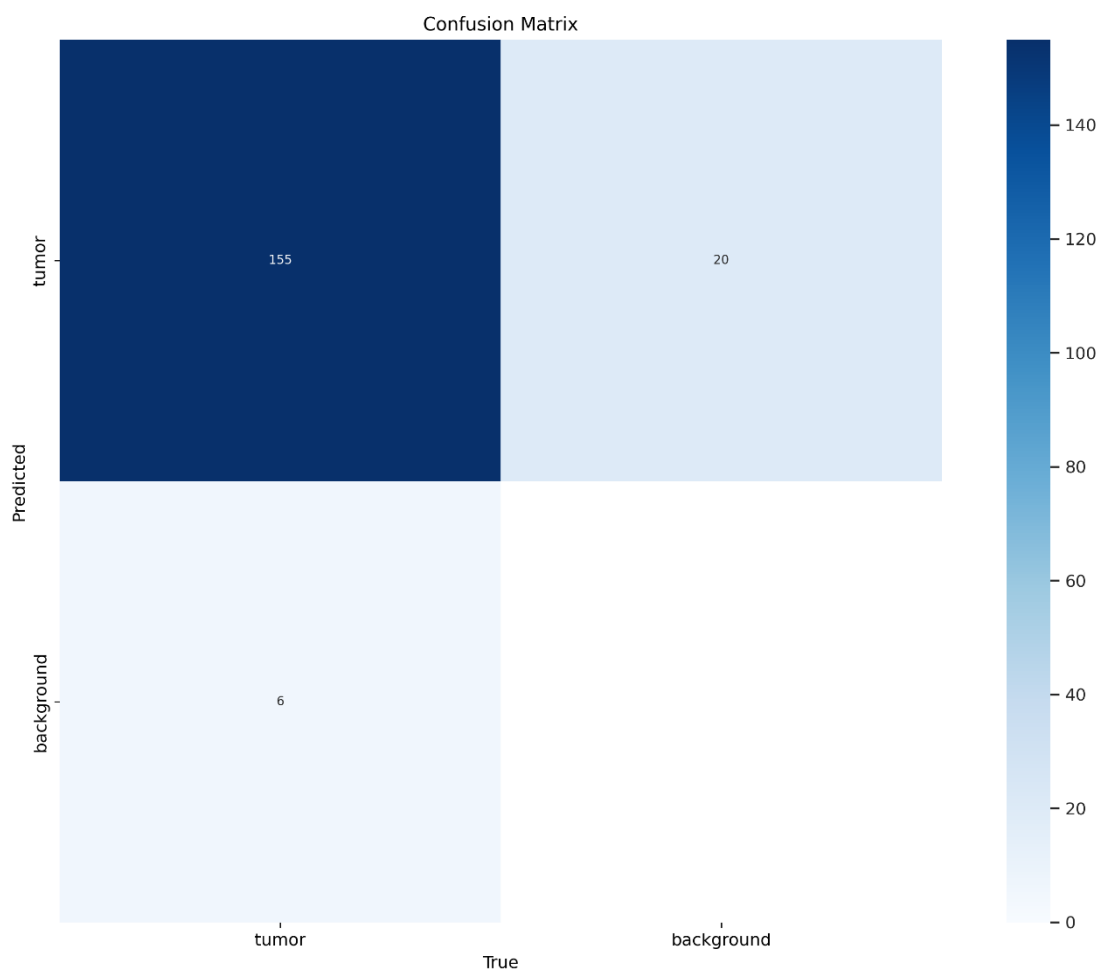
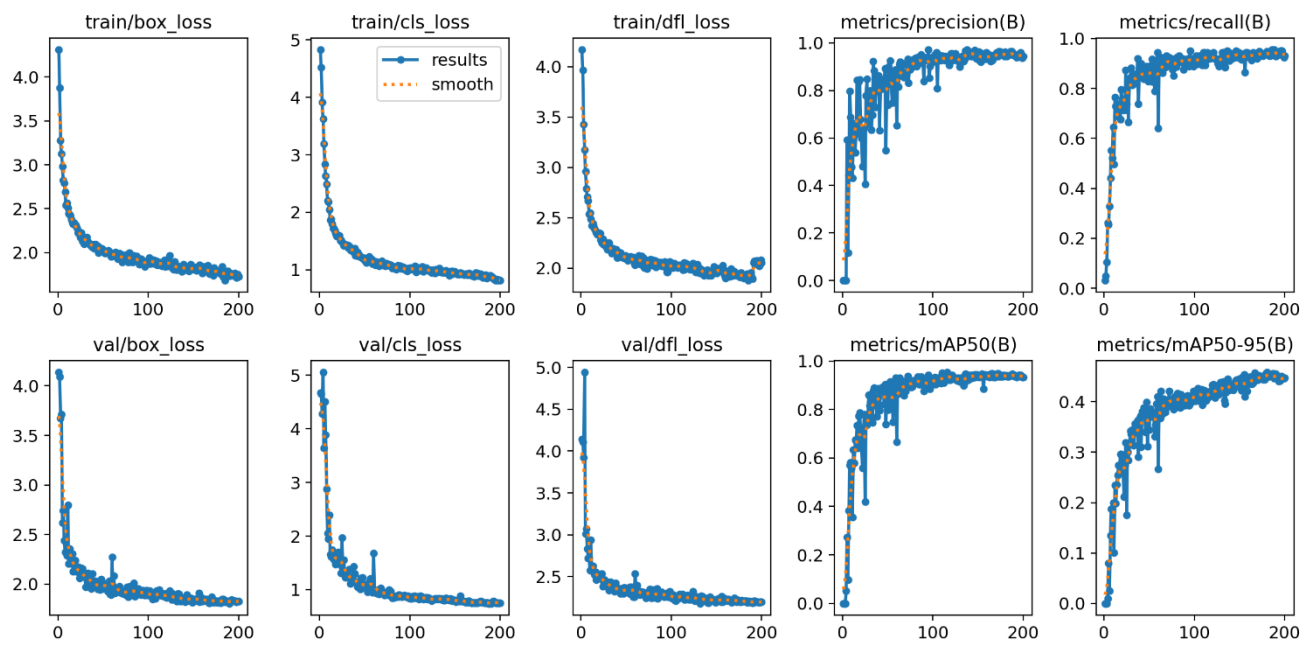
As I said before, I used f1 score to compare the different models I trained so that the final model has a balance between recall and precision.

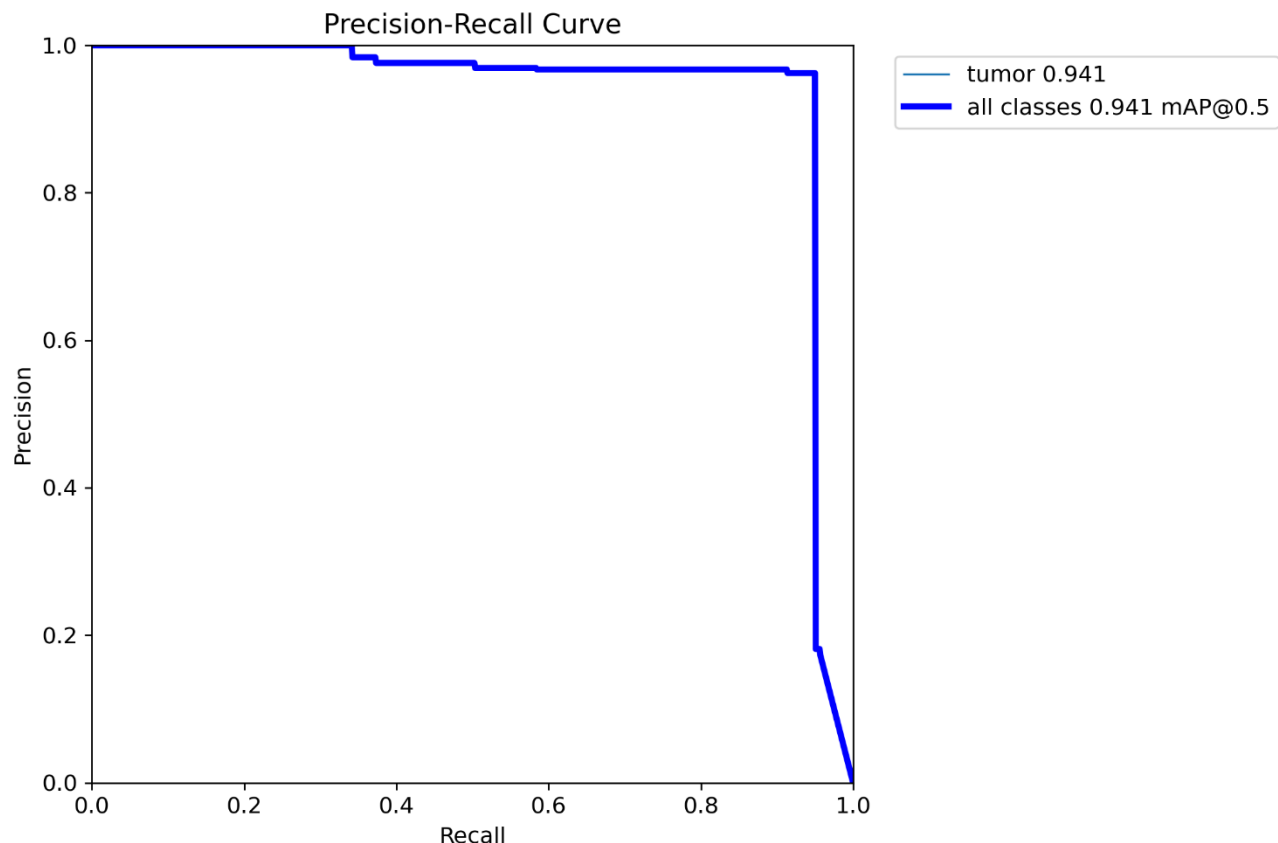
```
F1 score: [ 0.96214]
Ultralytics 8.3.3 Python-3.10.12 torch-2.4.1+cu121 CUDA:0 (Tesla T4, 15102MiB)
YOLOv8n summary (fused): 186 layers, 2,684,563 parameters, 0 gradients, 6.8 GFLOPs
val: Scanning /content/gdrive/My Drive/brain tumor/brain tumor detection.v2-mahitha.yolov8/valid/labels.cache... 114 images, 0 backgrounds, 0 corrupt: 100%|██████████| 114/114 [00:00<?, ?it/s]
      Class  Images  Instances  Box(P      R      mAP50  mAP50-95): 100%|██████████| 8/8 [00:03<00:00, 2.28it/s]
      all      114      161      0.936    0.905    0.928    0.435
Speed: 0.5ms preprocess, 5.4ms inference, 0.0ms loss, 5.7ms postprocess per image
Results saved to runs/detect/val6
F1 score: [ 0.92823]
Ultralytics 8.3.3 Python-3.10.12 torch-2.4.1+cu121 CUDA:0 (Tesla T4, 15102MiB)
YOLOv8n summary (fused): 186 layers, 2,684,563 parameters, 0 gradients, 6.8 GFLOPs
val: Scanning /content/gdrive/My Drive/brain tumor/brain tumor detection.v2-mahitha.yolov8/valid/labels.cache... 114 images, 0 backgrounds, 0 corrupt: 100%|██████████| 114/114 [00:00<?, ?it/s]
      Class  Images  Instances  Box(P      R      mAP50  mAP50-95): 100%|██████████| 8/8 [00:05<00:00, 1.55it/s]
      all      114      161      0.961    0.926    0.941    0.448
Speed: 1.4ms preprocess, 6.5ms inference, 0.0ms loss, 7ms postprocess per image
Results saved to runs/detect/val7
F1 score: [ 0.94347]
Ultralytics 8.3.3 Python-3.10.12 torch-2.4.1+cu121 CUDA:0 (Tesla T4, 15102MiB)
YOLOv8n summary (fused): 186 layers, 2,684,563 parameters, 0 gradients, 6.8 GFLOPs
val: Scanning /content/gdrive/My Drive/brain tumor/brain tumor detection.v2-mahitha.yolov8/valid/labels.cache... 114 images, 0 backgrounds, 0 corrupt: 100%|██████████| 114/114 [00:00<?, ?it/s]
      Class  Images  Instances  Box(P      R      mAP50  mAP50-95): 100%|██████████| 8/8 [00:03<00:00, 2.08it/s]
      all      114      161      0.945    0.932    0.937    0.447
Speed: 2.1ms preprocess, 5.6ms inference, 0.1ms loss, 4.2ms postprocess per image
Results saved to runs/detect/val8
F1 score: [ 0.9383]
Ultralytics 8.3.3 Python-3.10.12 torch-2.4.1+cu121 CUDA:0 (Tesla T4, 15102MiB)
YOLOv8n summary (fused): 186 layers, 2,684,563 parameters, 0 gradients, 6.8 GFLOPs
val: Scanning /content/gdrive/My Drive/brain tumor/brain tumor detection.v2-mahitha.yolov8/valid/labels.cache... 114 images, 0 backgrounds, 0 corrupt: 100%|██████████| 114/114 [00:00<?, ?it/s]
      Class  Images  Instances  Box(P      R      mAP50  mAP50-95): 100%|██████████| 8/8 [00:03<00:00, 2.09it/s]
      all      114      161      0.961    0.944    0.945    0.463
Speed: 0.7ms preprocess, 5.1ms inference, 0.0ms loss, 5.0ms postprocess per image
Results saved to runs/detect/val9
F1 score: [ 0.95229]
Ultralytics 8.3.3 Python-3.10.12 torch-2.4.1+cu121 CUDA:0 (Tesla T4, 15102MiB)
YOLOv8n summary (fused): 186 layers, 2,684,563 parameters, 0 gradients, 6.8 GFLOPs
val: Scanning /content/gdrive/My Drive/brain tumor/brain tumor detection.v2-mahitha.yolov8/valid/labels.cache... 114 images, 0 backgrounds, 0 corrupt: 100%|██████████| 114/114 [00:00<?, ?it/s]
      Class  Images  Instances  Box(P      R      mAP50  mAP50-95): 100%|██████████| 8/8 [00:03<00:00, 2.48it/s]
      all      114      161      0.936    0.905    0.928    0.435
Speed: 0.5ms preprocess, 5.0ms inference, 0.0ms loss, 2.9ms postprocess per image
Results saved to runs/detect/val10
F1 score: [ 0.92823]
Ultralytics 8.3.3 Python-3.10.12 torch-2.4.1+cu121 CUDA:0 (Tesla T4, 15102MiB)
YOLOv8n summary (fused): 186 layers, 2,684,563 parameters, 0 gradients, 6.8 GFLOPs
val: Scanning /content/gdrive/My Drive/brain tumor/brain tumor detection.v2-mahitha.yolov8/valid/labels.cache... 114 images, 0 backgrounds, 0 corrupt: 100%|██████████| 114/114 [00:00<?, ?it/s]
      Class  Images  Instances  Box(P      R      mAP50  mAP50-95): 100%|██████████| 8/8 [00:03<00:00, 2.59it/s]
      all      114      161      0.961    0.926    0.941    0.448
Speed: 0.3ms preprocess, 5.2ms inference, 0.0ms loss, 4.2ms postprocess per image
Results saved to runs/detect/val11
F1 score: [ 0.94347]
      all      114      161      0.945    0.932    0.937    0.447
Speed: 0.7ms preprocess, 6.1ms inference, 0.0ms loss, 4.2ms postprocess per image
Results saved to runs/detect/val12
F1 score: [ 0.9383]
Ultralytics 8.3.3 Python-3.10.12 torch-2.4.1+cu121 CUDA:0 (Tesla T4, 15102MiB)
YOLOv8n summary (fused): 186 layers, 2,684,563 parameters, 0 gradients, 6.8 GFLOPs
val: Scanning /content/gdrive/My Drive/brain tumor/brain tumor detection.v2-mahitha.yolov8/valid/labels.cache... 114 images,
      Class  Images  Instances  Box(P      R      mAP50  mAP50-95): 100%|██████████| 8/8 [00:04<00:00,
      all      114      161      0.961    0.944    0.945    0.463
Speed: 0.6ms preprocess, 6.0ms inference, 0.0ms loss, 5.9ms postprocess per image
Results saved to runs/detect/val13
F1 score: [ 0.95229]
Ultralytics 8.3.3 Python-3.10.12 torch-2.4.1+cu121 CUDA:0 (Tesla T4, 15102MiB)
```

The following is the metrics of my final trained model:

F1 Score : 0.96214







INSTRUCTIONS:

To re run the code and reproduce the results,

1)Upload the <https://universe.roboflow.com/brain-tumor-jolxi/brain-tumor-detection-o0ggc> dataset to your google drive(while downloading the dataset, download the one which saying mahitha in yolo v8 format)

2)Open the .ipynb file in google colab

3)Change the paths in the code accordingly

4)Run the code

5)To get only the final trained model, do not run the first block of code, just run the second block of code(I have written a comment on top of the code block saying "CODE TO GET FINAL TRAINED MODEL")

