MIA Project
Liver Tumour Segmentation
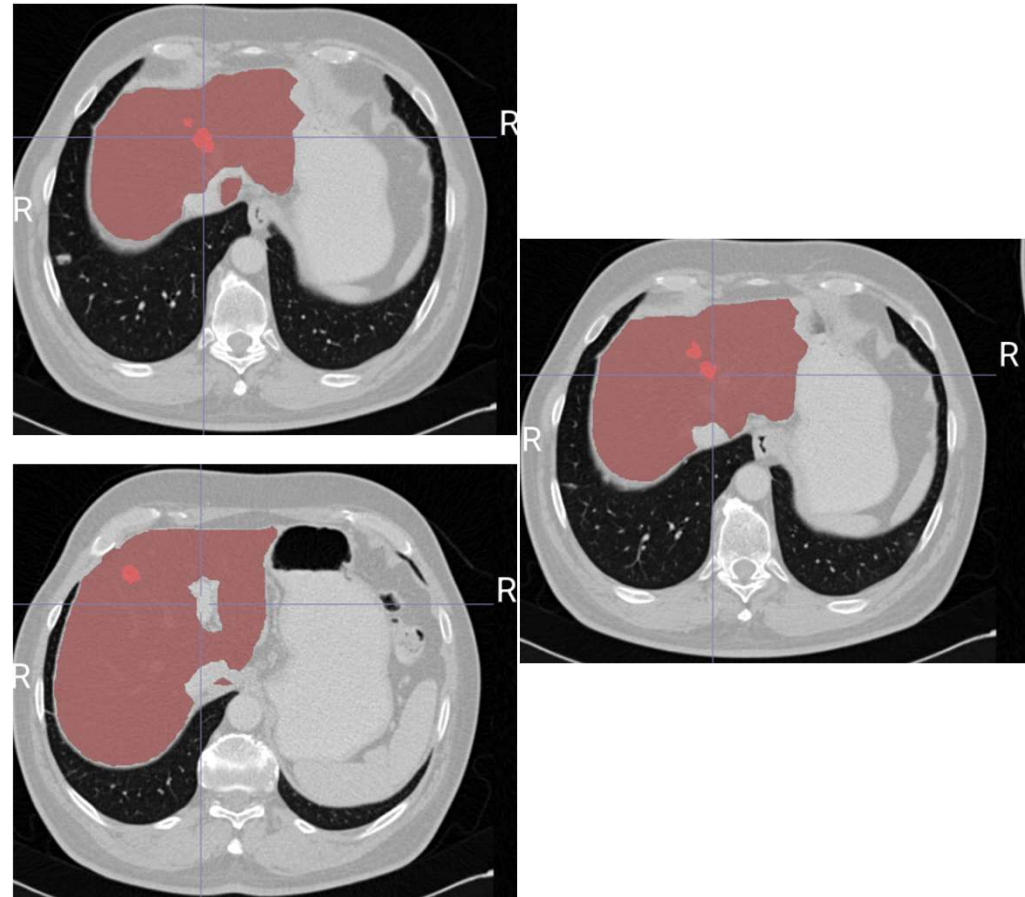
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Dataset

- Liver Tumour Segmentation Benchmark (LiTS)
- Contains **130 CT Images** with labels
- Active benchmark and resource for research
- Competition live at: MedicalDecathlon
- Transverse plane: 512x512x(500-700) slices

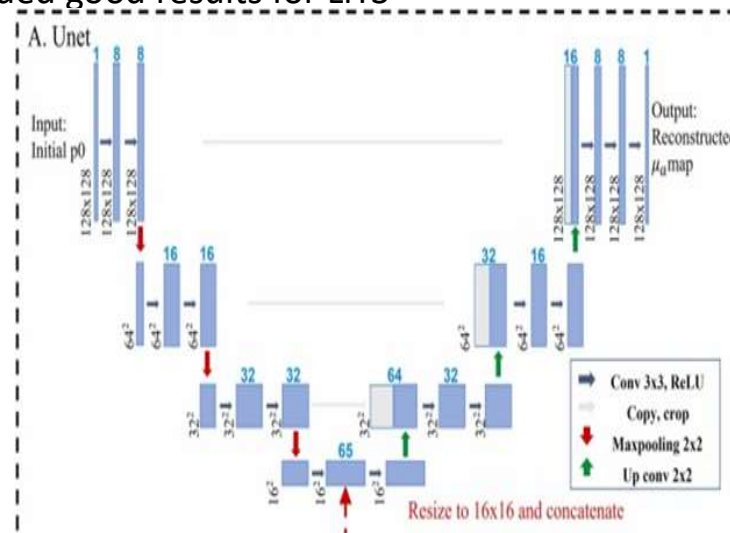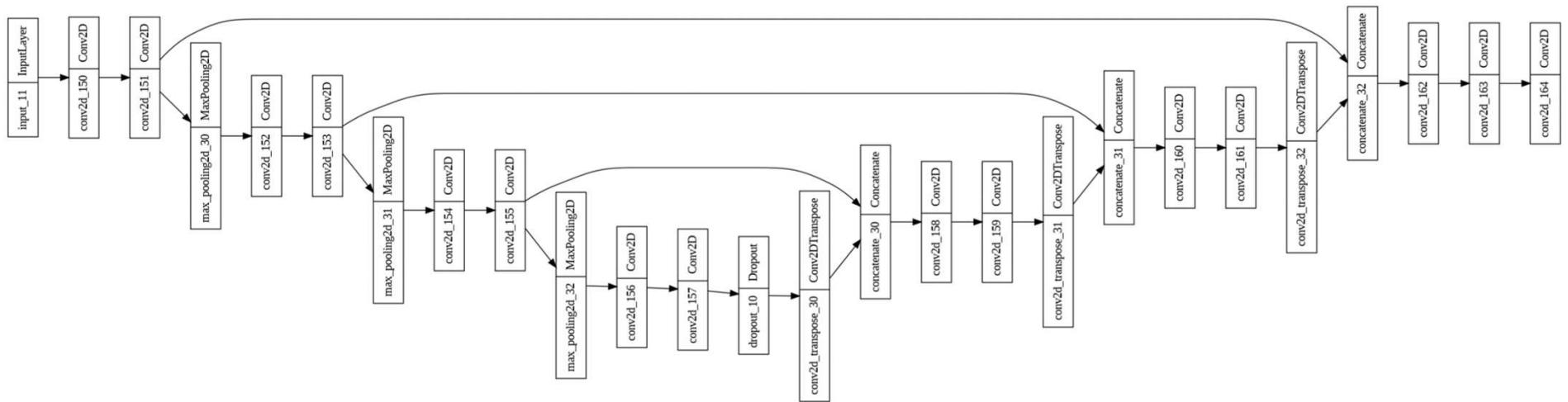| Type	Maximum Dice score Achieved (in Literature)
Liver	0.93
Tumour	0.74

CT Liver images in transverse plane

Model used: Unet
- Data is windowed from -45HU to 105HU
- Encoder-Decoder architecture
- Skip connections
- Contracting path and expanding path
- (From literature) provided good results for LiTS

Model Architecture

Results

Liver segmentation (Metrics)		Tumour segmentation (Metrics)	
Epochs	15	Epochs	10
Time taken	3.09 hours	Time taken	1.00 hours
Dice score	0.88 Train/0.90 Test	Dice score	0.01
Intersection Over Union	0.79 Train/0.82 Test	Intersection Over Union	0.005

Liver segmentation (Training)		Tumour segmentation (Training)	
Loss function	Dice loss	Loss function	Dice loss
Activation function	AdamW (Learning rate: 0.0001)	Activation function	AdamW (Learning rate: 0.0001)
Batch size	32 (Max. Memory limit)	Batch size	32 (Max. Memory limit)
Dataset size	25000 Train/2500 Test		

Results (Liver: Loss curve)
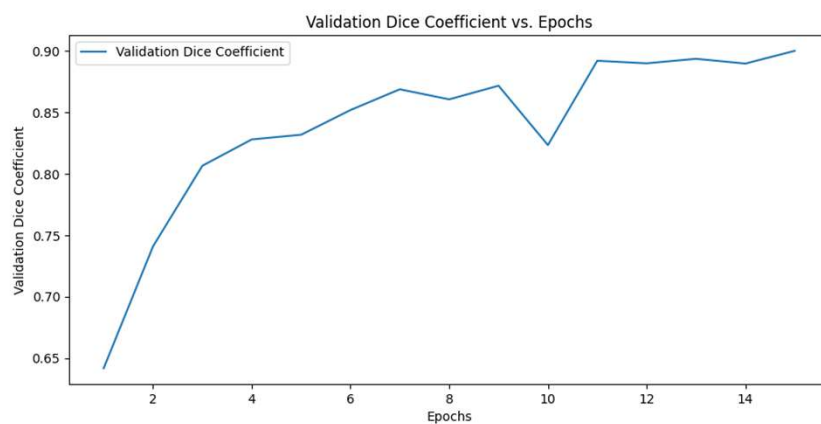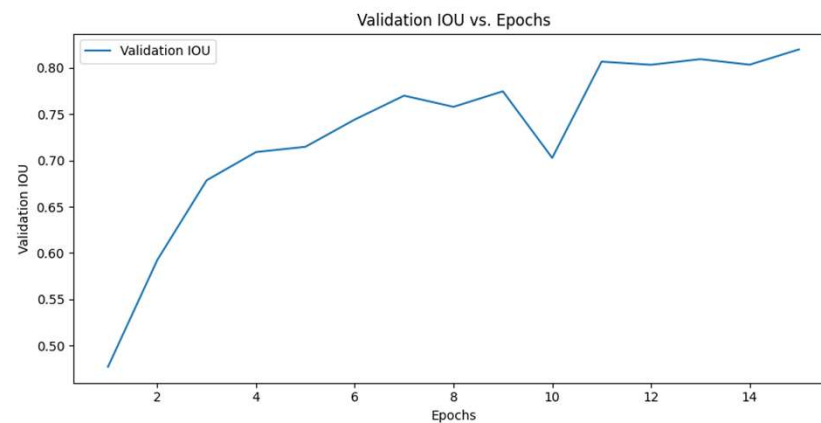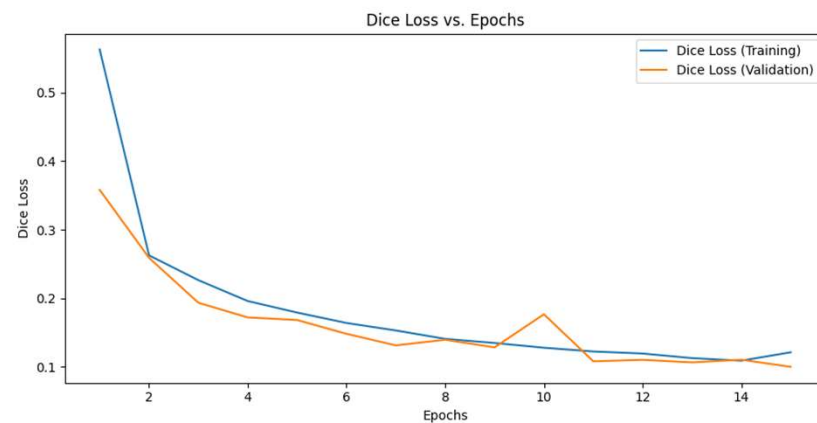
Why Tumour segmentation (using models) is inaccurate?

- Less frequency of tumours in images – leading to confusion
- Lack of computing resources
    - Slow CPUs/Disk
    - Google colab ~ 14 GB GPU
        - Bad storage – Lose ~1000 files/unpack
    - Kaggle ~ 14 GB GPU (x2)
        - 30 hrs/week
- Less Image count
- Varied nature of tumours

Tumour segmentation (Image processing)

Thresholding

Area closing

Remove small objects

Rescale intensity

Tumour segmentation (Metrics)	
Dice score	0.67 (1 volume)