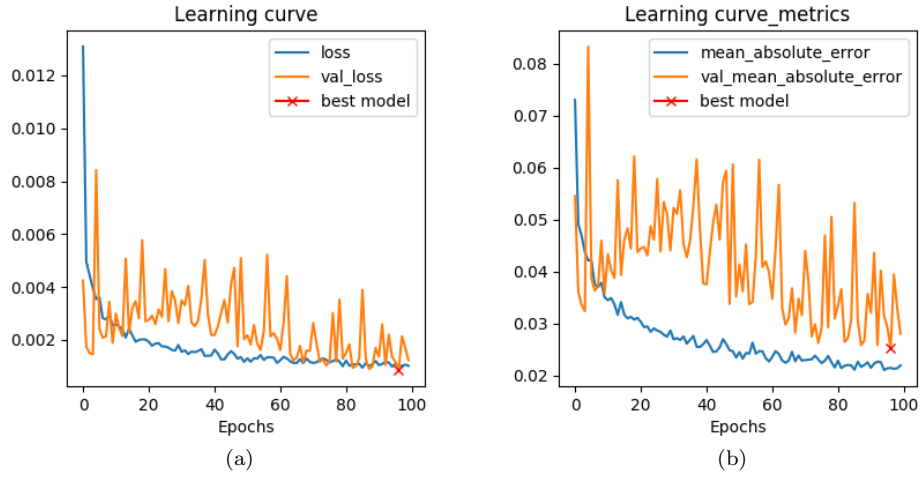**Task1**:

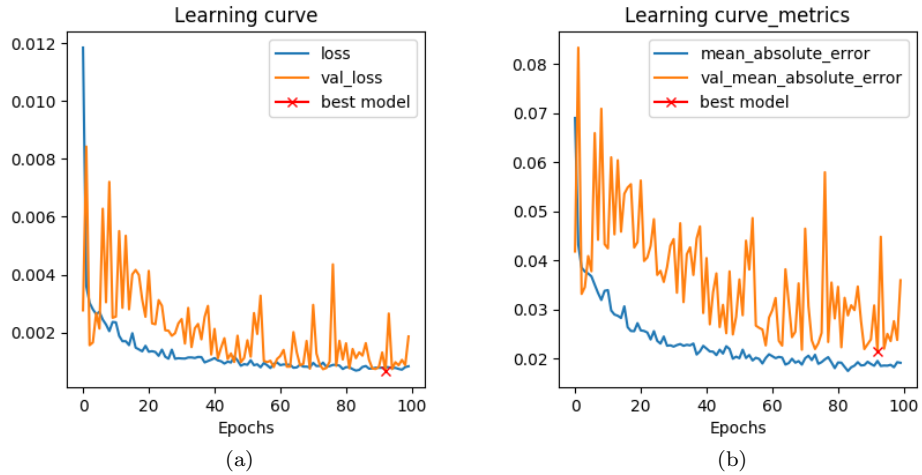Figure 1: Learning curve vs validation metrics with output units = 20

Figure 2: Learning curve vs validation metrics with output units = 40

I can not see any significant differences between curves in Figure 1 and 2. But Figure 2 has a bit less fluctuation compared with the previous one. Moreover, mean absolute error with output units = 40 drop to less than 0.02, whereas for the other case, this value is a bit bigger than 0.02. Therefore, it can be said that the model works a bit better with the output units = 40.

Task2:
To compared the experimental results, four different output units (units = 10, 8, 5 2) has been considered. Results are presented below.
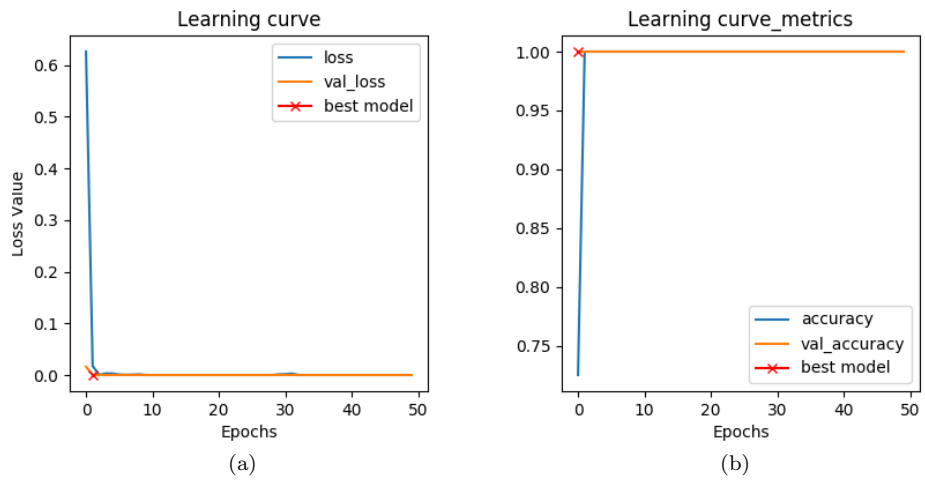
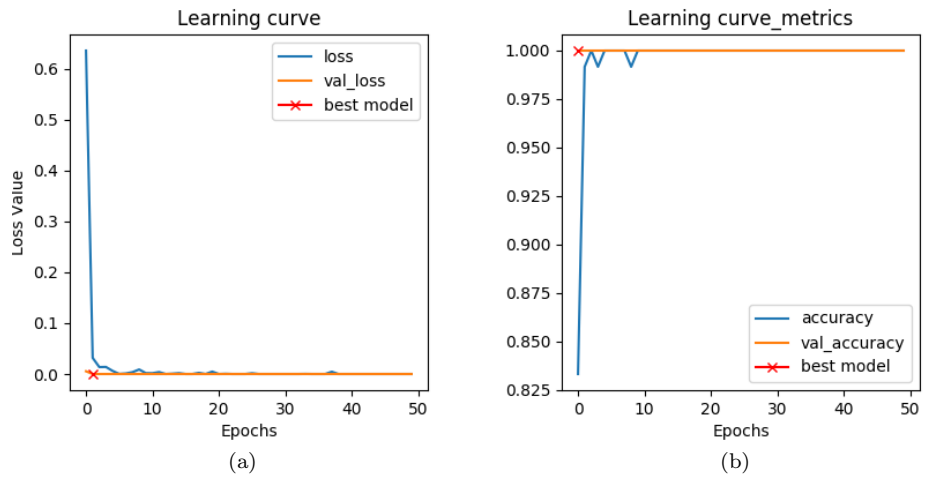Figure 3: Learning curve vs validation metrics with output units = 10

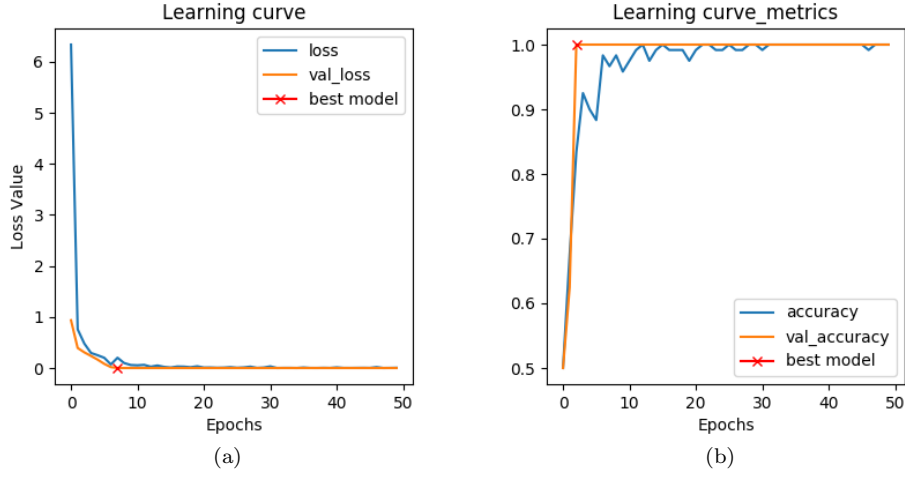Figure 4: Learning curve vs validation metrics with output units = 8

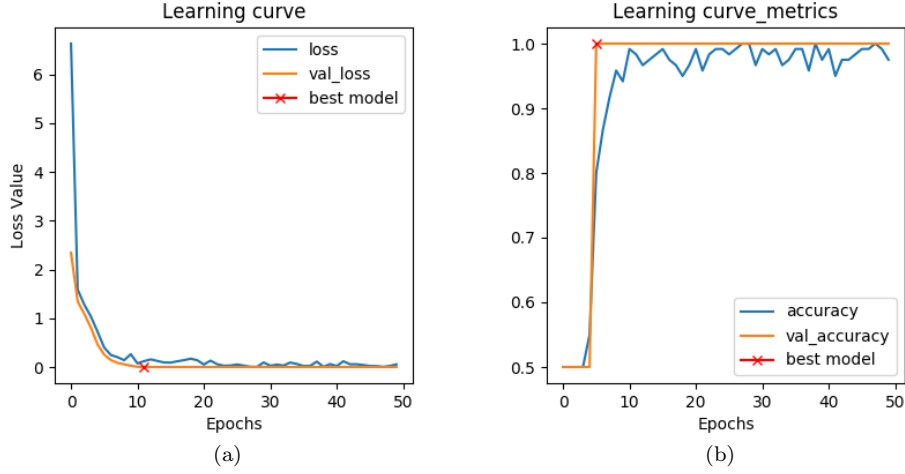Figure 5: Learning curve vs validation metrics with output units = 5

Figure 6: Learning curve vs validation metrics with output units = 2

From Figures 3 - 6, it can be observed, when the output units is high then the higher accuracy is gained with fewer epochs. When output units is 10, accuracy is converged within 3-4 epochs. On the other hand, then the output units is 2, the accuracy has not converged yet with 50 epochs.

Task3:
For this task LSTM layers are added to the U-Net architecure that is developed during lab 3. For the experiments, the following setting has been considered in the brain tumor classification task.

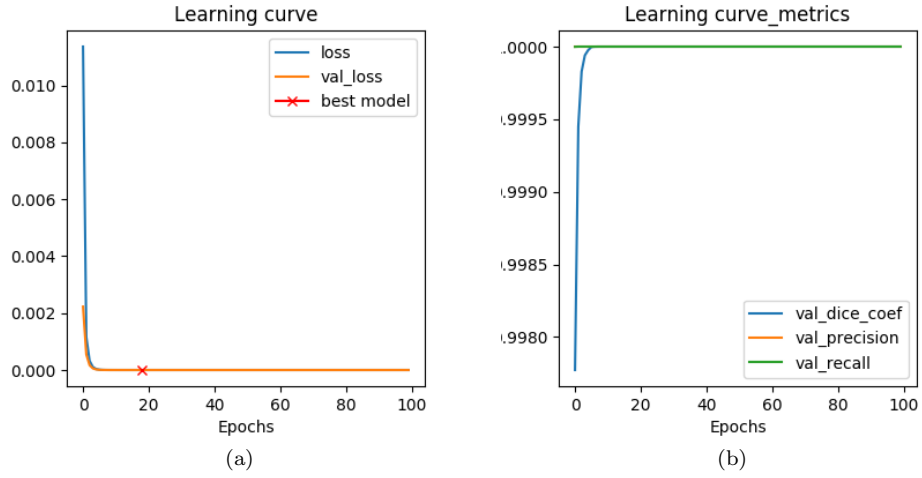| number of filters	image size	batch size	dropout	batch normalization	learning rate (Adam)	metics
16	240	4	0.5	True	0.0001	Dice Coefficient

Figure 7: LSTM layers to U-Net architecture.

The experimented results are presented in Figures [7]. On the other hand, the results from U-Net architecure in lab3 are presented on the Figure [8] below. If we compare experimented results, it can be said that the LSTM layers with the U-Net architecture is more efficient concerning number of epochs to achieve best result. With this technique, from the learning curves we can see that the model require only 20 epochs, whereas the U-Net architecture require almost 100 epochs.
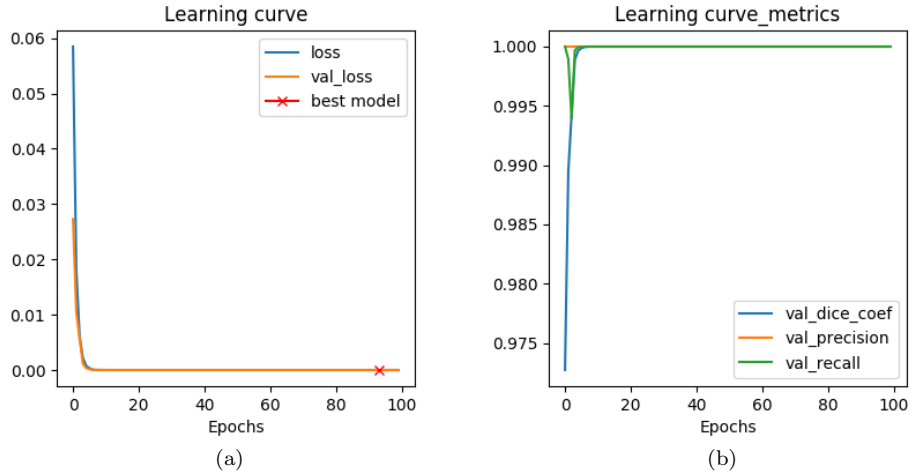

Figure 8: U-Net architecture from Lab 3