Question 3

We choose Option2

a)

1.ALS break down large matrix into lower-dimensional matrices, Neural network modeling non-linear relationship trough layers.

2.ALS is less flexible than Neural network since they are designed for matrix factorization where neural network can model non-linear relationship.

3.ALS is more computationally efficient than Neural network for sparse dataset, Neural network require significant computational resource.

b)

coding in neural_network.py

c)

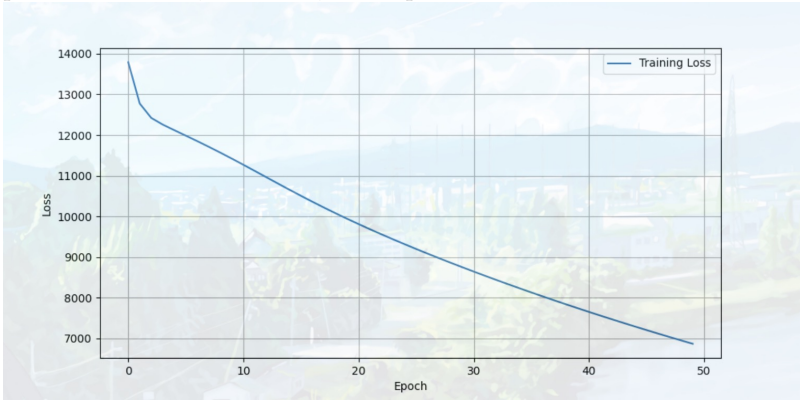
the optimization hyperparameter we choose is:

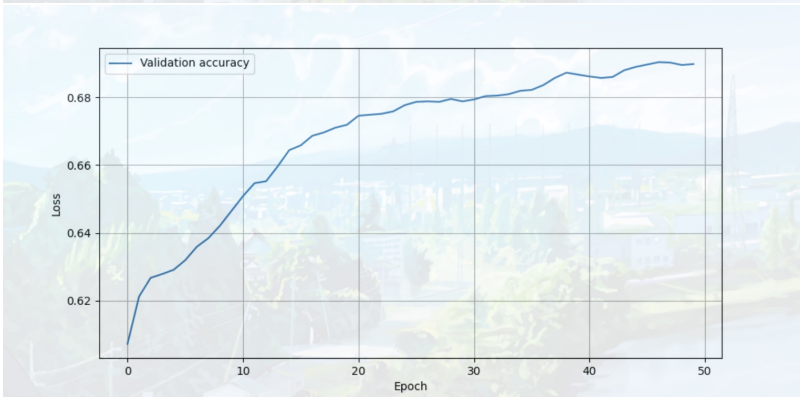
k = 50, lr = 0.01, num_epoch = 50

We got Validation Accuracy of: 0.68981

d)

plot with k = 50, lr = 0.01, num_epoch = 50:





The Final Test Accuracy is: 0.68558

e)

the best regularization penalty is lamb = 0.01, with this lamb, we got:

Final Validation Accuracy: 0.67824

Final Test Accuracy: 0.68078

The model didn't perform better with the regularization penalty, this may because that our model already well-regularized and does not overfitting or only has negligible overfitting issues.