

# **Report on Offline-4**

## **Convolutional Neural Network: Bangla Character Recognition Challenge**

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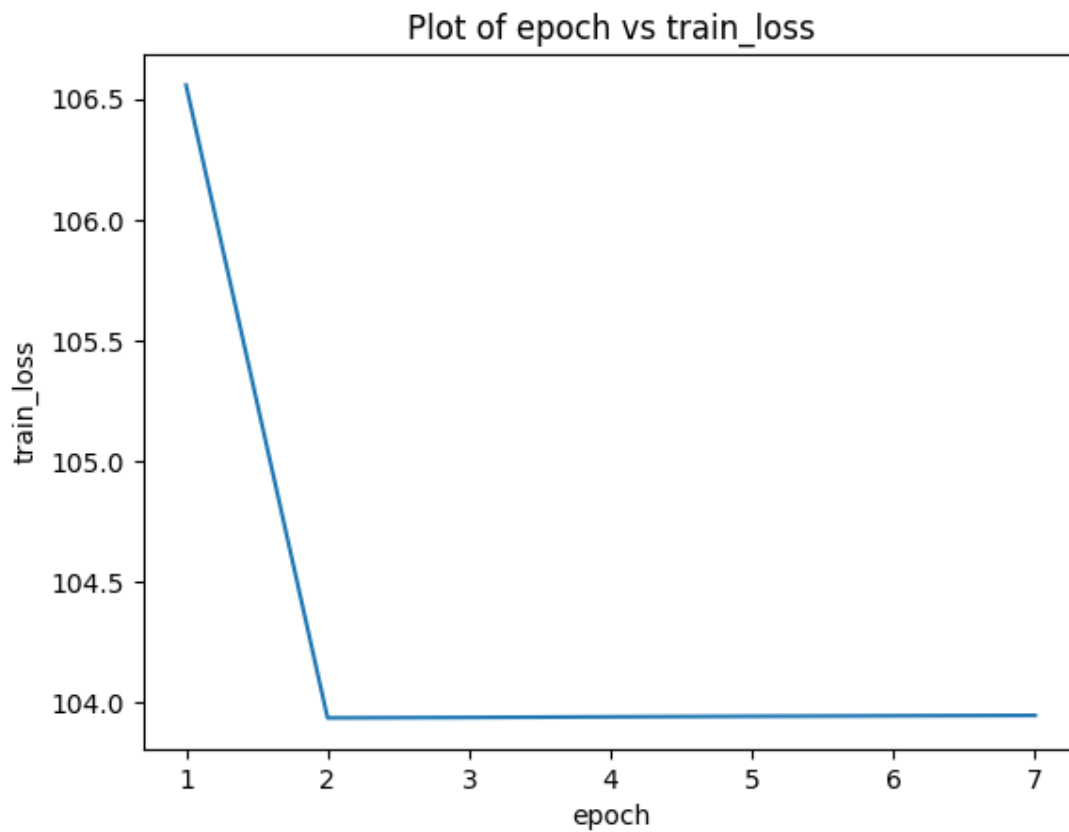


Department of Computer Science and Engineering, BUET  
Feb 10, 2023

We have run 7 epochs and have taken 15 samples in each batch to train the model with a total of 5000 training data. Below the graphs for varying learning rates are shown.

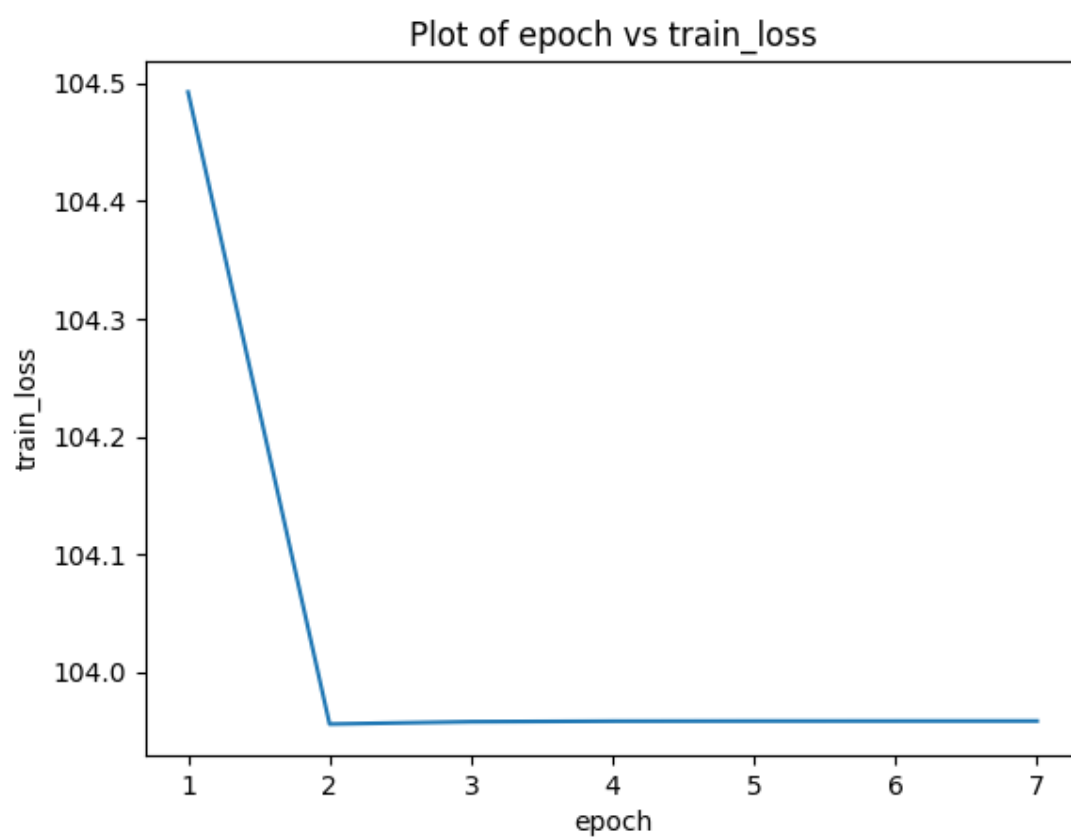
### Loss (Training)

For learning rate = 0.01



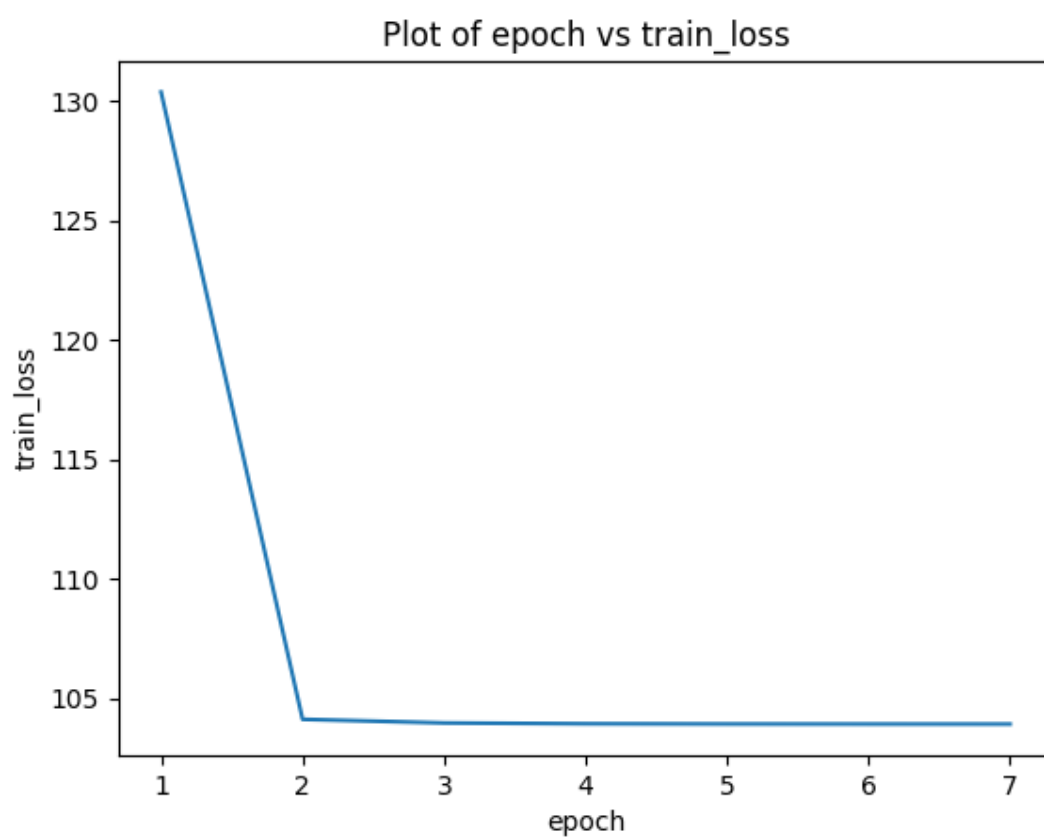
## Loss (Training)

For learning rate = 0.005



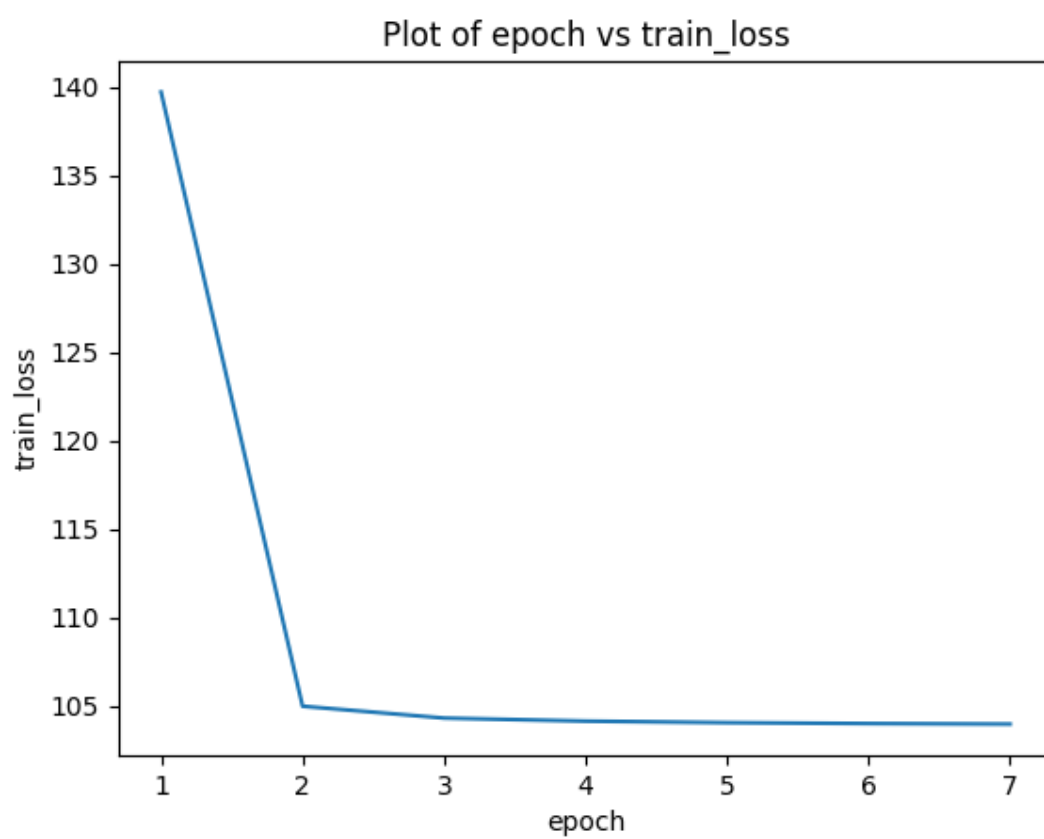
## Loss (Training)

For learning rate = 0.0001



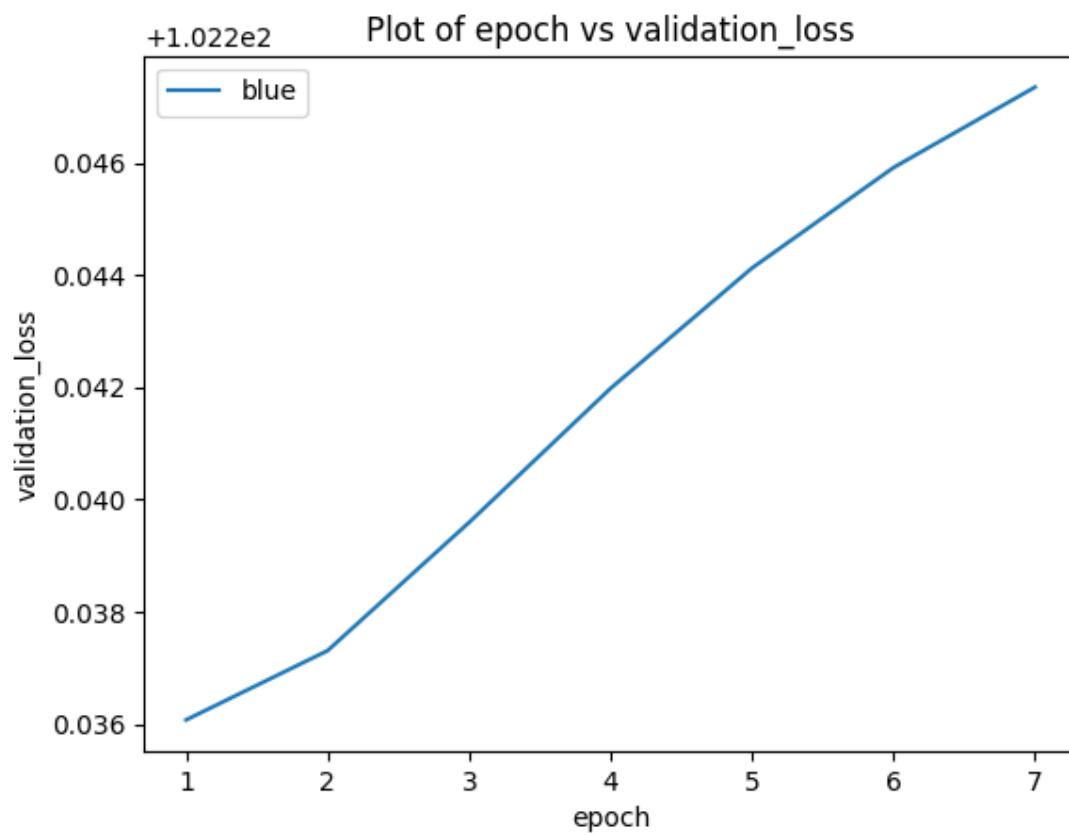
## Loss (Training)

For learning rate = 0.00005



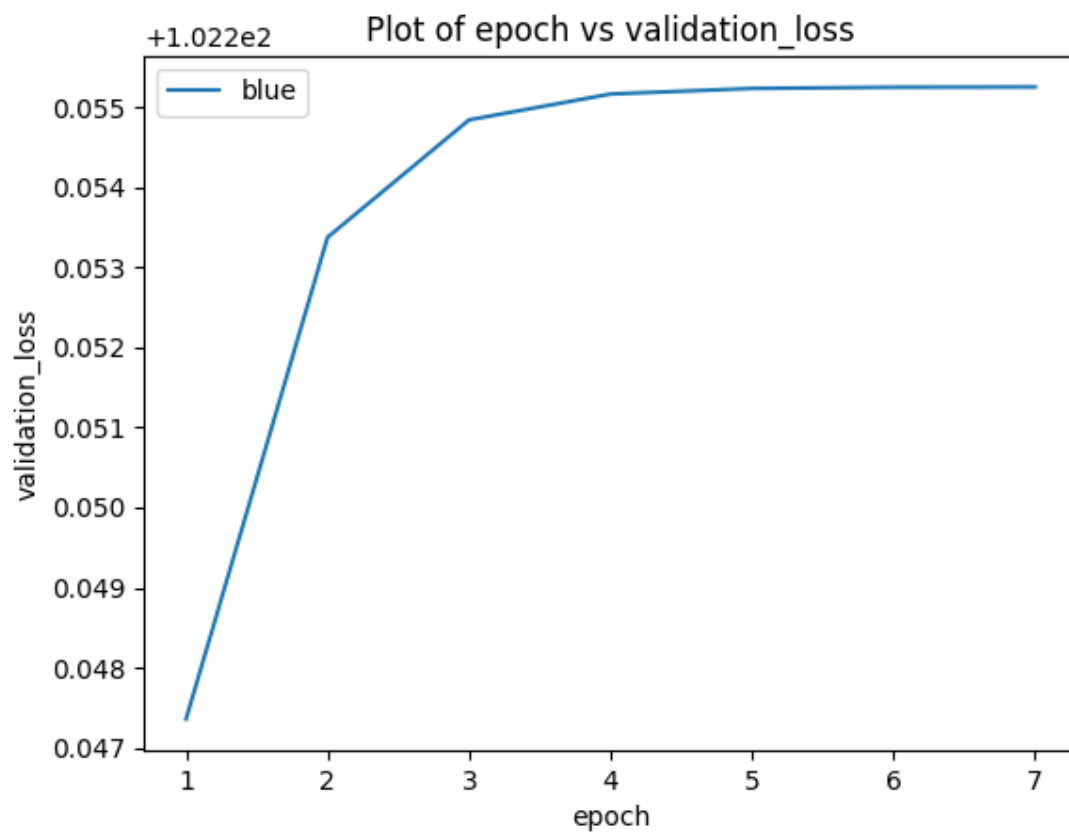
## Loss (Validation)

For learning rate = 0.001



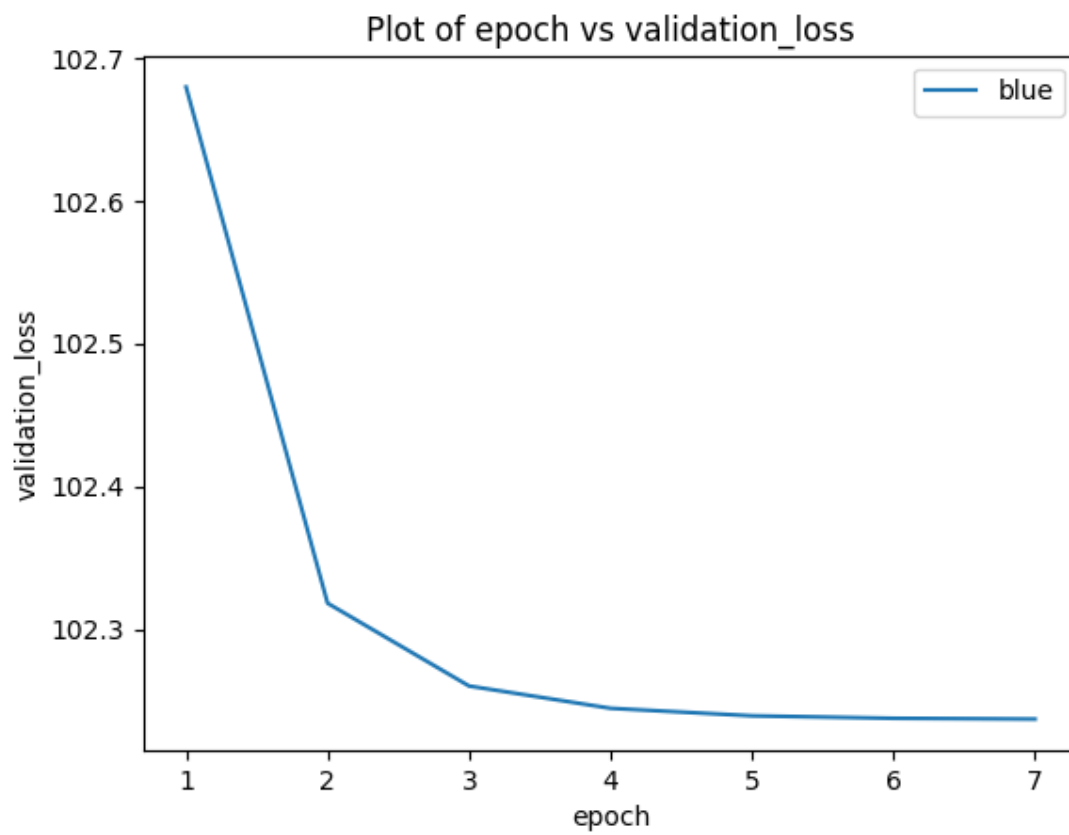
## Loss (Validation)

For learning rate = 0.005



## Loss (Validation)

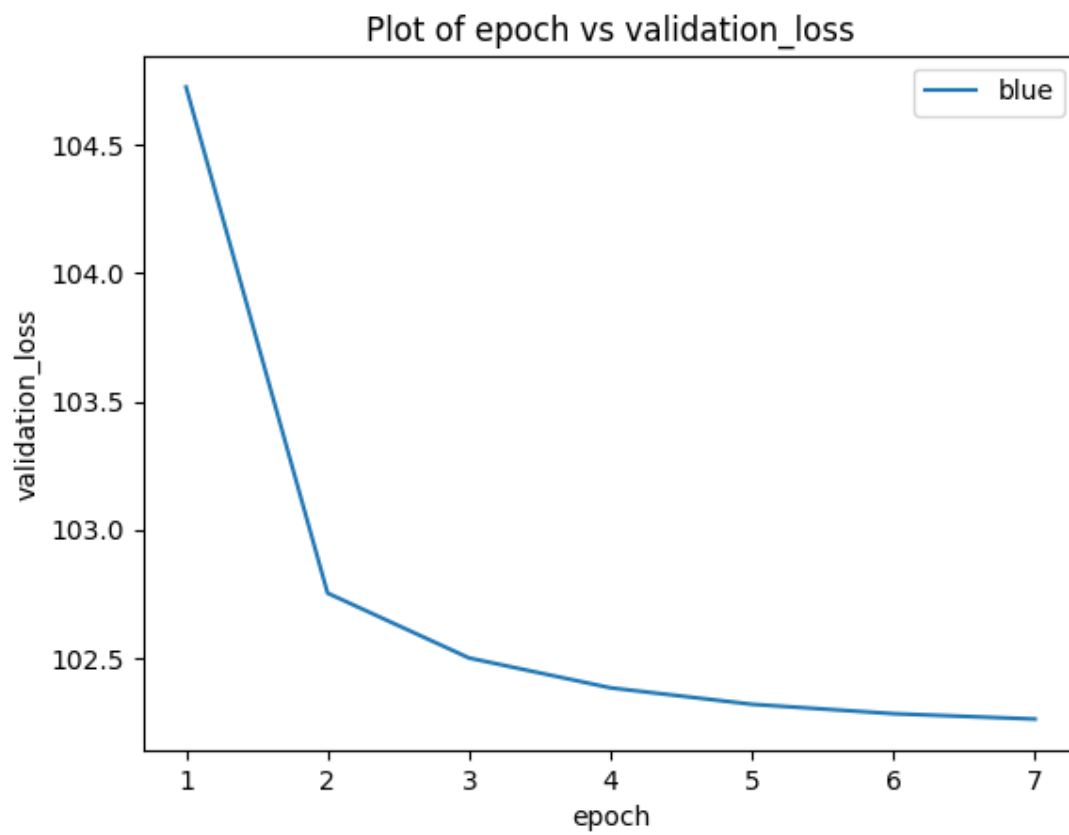
For learning rate = 0.0001





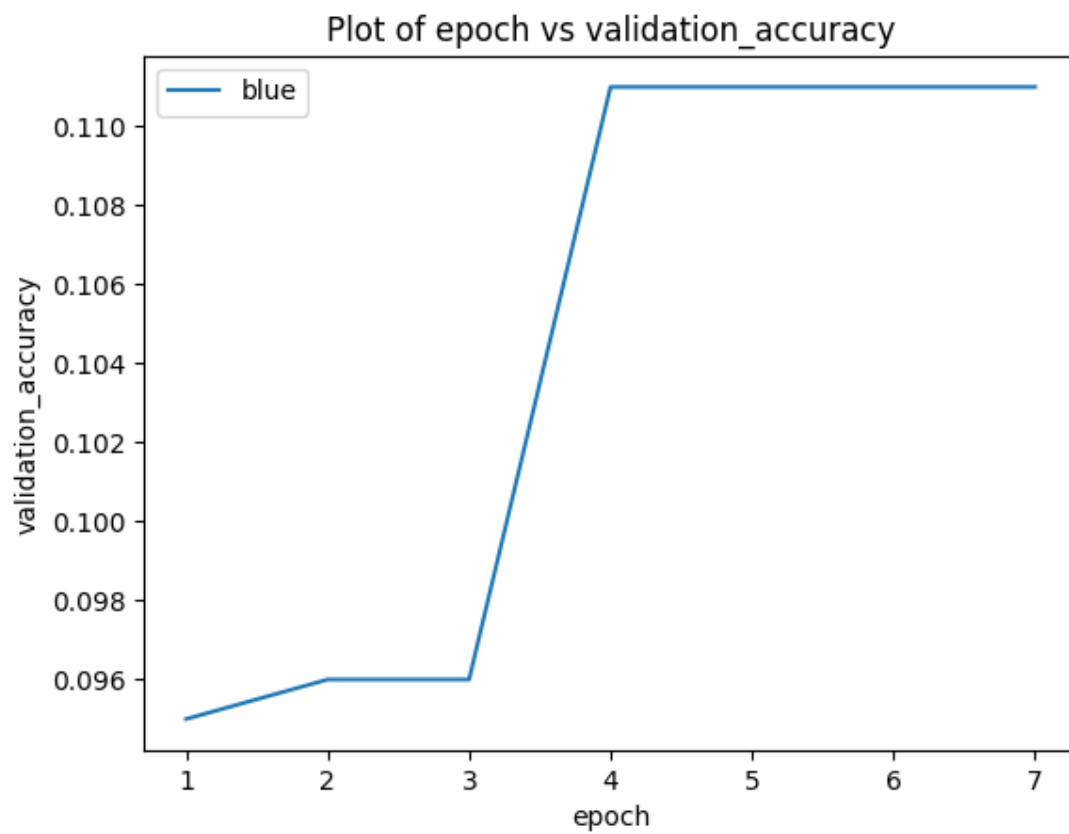
## Loss (Validation)

For learning rate = 0.00005



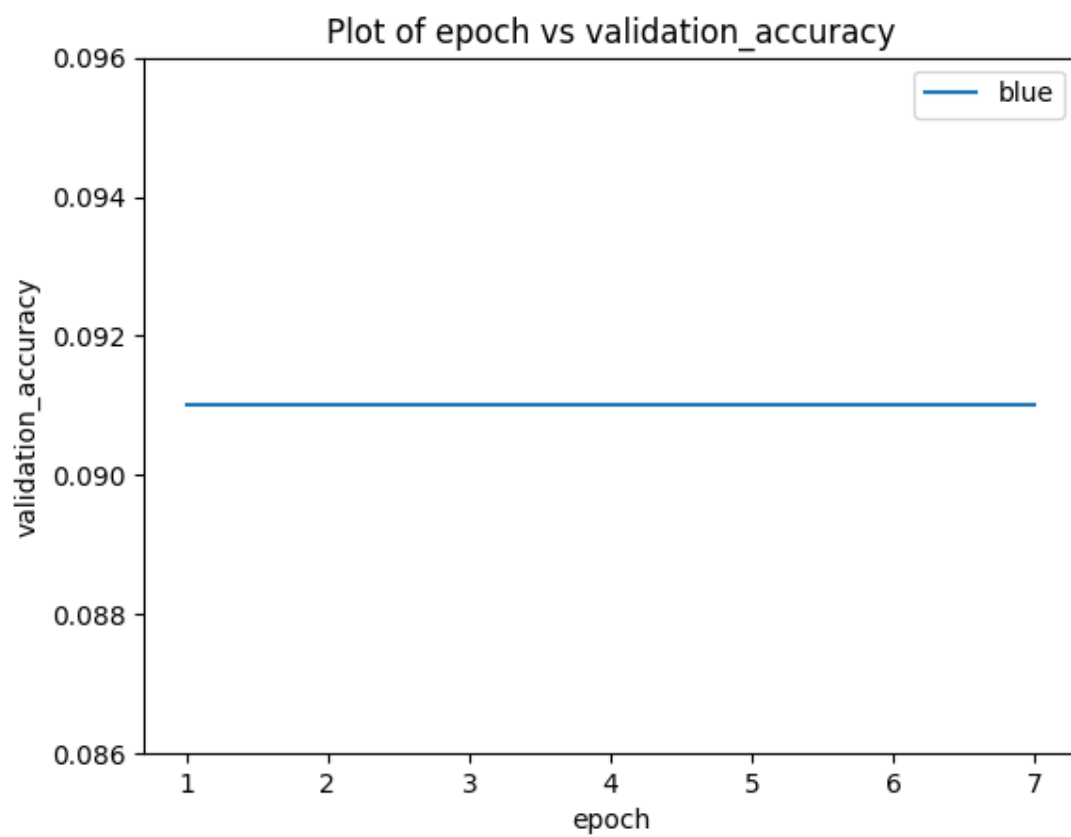
## Accuracy (Validation)

For learning rate = 0.001



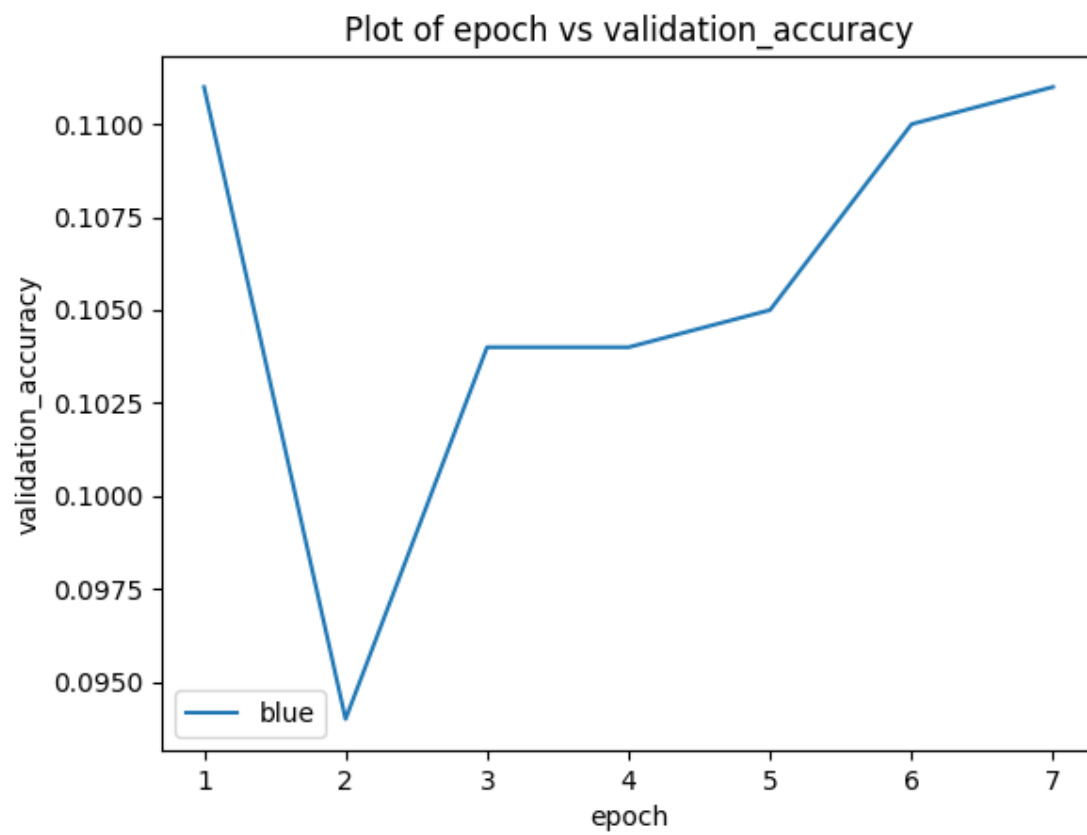
## Accuracy (Validation)

For learning rate = 0.005



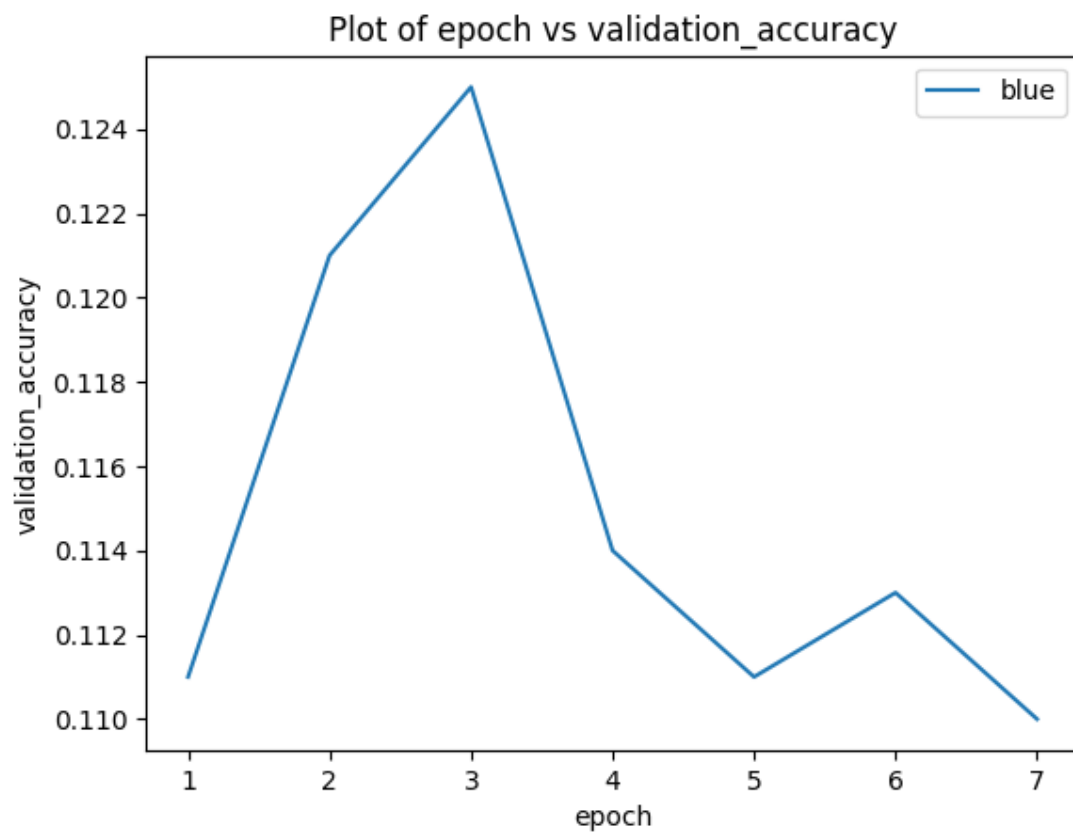
## Accuracy (Validation)

For learning rate = 0.0001



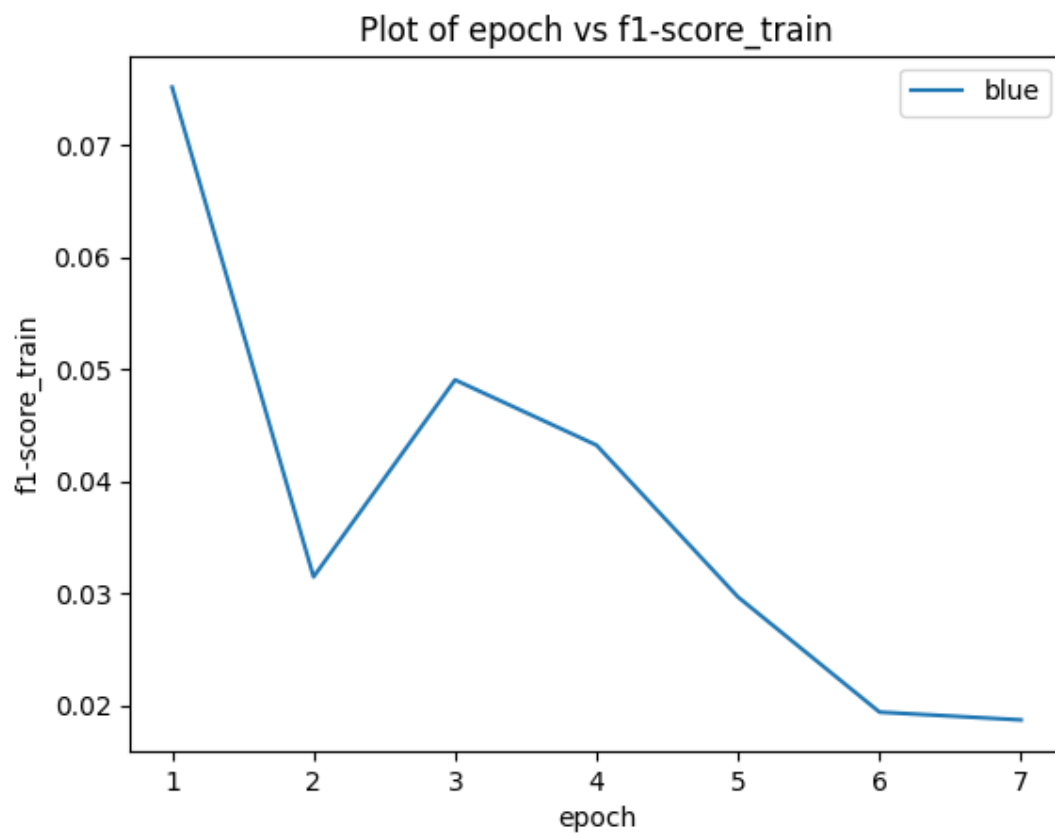
## Accuracy (Validation)

For learning rate = 0.00005



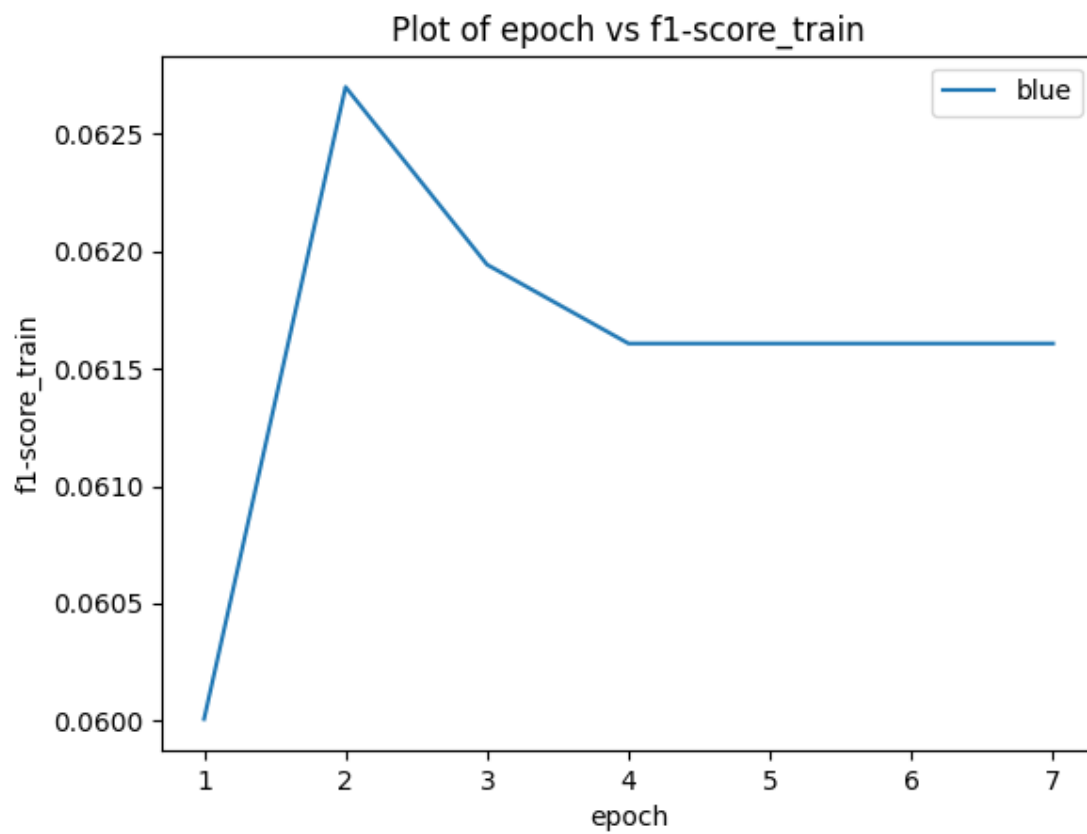
## F1-Score (Training)

For learning rate = 0.001



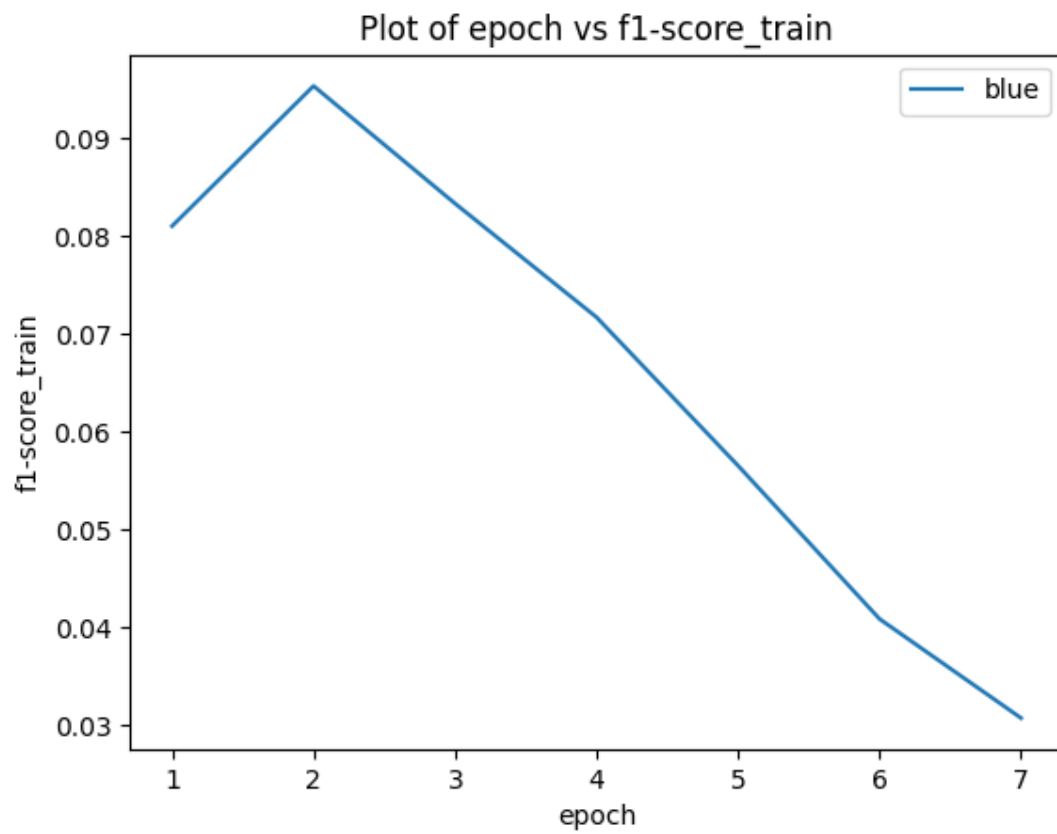
## F1-Score (Training)

For learning rate = 0.005



## F1-Score (Training)

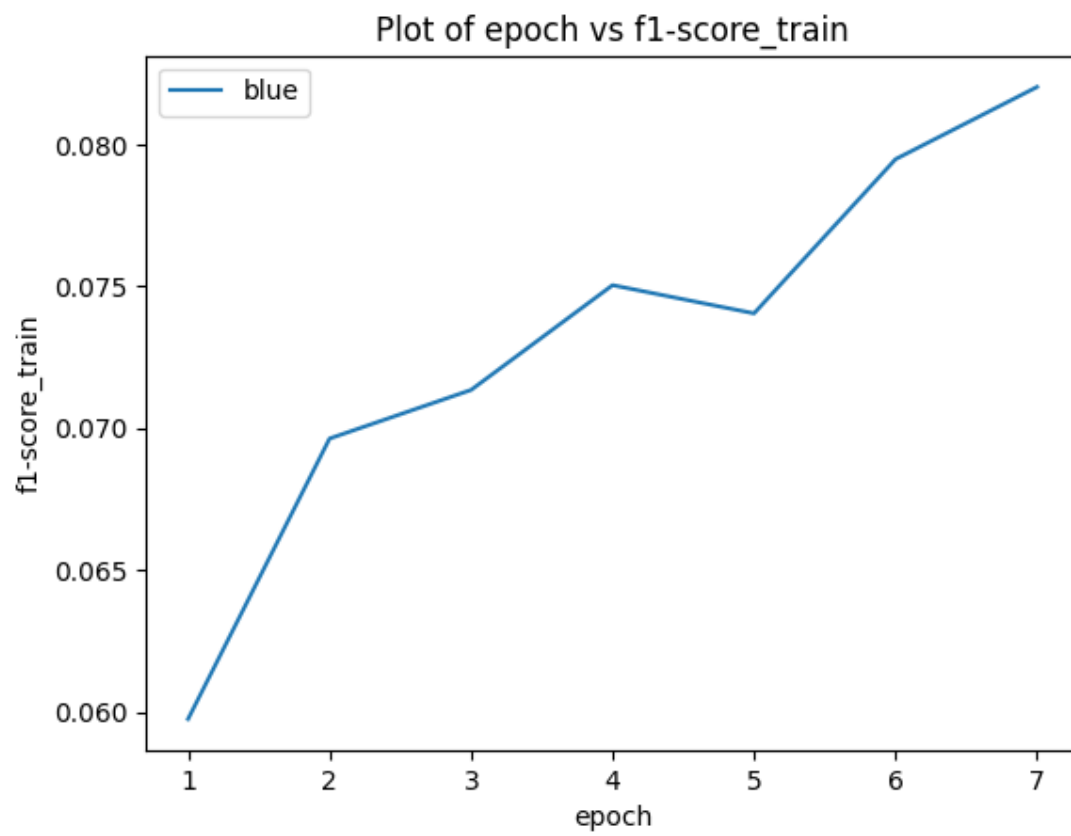
For learning rate = 0.0001





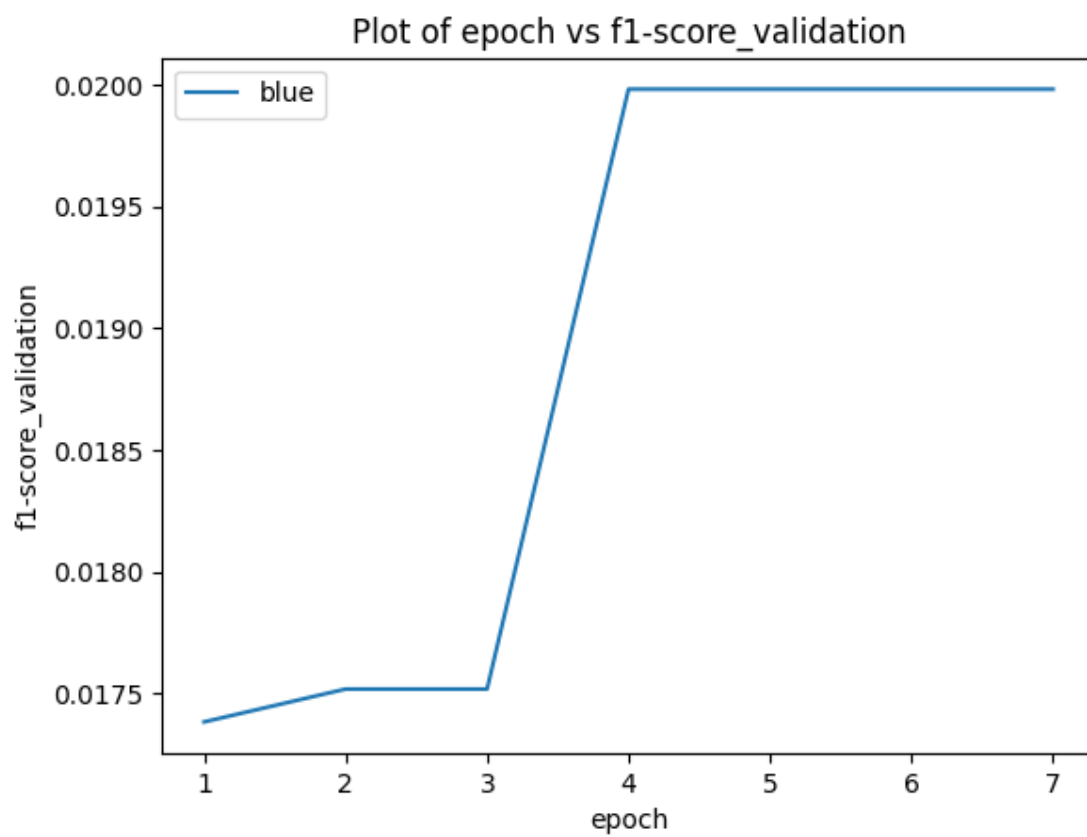
## F1-Score (Training)

For learning rate = 0.00005



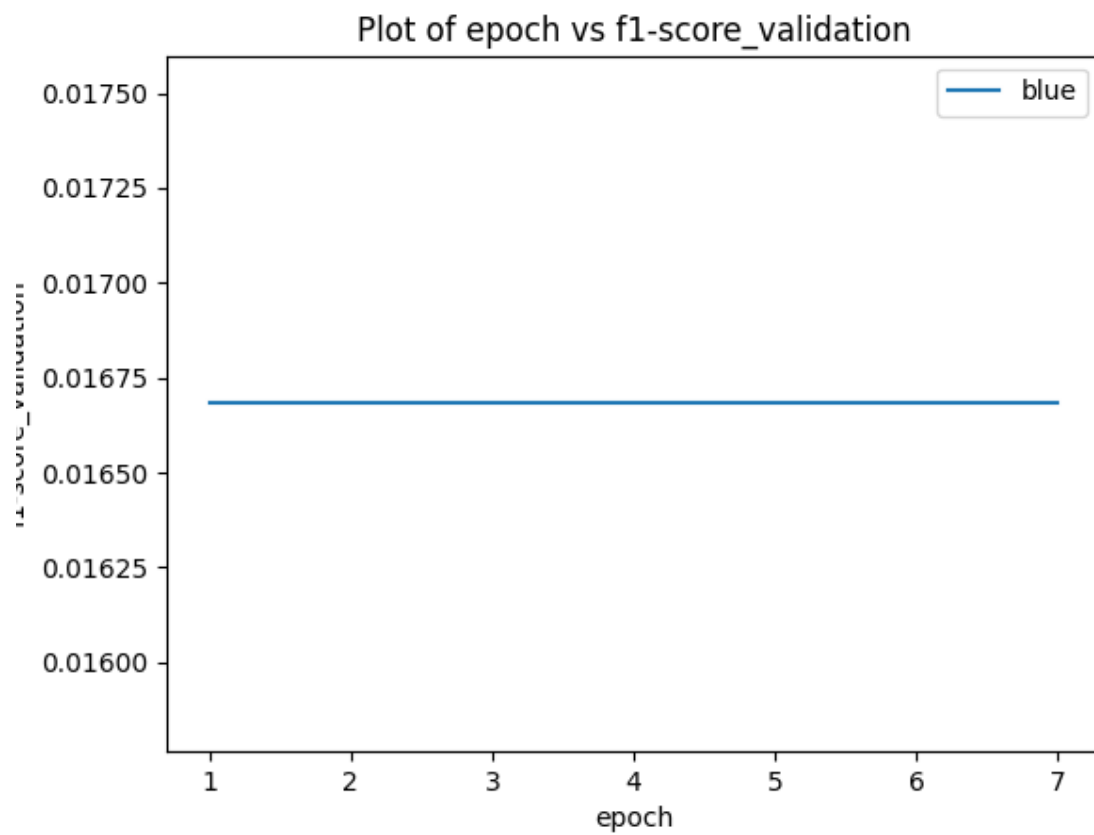
## F1-Score (Validation)

For learning rate = 0.001



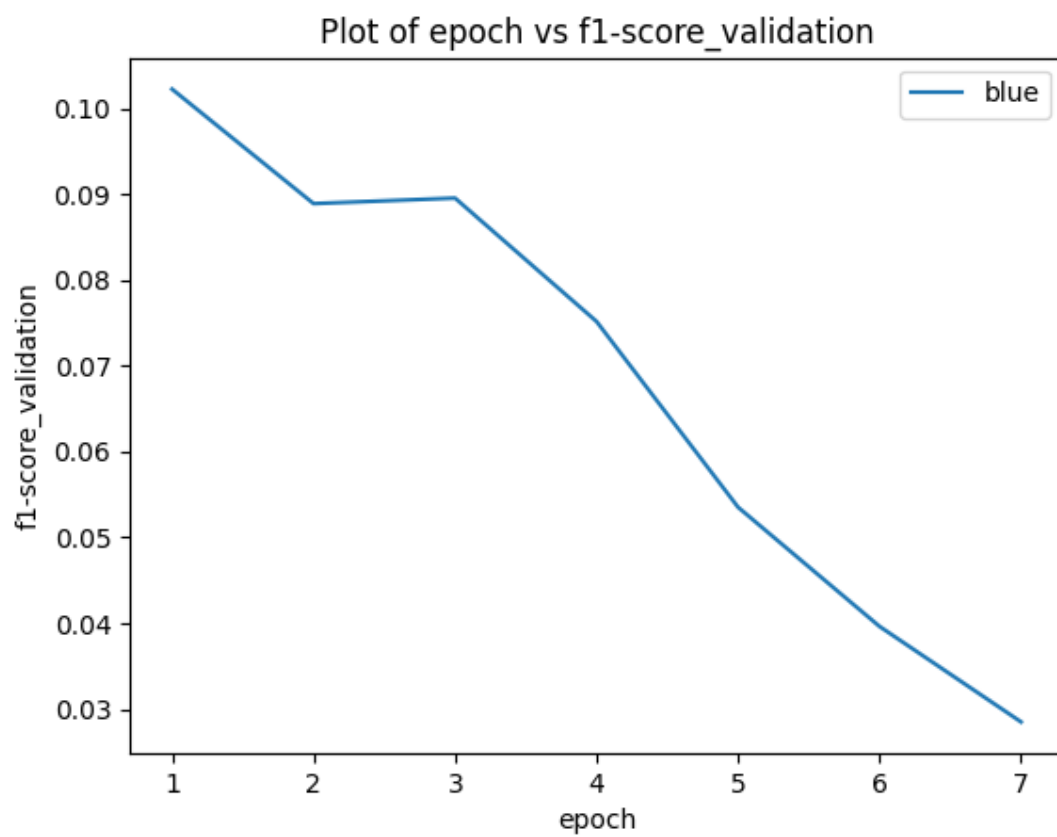
## F1-Score (Validation)

For learning rate = 0.005



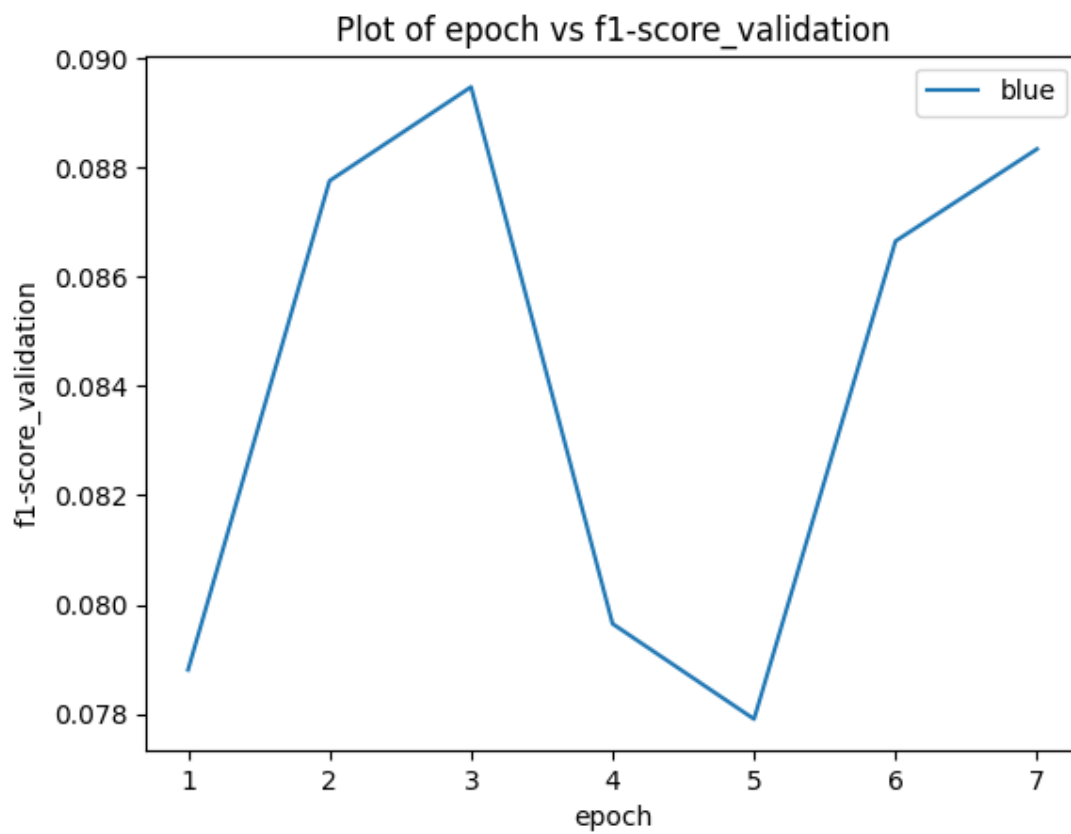
## F1-Score (Validation)

For learning rate = 0.0001



## F1-Score (Validation)

For learning rate = 0.00005



We can see from above that the learning rate = 0.00005 gives the best F1-score on validation.

Below are the loss, accuracy, and macro-f1 score on each pass over the training set.

Epoch 1/7: Train Accuracy: 0.0952  
Epoch 1/7: Train Loss: 139.74305077537937  
Epoch 1/7: Validation Loss: 104.725993744014  
Epoch 1/7: Validation Accuracy: 0.111  
Epoch 1/7: F1 Score Train: 0.05974778347323203  
Epoch 1/7: F1 Score Validation: 0.07880600170246829

Epoch 2/7: Train Accuracy: 0.0982  
Epoch 2/7: Train Loss: 104.98336215535718  
Epoch 2/7: Validation Loss: 102.75489446725796  
Epoch 2/7: Validation Accuracy: 0.121  
Epoch 2/7: F1 Score Train: 0.06963931567637457  
Epoch 2/7: F1 Score Validation: 0.08775837119975402

Epoch 3/7: Train Accuracy: 0.1008  
Epoch 3/7: Train Loss: 104.31221340654263  
Epoch 3/7: Validation Loss: 102.5022471731776  
Epoch 3/7: Validation Accuracy: 0.125  
Epoch 3/7: F1 Score Train: 0.07135309053574379  
Epoch 3/7: F1 Score Validation: 0.08947612704618253

Epoch 4/7: Train Accuracy: 0.1032  
Epoch 4/7: Train Loss: 104.14028255730031  
Epoch 4/7: Validation Loss: 102.38595480668394  
Epoch 4/7: Validation Accuracy: 0.114  
Epoch 4/7: F1 Score Train: 0.07504872066832802  
Epoch 4/7: F1 Score Validation: 0.0796494900059809

Epoch 5/7: Train Accuracy: 0.0994  
Epoch 5/7: Train Loss: 104.05346663891211  
Epoch 5/7: Validation Loss: 102.32192374358875  
Epoch 5/7: Validation Accuracy: 0.111  
Epoch 5/7: F1 Score Train: 0.07405418587985148  
Epoch 5/7: F1 Score Validation: 0.07790518689760359

Epoch 6/7: Train Accuracy: 0.102  
Epoch 6/7: Train Loss: 104.00347613232051  
Epoch 6/7: Validation Loss: 102.28531123155382  
Epoch 6/7: Validation Accuracy: 0.113  
Epoch 6/7: F1 Score Train: 0.07949118898841313  
Epoch 6/7: F1 Score Validation: 0.08665481776831443

Epoch 7/7: Train Accuracy: 0.1022  
Epoch 7/7: Train Loss: 103.97418915446447  
Epoch 7/7: Validation Loss: 102.26440557243212  
Epoch 7/7: Validation Accuracy: 0.11  
Epoch 7/7: F1 Score Train: 0.08203823273860592  
Epoch 7/7: F1 Score Validation: 0.08834024409741091