| **Sr. No** | **Train Test split** | **Learning Rate** | **Optimizer** | **Activation Function** | **Loss Function** | **Number of Layers** | **Epochs** | **NUM\_BITS\_PER\_SYMBOL** | **BATCH\_SIZE** | **Frame\_SIZE** | **Blocklength** | **BER** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 80:20 | 0.1 | SGD | ReLU | BCELoss | 2 | 20 | 4 | 32 | 64 | 1024 | **0.2029** |
| 2 | 80:20 | 0.05 | SGD | ReLU | BCELoss | 2 | 20 | 4 | 32 | 64 | 1024 | **0.2262** |
| 3 | 80:20 | 0.05 | SGD | ReLU | BCELoss | 2 | 15 | 4 | 32 | 64 | 1024 | **0.2481** |
| 4 | 80:20 | 0.05 | SGD | ReLU | BCELoss | 2 | 20 | 4 | 64 | 64 | 1024 | **0.2127** |
| 5 | 80:20 | 0.05 | Adam | ReLU | BCELoss | 2 | 20 | 4 | 64 | 64 | 1024 | **0.1816** |
| 6 | 80:20 | 0.1 | Adam | ReLU | BCELoss | 2 | 20 | 4 | 64 | 64 | 1024 | **0.1872** |
| 7 | 80:20 | 0.1 | Adam | Tanh | BCELoss | 2 | 20 | 4 | 64 | 64 | 1024 | **0.1864** |
| 8 | 80:20 | 0.1 | Adam | Tanh | BCELoss | 3 | 20 | 4 | 32 | 64 | 1024 | **0.1865** |
| 9 | 80:20 | 0.1 | SGD | Tanh | BCELoss | 3 | 20 | 4 | 32 | 64 | 1024 | **0.1865** |
| 10 | 80:20 | 0.1 | SGD | Tanh | BCELoss | 3 | 30 | 4 | 32 | 64 | 1024 | **0.1848** |
| 11 | 80:20 | 0.02 | SGD | Tanh | BCELoss | 3 | 30 | 4 | 64 | 64 | 1024 | **0.2894** |
| 12 | 80:20 | 0.15 | SGD | Tanh | BCELoss | 3 | 30 | 4 | 16 | 64 | 1024 | **0.1814** |
| 13 | 80:20 | 0.15 | SGD | Tanh | BCELoss | 4 | 30 | 4 | 16 | 64 | 1024 | **0.1828** |
| 14 | 80:20 | 0.15 | AdamW | Tanh | BCELoss | 4 | 30 | 4 | 16 | 64 | 1024 | **0.1828** |
| 15 | 80:20 | 0.15 | SGD | LeakyReLu | BCELoss | 4 | 30 | 4 | 16 | 64 | 1024 | **0.1916** |
| 16 | 80:20 | 0.15 | SGD | Tanh | BCEWithLogitsLoss | 3 | 30 | 4 | 16 | 64 | 1024 | **0.2548** |

The row highlighted one has the lowest BER, therefore Ill be choosing that as my final model.

**Below are the graphs of all the testing results mentioned above:**

| **Sr. No.** | **Training and Validation Loss Over Epochs** | **Bit Error Rate (BER) on validation set** |
| --- | --- | --- |
| **1.** |  |  |
| **2.** |  |  |
| **3.** |  |  |
| **4.** |  |  |
| **6.** |  |  |
| **8.** |  |  |
| **9.** |  |  |
| **10.** |  |  |
| **11.** |  |  |
| **12.** |  |  |
| **14.** |  |  |
| **15.** |  |  |
| **16.** |  |  |