

Offline 3 Report

# FNN From Scratch

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## Hyperparameters

1. Learning Rate 0.005, 0.001, 0.0005
2. Batch\_size 1024
3. Epochs 20, 30, 50
4. Weight and Bias saved in pickle
5. Xavier Initialization

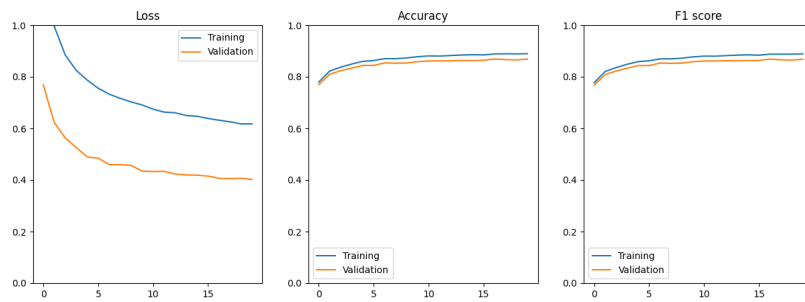
### Model 1 (Third Best)

```
'id' : 1,  
'epochs' : 20,  
'batch_size' : 1024,  
'model' : [  
    Dense(784, 128),  
    Dropout(0.5),  
    ReLU(),  
    Dense(128, 64),  
    ReLU(),  
    Dense(64, 26),  
    Softmax()  
],
```

$$\text{LR} = 0.005$$

Test Accuracy: 0.884

Test F1: 0.884

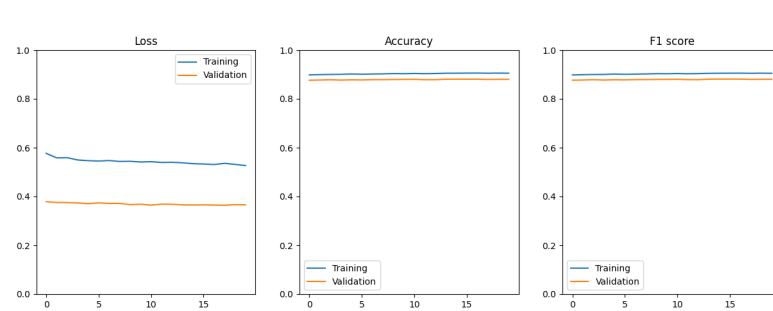


Confusion matrix																								
50	7	8	9	7	3	8	22	0	2	2	5	4	13	21	7	16	2	0	1	6	0	2	4	0
4	15	0	12	0	0	2	28	1	2	1	5	24	3	2	13	10	0	0	0	0	0	1	0	
6	14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6	14	1	0	0	0	0	0	0	0	0	0	13	1	1	6	36	10	1	4	0	4	0	0	
5	12	0	0	0	0	0	0	0	0	0	0	0	7	6	1	2	0	2	0	2	1	0	0	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
-21	142	1	9	12	0	0	0	0	0	0	0	1	0	1	0	2	512	11	0	0	0	0	2	2
2	10	0	4	0	0	0	0	0	0	0	0	3	14	12	8	20	1	0	1	0	1	0	2	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
2	0	0	1	0	1	0	1	0	0	0	0	0	1	0	0	1	0	9	18	2	1	0	1	
2	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	6	0	3	0	3	1	
2	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
21	0	0	5	0	0	0	12	2	10	1	0	0	0	0	0	0	5	0	2	1	4	6	0	
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	0	0	5	0	0	0	19	0	0	0	0	0	0	0	0	0	2	7	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	0	4	17	5	0	0	2	24	3	3	0	0	1	0	0	1	1	1	0	0	11	0	7	
1	1	1	0	1	6	10	13	19	0	0	0	1	2	0	1	1	1	1	1	1	0	0	0	
1	1	1	0	1	6	10	13	19	0	0	0	1	2	0	1	1	1	1	1	1	0	0	0	
-3	0	0	1	3	0	0	1	7	0	1	1	2	0	3	1	1	0	1	0	1	0	1	2	
-3	0	0	1	3	0	0	1	7	0	1	1	2	0	3	1	1	0	1	0	1	0	1	2	
-3	0	0	1	3	0	0	1	7	0	1	1	2	0	3	1	1	0	1	0	1	0	1	2	
-2	0	0	2	0	2	0	6	2	21	3	8	0	0	0	0	1	3	0	2	0	5	0	1	
-2	0	0	2	0	2	0	6																	

LR = 0.001

Test Accuracy: 0.883

Test F1: 0.882

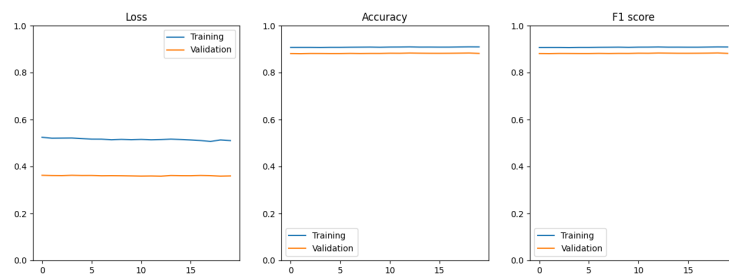


0	5	6	15	10	11	0	4	0	0	3	0	10	11	5	23	3	2	4	0	0	2	0
7	2	7	6	6	1	11	26	0	0	4	2	1	4	13	3	2	2	2	0	0	0	1
4	2	6	24	11	0	0	2	10	0	0	0	1	1	3	1	2	1	3	2	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8	3	3	25	0	0	0	0	1	1	4	0	0	3	3	3	2	2	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
17	15	11	1	0	0	0	0	11	0	2	0	0	0	0	27	130	1	1	0	0	1	0
2	13	0	4	0	0	0	1	12	12	16	0	0	0	0	0	4	3	3	0	0	1	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3	0	3	11	2	0	3	1	26	0	0	0	0	0	0	2	0	6	16	1	1	0	0
2	3	2	5	2	2	0	32	0	0	0	0	0	0	0	0	0	6	1	1	0	1	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3	0	0	1	0	1	0	1	0	1	0	1	1	0	1	0	1	0	1	1	0	0	0
13	0	0	0	0	0	0	2	16	0	2	8	1	9	0	0	0	4	2	2	5	4	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	5	2	10	0	0	0	0	0	0	0	4	4	0	0	2	0	4	0	2	0
0	26	5	5	10	4	0	1	0	2	1	1	3	13	2	7	6	6	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	1	1	2	2	20	0	0	0	1	1	0	2	0	3	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	0	1	6	0	0	0	1	4	0	1	1	2	0	0	1	0	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	0	0	4	0	1	0	4	1	2	18	2	2	1	0	1	1	1	4	0	0	0	0
0	1	0	0	0	5	0	0	8	3	4	1	1	0	1	2	0	15	13	1	0	1	
2	0	1	0	1	7	1	18	1	1	0	0	0	0	0	0	0	0	0	0	0	0	
0	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	1	2	0	1	0	4	5	6	7	8	10	12	13	14	15	16	17					

LR=0.0005

Test Accuracy: 0.873

Test F1: 0.872

[illegible]

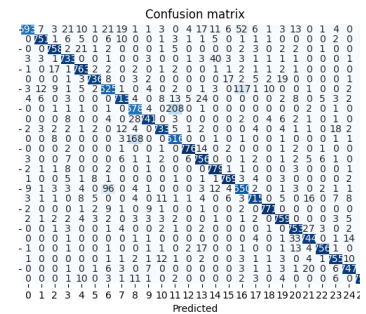
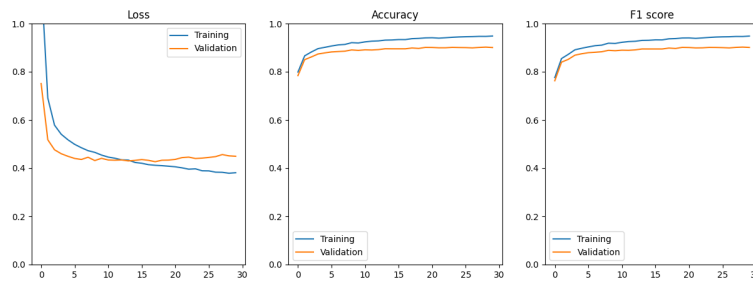
## Model 2 (Second Best)

```
'id' : 2,
'epochs' : 30,
'batch_size' : 1024,
'model' : [
    Dense(784, 1024),
    Dropout(0.5),
    ReLU(),
    Dense(1024, 26),
    ReLU(),
    Softmax()
],
```

LR = 0.005

Test Accuracy: 0.918

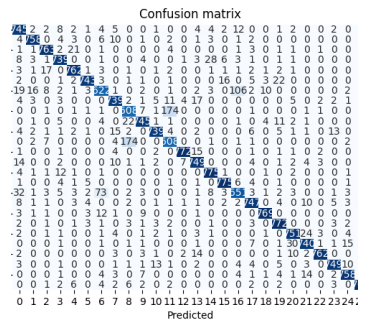
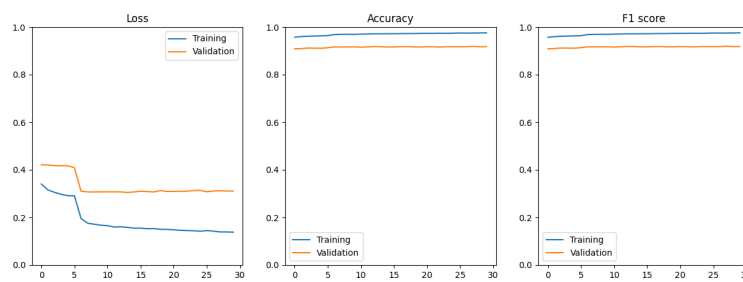
Test F1: 0.918



LR = 0.001

Test Accuracy: 0.919

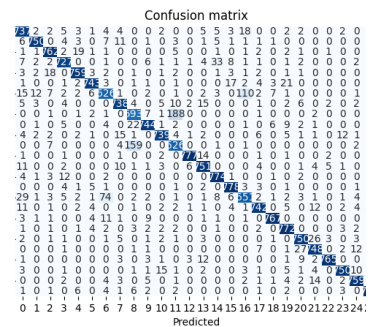
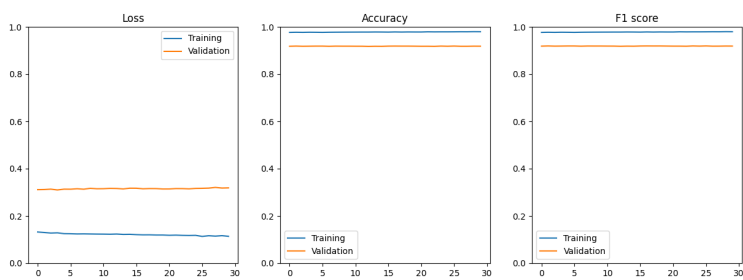
Test F1: 0.919



LR=0.0005

Test Accuracy: 0.905

Test F1: 0.905



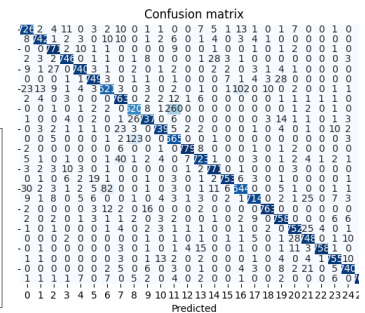
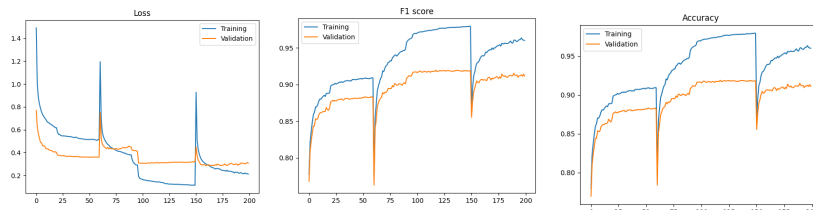
## Model 3 (Best)

```
'id' : 3,
'epochs' : 50,
'batch_size' : 1024,
'model' : [
    Dense(784, 1024),
    Dropout(0.5),
    ReLU(),
    Dense(1024, 512),
    ReLU(),
    Dense(512, 26),
    Softmax()
]
```

LR = 0.005

Test Accuracy: 0.924

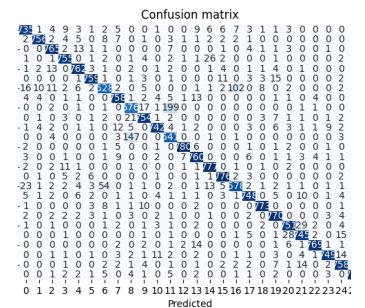
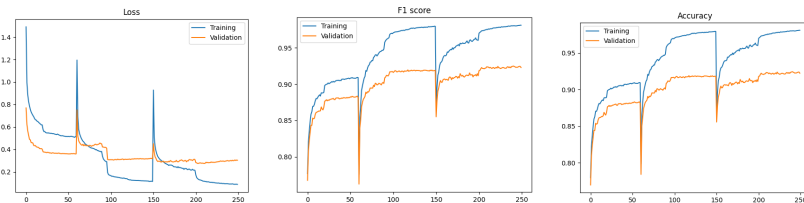
Test F1: 0.924



LR = 0.001 (Best)

Test Accuracy: 0.925

Test F1: 0.925



LR=0.0005

Test Accuracy: 0.910

Test F1: 0.911

