# Math Foundation Assignment

Chapter 5: Multilayer Perceptron - MLP

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#### Contents

#### **5.1: Multilayer perceptrons:**

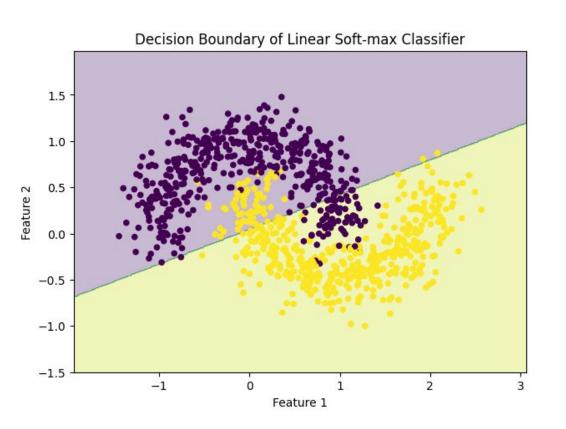
- Hidden layers
- Activation functions

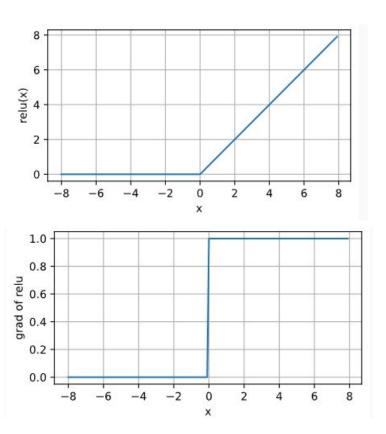
#### **5.2: Implementation of MLP from scratch**

- Implement MLP from scratch to classify MNIST dataset

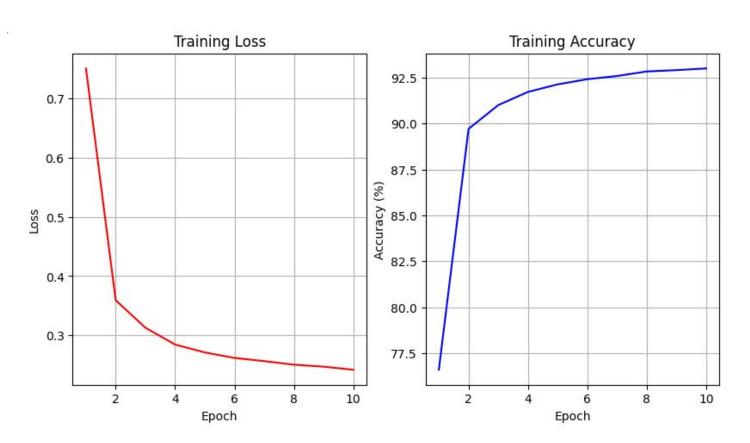
# 5.3: Forward Propagation, Backward Propagation and Computational Graphs

### 5.1: Multilayer Perceptions





### 5.2: Implement MLP from scratch



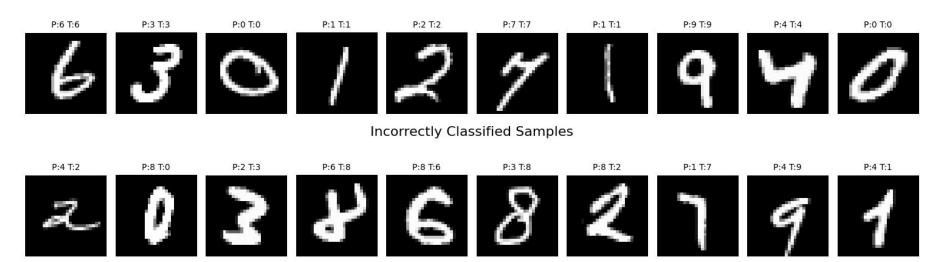
## 5.2: Implement MLP from scratch

Final Test Accuracy (best model from epoch 2): 90.28%										
Confusion Matrix — Best Model										
0 -	1308	0	8	2	4	12	9	2	15	0
н -	- 1	1499	6	6	6	6	2	2	20	1
7 -	- 22	20	1191	27	26	7	32	18	38	2
m -	4	9	29	1262	2	81	2	28	34	12
Frue Label	5	5	3	2	1245	0	8	4	6	57
True 5	36	9	11	30	17	1101	22	2	49	15
9 -	21	5	5	0	19	27	1275	0	15	1
7	. 7	17	13	6	12	0	0	1391	5	53
ω -	10	42	8	28	7	42	19	3	1161	19
o -		7	2	15	79	11	1	53	19	1206
0 1 2 3 4 5 6 7 8 9  Predicted Label										

### 5.2: Implement MLP from scratch

Correctly classified: 12639 Incorrectly classified: 1361

#### **Correctly Classified Samples**



# 5.3: Forward Propagation, Backward Propagation, and Computational Graphs

Forward: Input -> Hidden -> ... -> Output -> Loss

Backward: Loss -> Output -> ... -> Hidden -> Weight (apply chain rule)