CS 203: Software Tools & Techniques for AI
IIT Gandhinagar
Sem-II - 2024-25

LAB 07
GROUP 15
Members-
Kodali Dinesh Siddhartha(23110168),
## Hardik Shudhodhan Khobragade (24120029)

Colab Link-
https://colab.research.google.com/drive/1a7AekEY8RubZoxwsObbfO_PkZyH6Fk1p?usp=sharing

Github Repo Link- https://github.com/DineshSiddhartha/SAI_A7

Screenshots of the following displaying:
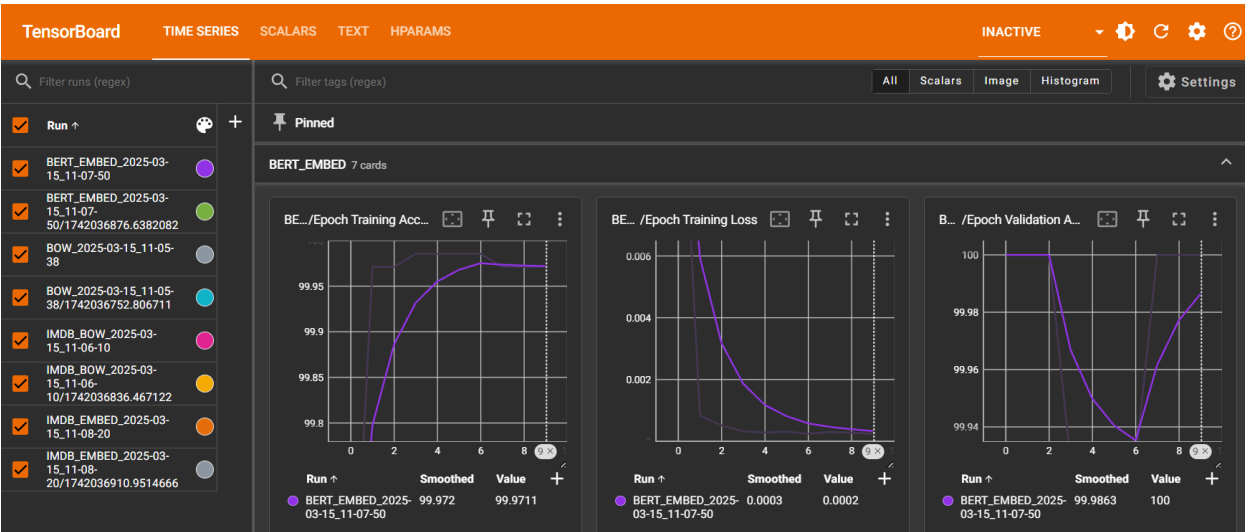
- ○ Model architecture.

```
Model architecture:
SimpleMLP(
  (layer1): Linear(in_features=10000, out_features=512, bias=True)
  (layer2): Linear(in_features=512, out_features=256, bias=True)
  (layer3): Linear(in_features=256, out_features=128, bias=True)
  (layer4): Linear(in_features=128, out_features=64, bias=True)
  (layer5): Linear(in_features=64, out_features=2, bias=True)
  (relu): ReLU()
  (dropout): Dropout(p=0.3, inplace=False)
)
```
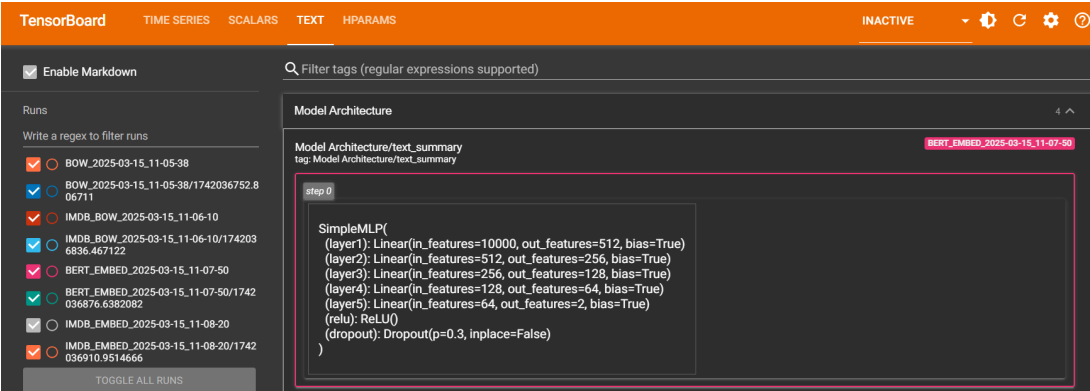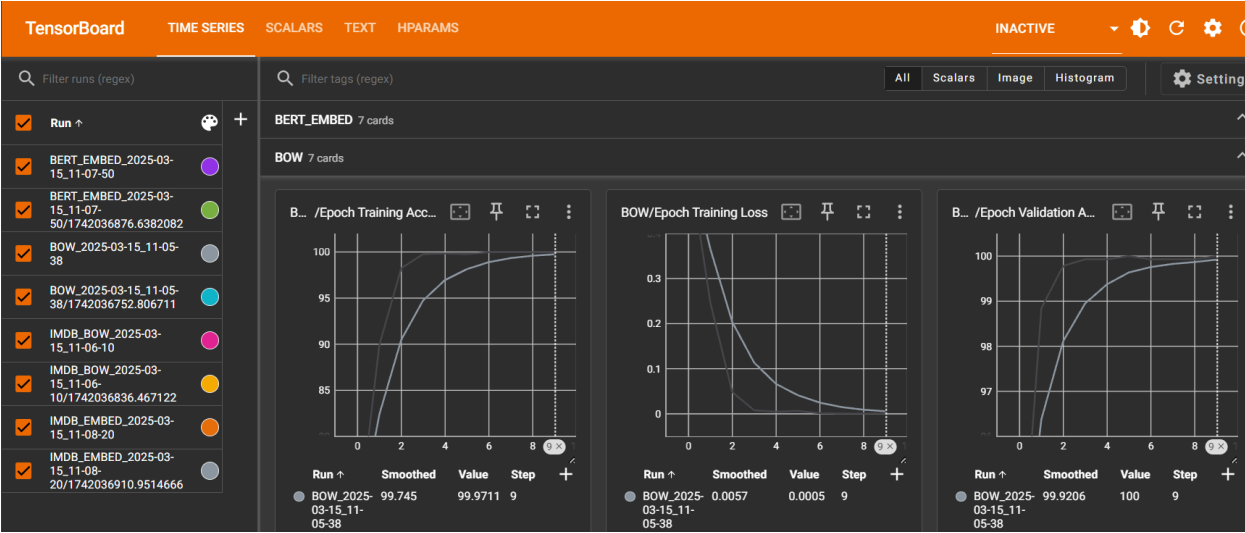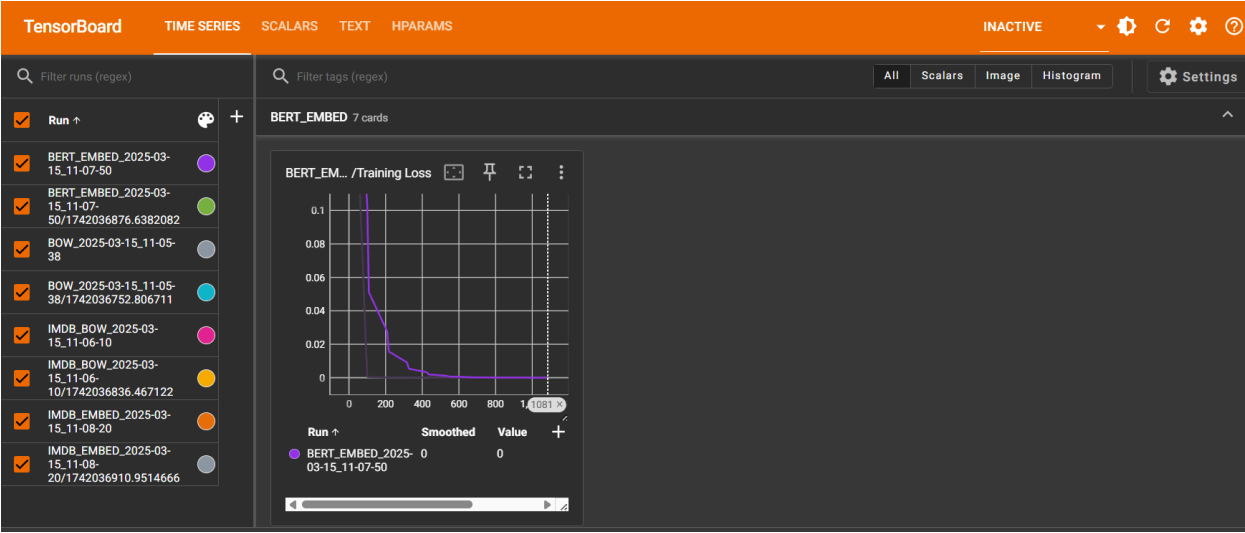
- ○ Hyperparameters.

Trial ID	Show Metrics	Number of Batches	epochs	initial_lr	optimiser	transfer_lr
Dataset1_2025-...	☐	217.00	10.000	0.0010000	Adam	0.00010000
Dataset2_2025-...	☐	109.00	10.000	0.0010000	Adam	0.00010000
IMDB_BOW_202...	☐	1250.0	10.000	0.0010000	Adam	0.00010000
IMDB_EMBED_2...	☐	13.000	10.000	0.0010000	Adam	0.00010000

- ○ Logged metrics.

TIME SERIES   SCALARS   TEXT   HPARAMS

INACTIVE

All   Scalars   Image   Histogram   ⚙ Settings

Q Filter runs (regex)

Run ↑   +

☑ BERT_EMBED_2025-03-15_11-07-50   ●
☑ BERT_EMBED_2025-03-15_11-07-50/1742036876.6382082   ●
☑ BOW_2025-03-15_11-05-38   ●
☑ BOW_2025-03-15_11-05-38/1742036752.806711   ●
☑ IMDB_BOW_2025-03-15_11-06-10   ●
☑ IMDB_BOW_2025-03-15_11-06-10/1742036836.467122   ●
☑ IMDB_EMBED_2025-03-15_11-08-20   ●
☑ IMDB_EMBED_2025-03-15_11-08-20/1742036910.9514666   ●

BOW 7 cards

BO.../Epoch Validation L...

Run ↑	Smoothed	Value	Step	+
● BOW_2025-03-15_11-05-38	0.0022	0.0003	9	

B.../Final Validation Ac...

Alt + Scroll to Zoom

Run ↑	Smoothed	Value	+
● BOW_2025-03-15_11-05-38/1742036752.806711	100	100	

BOW/Training Accuracy

Run ↑	Smoothed	Value	Step	+
● BOW_2025-03-15_11-05-38	99.9794	99.9689	2,153	

TIME SERIES   SCALARS   TEXT   HPARAMS

INACTIVE

All   Scalars   Image   Histogram   ⚙ Settings

Q Filter runs (regex)

Run ↑   +

☑ BERT_EMBED_2025-03-15_11-07-50   ●
☑ BERT_EMBED_2025-03-15_11-07-50/1742036876.6382082   ●
☑ BOW_2025-03-15_11-05-38   ●
☑ BOW_2025-03-15_11-05-38/1742036752.806711   ●
☑ IMDB_BOW_2025-03-15_11-06-10   ●
☑ IMDB_BOW_2025-03-15_11-06-10/1742036836.467122   ●
☑ IMDB_EMBED_2025-03-15_11-08-20   ●
☑ IMDB_EMBED_2025-03-15_11-08-20/1742036910.9514666   ●

IMDB_BOW 7 cards

IM.../Epoch Training Acc...

Run ↑	Smoothed	Value	St	+
● IMDB_BOW_2025-03-15_11-06-10	98.6191	99.815	9	

IM.../Epoch Training Loss

Run ↑	Smoothed	Value	St	+
● IMDB_BOW_2025-03-15_11-06-10	0.0525	0.0072	9	

I.../Epoch Validation A...

Run ↑	Smoothed	Value	St	+
● IMDB_BOW_2025-03-15_11-06-10	87.9646	88	9	

TIME SERIES   SCALARS   TEXT   HPARAMS

INACTIVE

All   Scalars   Image   Histogram   ⚙ Settings

Q Filter runs (regex)

Run ↑   +

☑ BERT_EMBED_2025-03-15_11-07-50   ●
☑ BERT_EMBED_2025-03-15_11-07-50/1742036876.6382082   ●
☑ BOW_2025-03-15_11-05-38   ●
☑ BOW_2025-03-15_11-05-38/1742036752.806711   ●
☑ IMDB_BOW_2025-03-15_11-06-10   ●
☑ IMDB_BOW_2025-03-15_11-06-10/1742036836.467122   ●
☑ IMDB_EMBED_2025-03-15_11-08-20   ●
☑ IMDB_EMBED_2025-03-15_11-08-20/1742036910.9514666   ●

IMDB_BOW 7 cards

IM.../Epoch Validation L...

Run ↑	Smoothed	Value	St	+
● IMDB_BOW_2025-03-15_11-06-10	0.7231	0.9094	9	

IM.../Final Validation Ac...

Run ↑	Smoothed	Value	+
● IMDB_BOW_2025-03-15_11-06-10/1742036836.467122	89.95	89.95	

IMDB.../Training Accuracy

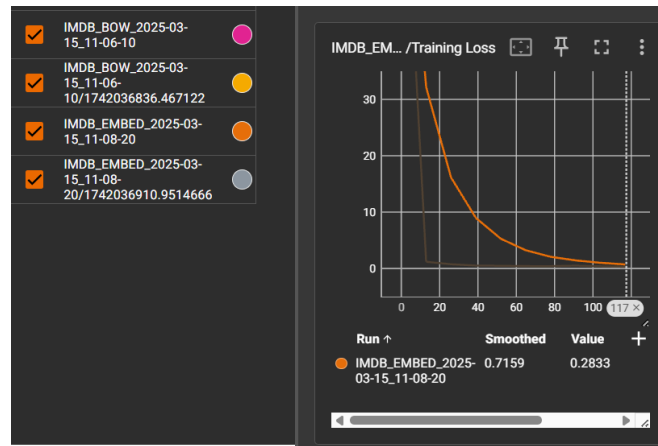| Run ↑	Smoothed	Value	St	+
● IMDB_BOW_2025-03-15_11-06-10	99.839	99.8361	12	

○ Final evaluation results.

```
Dataset1 - Validation Loss: 0.0000, Accuracy: 100.00%

IMDB_BOW - Validation Loss: 0.6633, Accuracy: 87.89%

Dataset2 - Validation Loss: 0.0001, Accuracy: 100.00%

IMDB_EMBED - Validation Loss: 0.3578, Accuracy: 82.00%
```
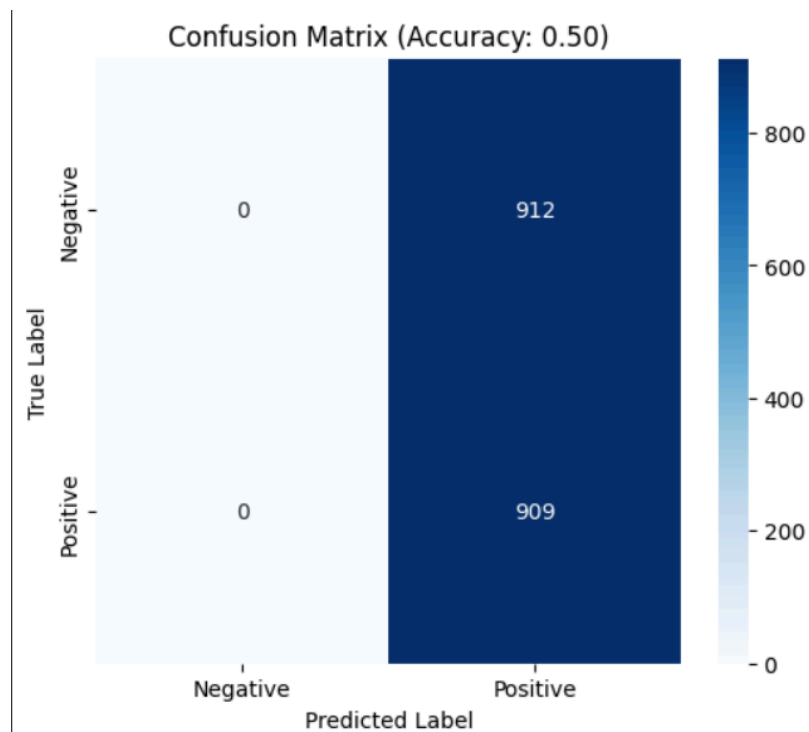
○ Confusion matrix visualization.
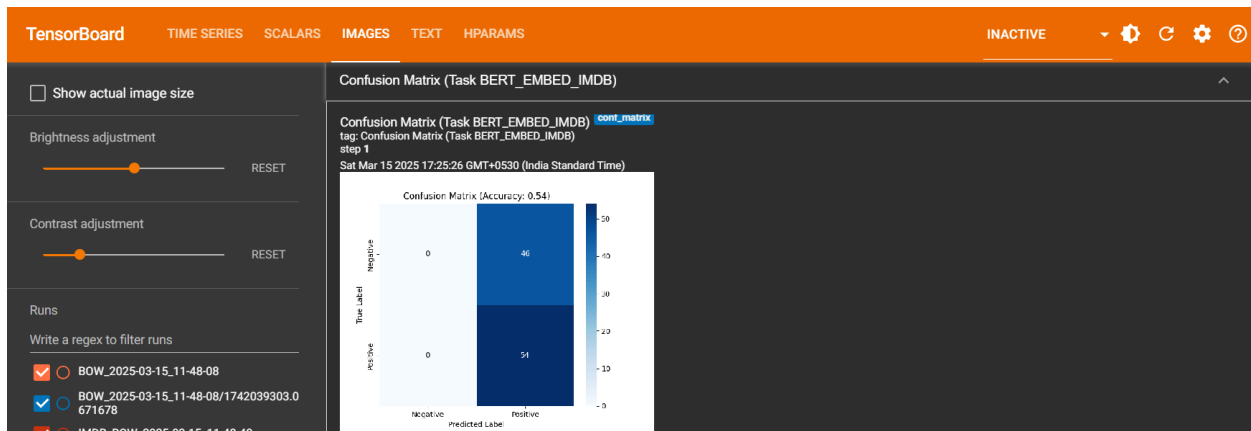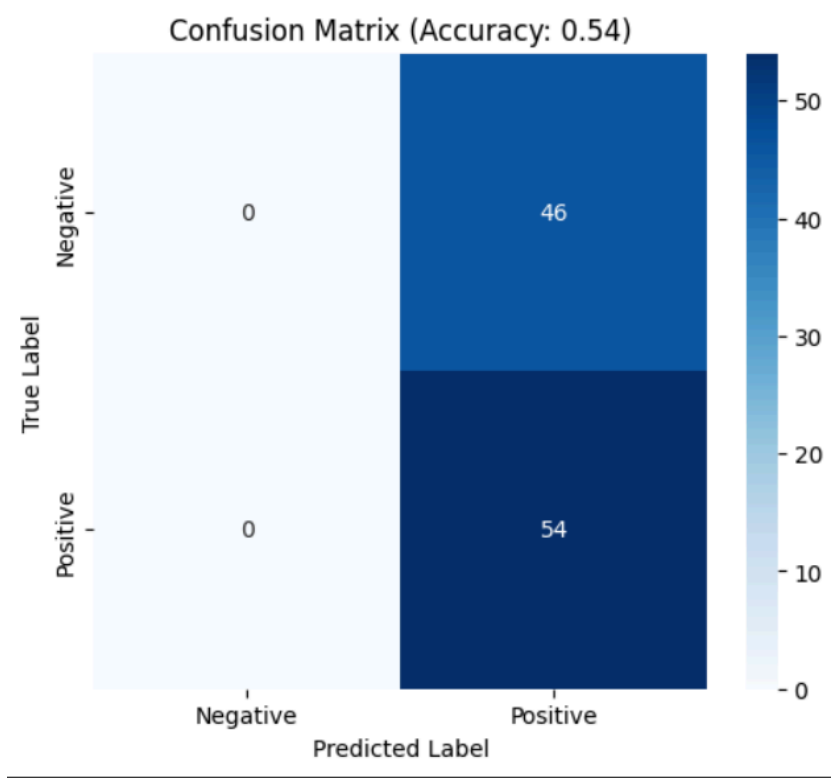
Bag of Words Dataset 1 (test data confusion matrix)
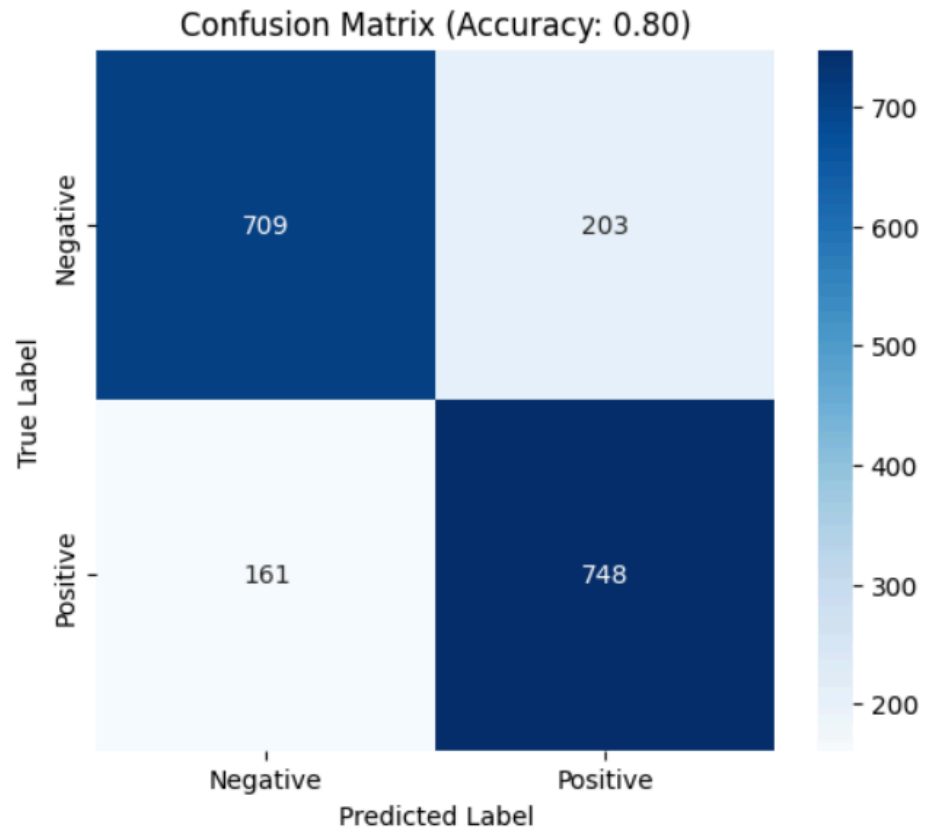
Bag of Words IMDB Dataset (validaton set confusion matrix)

Confusion Matrix (Accuracy: 0.88)
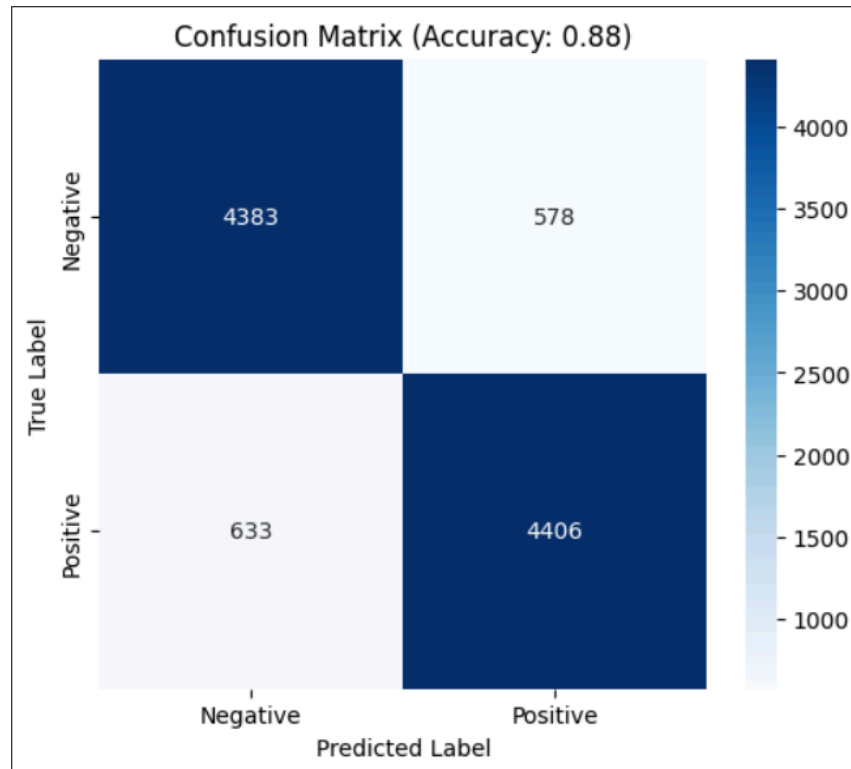
BERT EMBEDDINGS Dataset 1(test data confusion matrix)

Confusion Matrix (Accuracy: 0.50)

BERT EMBEDDINGS IMDB Dataset (validaton set confusion matrix)

Confusion Matrix (Task BERT_EMBED)   ⌃

Confusion Matrix (Task BERT_EMBED)   `cont_matrix`
tag: Confusion Matrix (Task BERT_EMBED)
step **1**
Sat Mar 15 2025 17:25:14 GMT+0530 (India Standard Time)
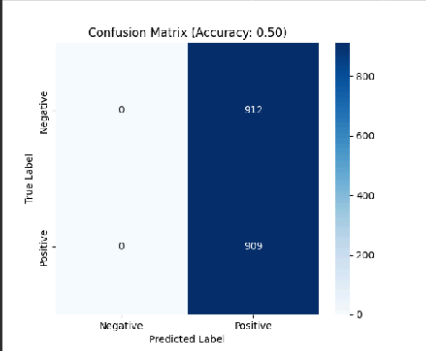
Confusion Matrix (Accuracy: 0.50)

Confusion Matrix (Task BOW_IMDB)   ⌄

Confusion Matrix (Task BOW)   ⌄

Confusion Matrix (Task BOW_IMDB)

Confusion Matrix (Task BOW_IMDB)   `cont_matrix`
tag: Confusion Matrix (Task BOW_IMDB)
step **1**
Sat Mar 15 2025 17:29:20 GMT+0530 (India Standard Time)
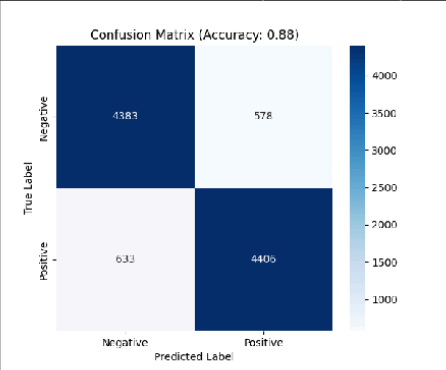
Confusion Matrix (Accuracy: 0.88)

Confusion Matrix (Task BOW)

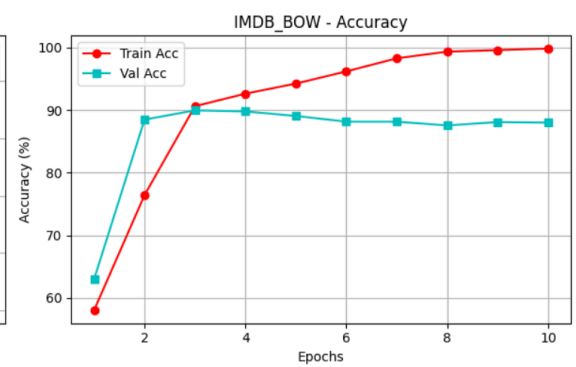### Confusion Matrix (Task BOW)   `cont_matrix`
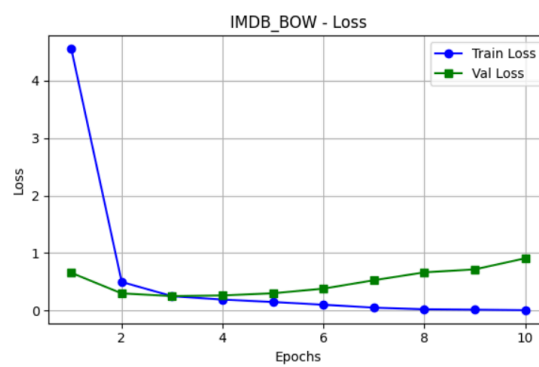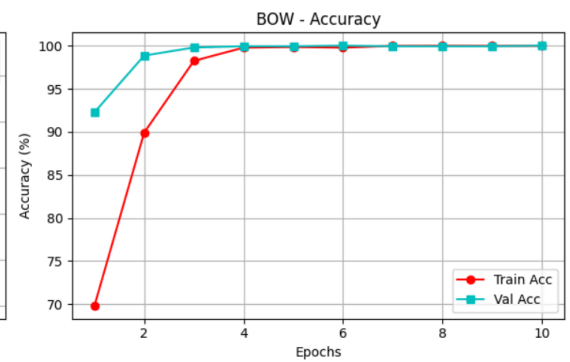tag: Confusion Matrix (Task BOW)
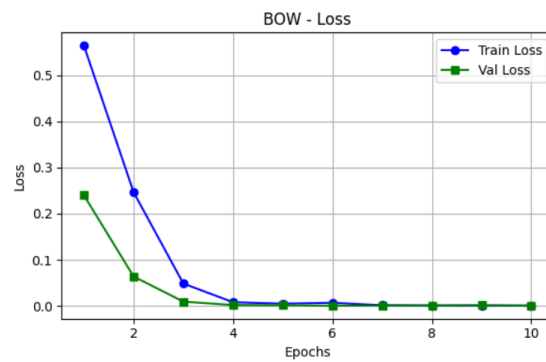
Confusion Matrix (Task BOW)
tag: Confusion Matrix (Task BOW)
step 1
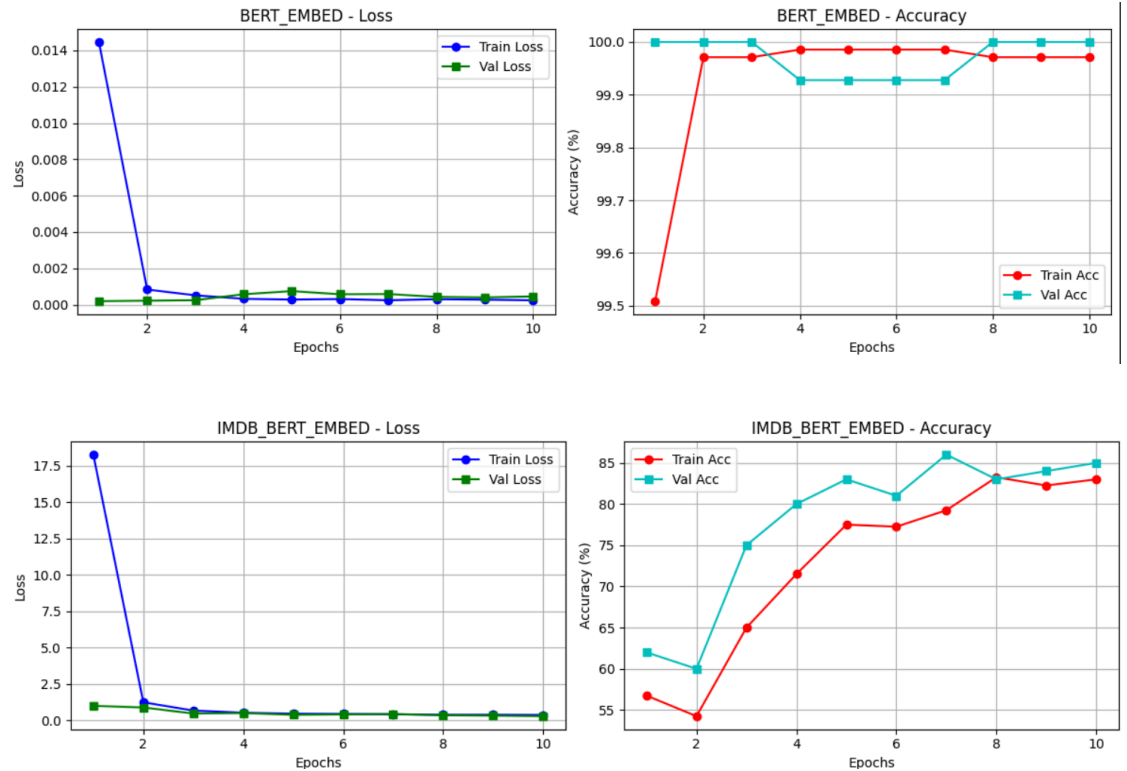Sat Mar 15 2025 17:28:00 GMT+0530 (India Standard Time)

`cont_matrix`

Confusion Matrix (Accuracy: 0.80)
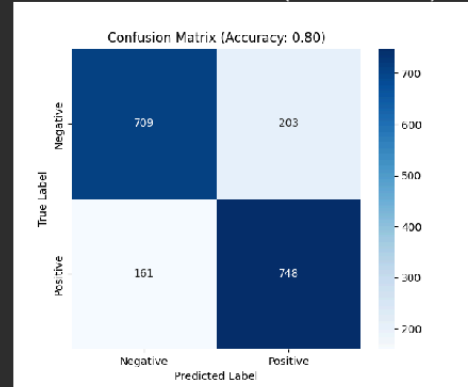
○ Training and validation loss curves.

We can clearly see that the BERT Embeddings aren't a good measure for the training as we get a 768 dimensional vector from BERT model which is then converted to a 10000 dimensional embedding using a layer of neural network, which leads to over fitting.

This could be improved upon by training for lesser epochs as we can see from the loss and accuracy variation curves and also reducing the input layer size in the model architecture could also help reducing the overfitting.