# CS 203: Software Tools & Techniques for AI

## IIT Gandhinagar

## Sem-II - 2024-25

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## Assignment 07

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- **GitHub repository: Team 3**
- **Screenshots:**

### Model architecture

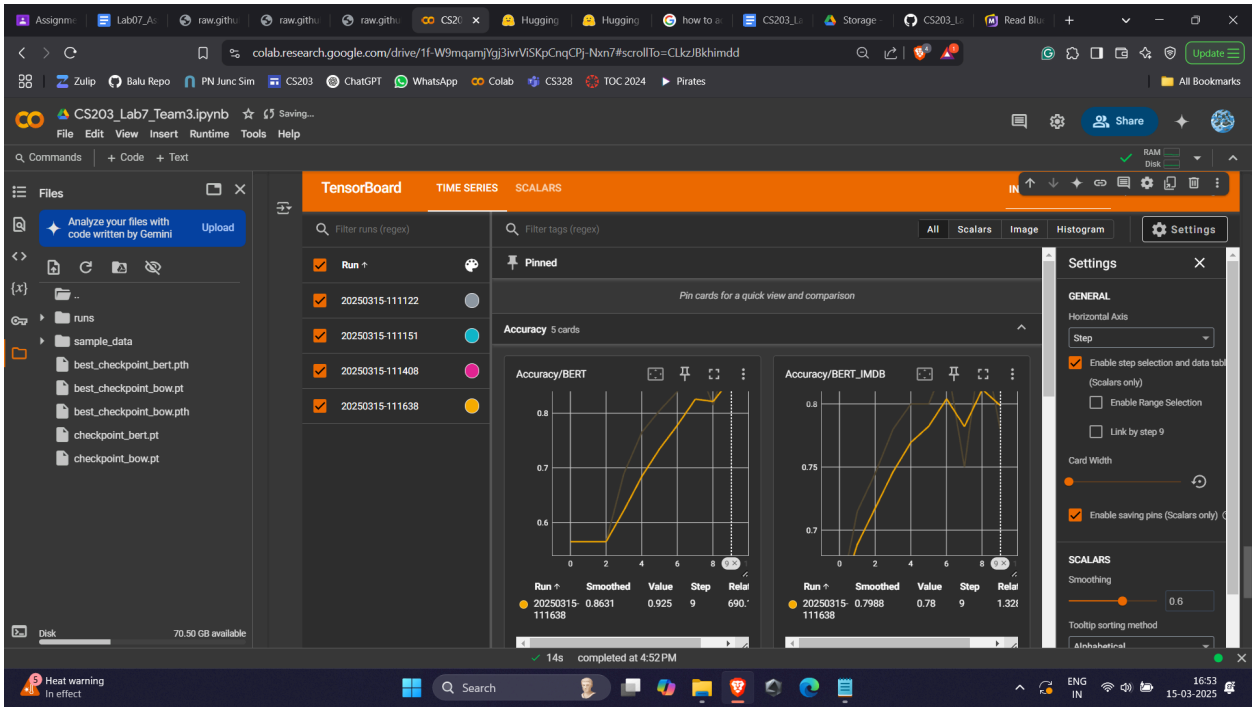
```python
# Define MLP model
class MLP(nn.Module):
    def __init__(self, input_dim):
        super(MLP, self).__init__()
        self.layers = nn.Sequential(
            nn.Linear(input_dim, config.HIDDEN_SIZES[0]), nn.ReLU(), nn.Dropout(0.3),
            nn.Linear(config.HIDDEN_SIZES[0], config.HIDDEN_SIZES[1]), nn.ReLU(), nn.Dropout(0.3),
            nn.Linear(config.HIDDEN_SIZES[1], config.HIDDEN_SIZES[2]), nn.ReLU(), nn.Dropout(0.3),
            nn.Linear(config.HIDDEN_SIZES[2], config.HIDDEN_SIZES[3]), nn.ReLU(), nn.Dropout(0.3),
            nn.Linear(config.HIDDEN_SIZES[3], 2)
        )

    def forward(self, x):
        return self.layers(x)
```

### Hyperparameters

```python
# Hyperparameter configuration
class Config:
    BATCH_SIZE = 32
    EPOCHS = 10
    IMDB_EPOCHS = 10
    LR = 0.001
    HIDDEN_SIZES = [512, 256, 128, 64]
    DEVICE = torch.device("cuda" if torch.cuda.is_available() else "cpu")
    BEST_CHECKPOINT_BOW = "best_checkpoint_bow.pth"
    BEST_CHECKPOINT_BERT = "best_checkpoint_bert.pth"
    LOG_DIR = "runs/" + datetime.datetime.now().strftime("%Y%m%d-%H%M%S")  # TensorBoard Logging
    MAX_FEATURES = 10000
```

# Logged metrics



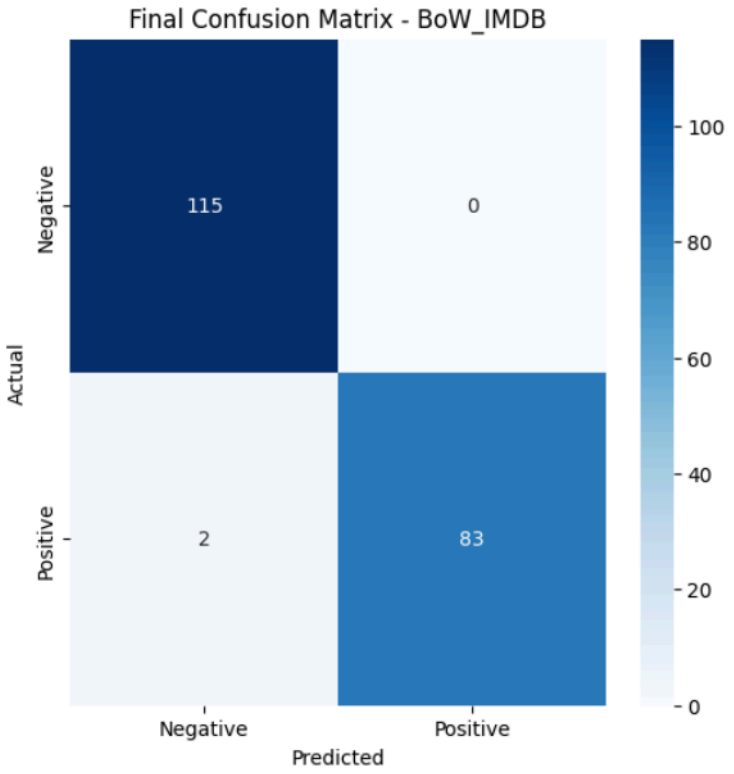

**Final evaluation results**

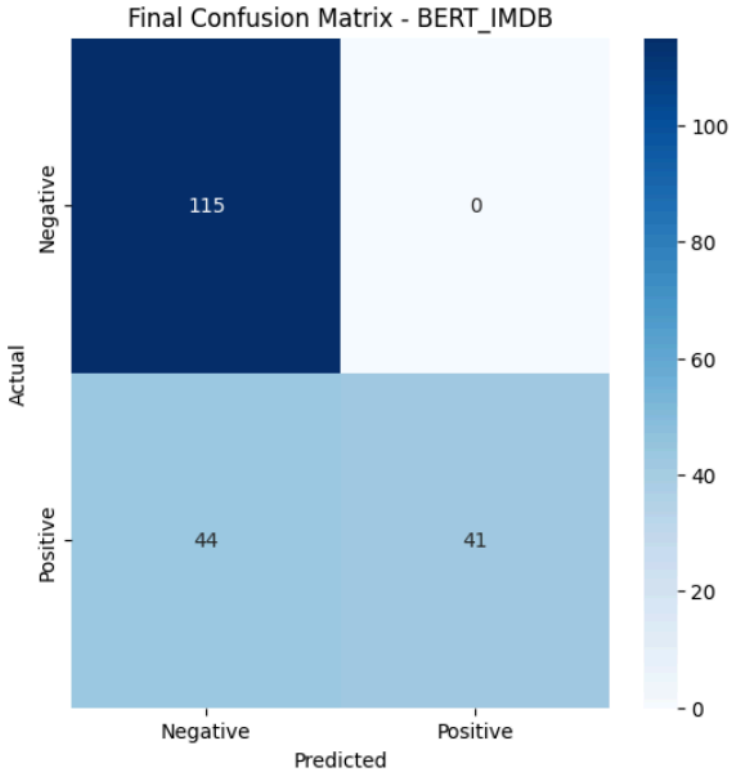
```
=== Loading Best Checkpoints for Transfer Learning ===

=== Fine-tuning BoW Model on IMDB ===
[BoW_IMDB] Epoch 1/10 - Loss: 24.8539 - Validation Accuracy: 0.7100
[BoW_IMDB] Epoch 2/10 - Loss: 9.0282 - Validation Accuracy: 0.7650
[BoW_IMDB] Epoch 3/10 - Loss: 3.1851 - Validation Accuracy: 0.8100
[BoW_IMDB] Epoch 4/10 - Loss: 1.7055 - Validation Accuracy: 0.9050
[BoW_IMDB] Epoch 5/10 - Loss: 0.7807 - Validation Accuracy: 0.9500
[BoW_IMDB] Epoch 6/10 - Loss: 0.5137 - Validation Accuracy: 0.9600
[BoW_IMDB] Epoch 7/10 - Loss: 0.3263 - Validation Accuracy: 0.9500
[BoW_IMDB] Epoch 8/10 - Loss: 0.6015 - Validation Accuracy: 0.9800
[BoW_IMDB] Epoch 9/10 - Loss: 0.1670 - Validation Accuracy: 0.9800
[BoW_IMDB] Epoch 10/10 - Loss: 0.1162 - Validation Accuracy: 0.9900
Best Validation Accuracy for BoW_IMDB: 0.9900
```

```
=== Fine-tuning BERT Model on IMDB ===
[BERT_IMDB] Epoch 1/10 - Loss: 0.7616 - Validation Accuracy: 0.6450
[BERT_IMDB] Epoch 2/10 - Loss: 0.5982 - Validation Accuracy: 0.7150
[BERT_IMDB] Epoch 3/10 - Loss: 0.5879 - Validation Accuracy: 0.7450
[BERT_IMDB] Epoch 4/10 - Loss: 0.5572 - Validation Accuracy: 0.7800
[BERT_IMDB] Epoch 5/10 - Loss: 0.5154 - Validation Accuracy: 0.8000
[BERT_IMDB] Epoch 6/10 - Loss: 0.4719 - Validation Accuracy: 0.8000
[BERT_IMDB] Epoch 7/10 - Loss: 0.4149 - Validation Accuracy: 0.8350
[BERT_IMDB] Epoch 8/10 - Loss: 0.4077 - Validation Accuracy: 0.7500
[BERT_IMDB] Epoch 9/10 - Loss: 0.4759 - Validation Accuracy: 0.8550
[BERT_IMDB] Epoch 10/10 - Loss: 0.4189 - Validation Accuracy: 0.7800
Best Validation Accuracy for BERT_IMDB: 0.8550
```

**Confusion matrix visualization**



## Training and validation loss curves