Movie Poster Classification Using Convolutional Neural Networks

INTRODUCTION:

Multi-label image classification is a challenging task where an algorithm needs to predict multiple labels for a given image. We investigate convolutional neural networks (CNNs) for multi-label image categorization in this research. Using the Keras Functional API, we construct a CNN model and train it on a dataset of pictures from movie posters that correspond with certain genres. Predicting a film's genres from its poster art is the aim.

DATASET AND PREPROCESSING:

The images in the dataset are movie posters that are kept on Google Drive. Using an 80:20 train-test split ratio, we preprocess the dataset by dividing it into training and testing sets. Using TensorFlow's tf.data, we load the image files and convert the labels to arrays. API for datasets. We also implement routines to analyze and process the photos, normalizing their pixel values and converting them to the necessary format (64x64 pixels, float32).

DATA ARCHITECTURE:

We define a CNN model using the Keras Functional API. The model consists of convolutional layers with max-pooling and dropout for feature extraction, followed by dense layers for classification. The output layer uses the sigmoid activation function to predict multiple labels. We compile the model using the Adam optimizer, binary crossentropy loss, and accuracy as the evaluation metric.

TRAINING AND EVOLUTION:

Using a batch size of 64, we train the model for 40 epochs while keeping an eye on the validation loss. To save the optimal model weights and modify the learning rate, we utilize callbacks like Model Checkpoint and Learning Rate Scheduler. Using Matplotlib, we visualize the training and validation accuracy and loss after training. In addition, we use classification metrics like precision, recall, and confusion matrix to assess the model's performance and load the optimal weights from the model checkpoint.

Training and Validation Precision / **Training and Validation Recall**
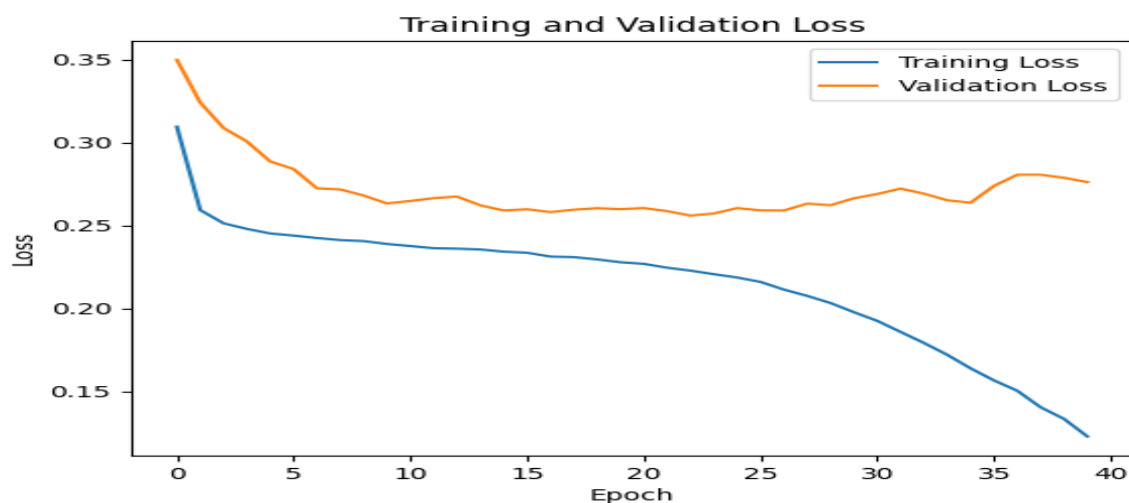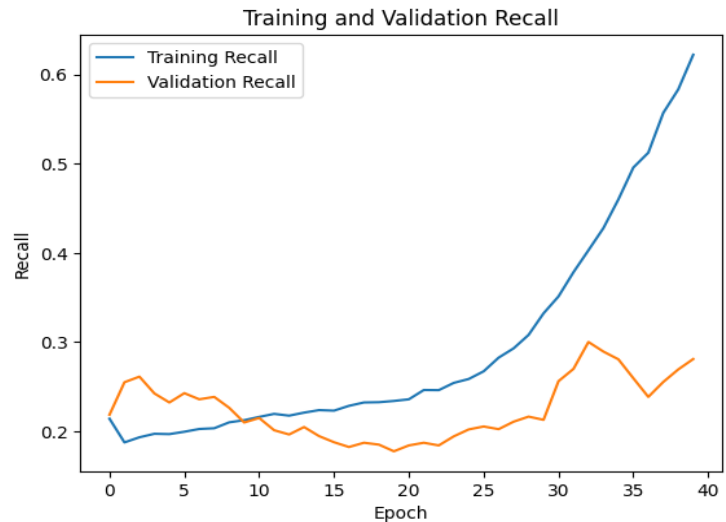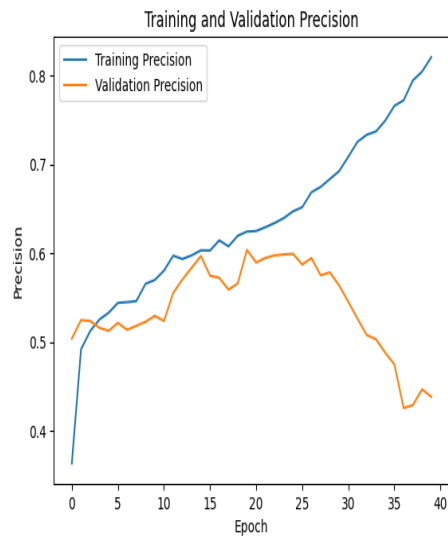
RESULTS AND DISCUSSION:

High accuracy and relatively low loss are achieved by the model on both the training and validation sets, showing promising results. But during training, there are occasional variations in accuracy and loss, which could mean that the model is either overfitting or underfitting. The model's performance in various genres is revealed via the classification report and confusion matrix. The model may need to be further examined and adjusted in order to work better on particular genres or with unbalanced data.

Predicted Genres: Action, Drama, Thriller
Ground Truth Genres: Action, Adventure, Thriller

Predicted Genres: Drama, Horror, Thriller
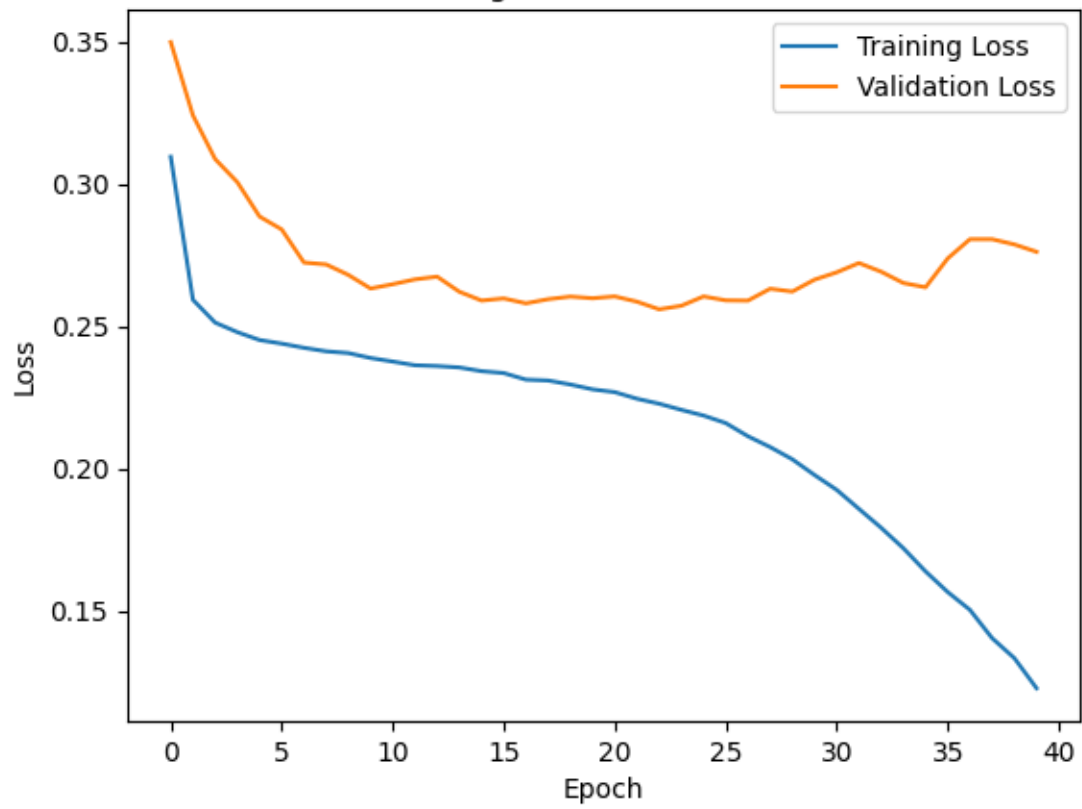Ground Truth Genres: Crime, Drama
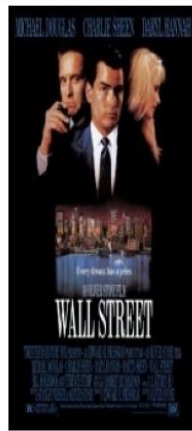
Predicted Genres: Drama, Action, Thriller
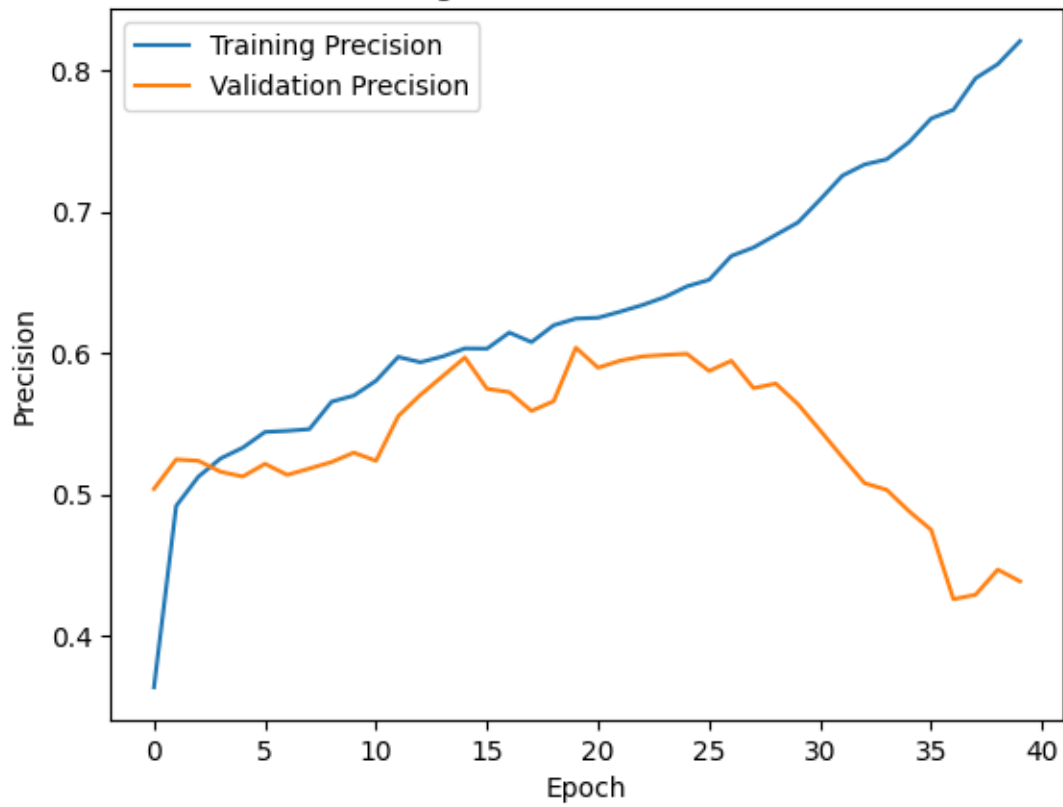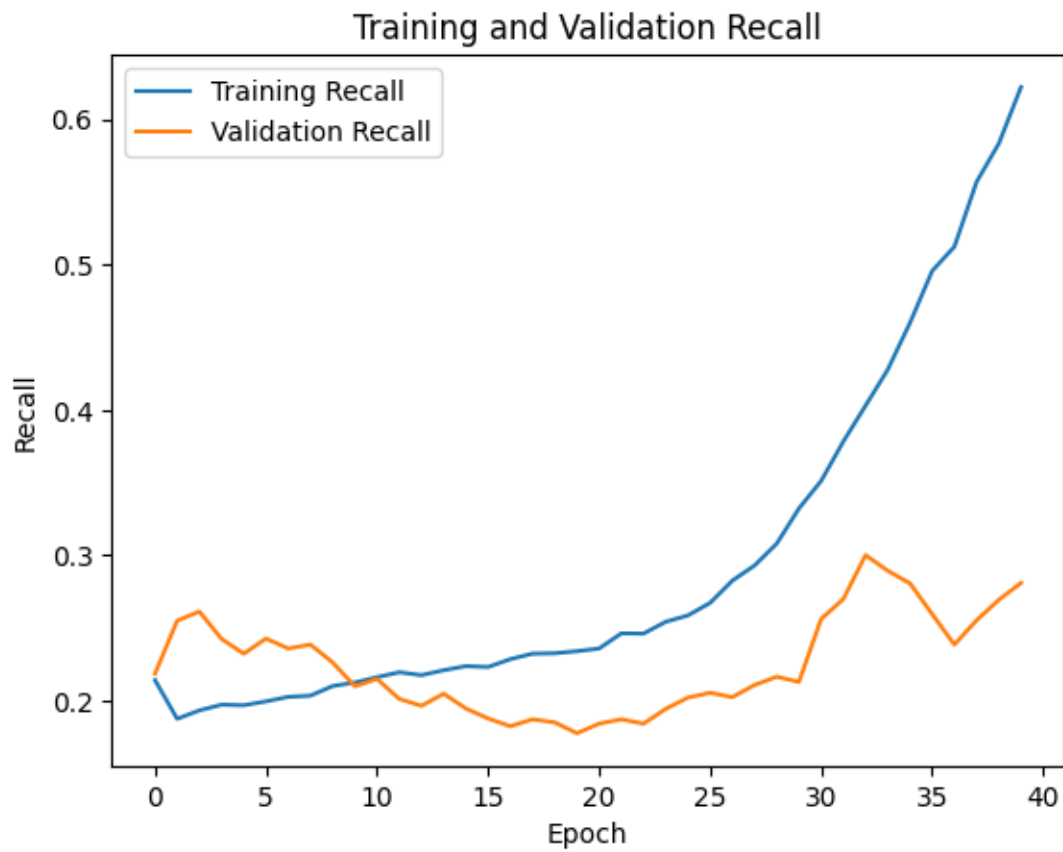Ground Truth Genres: Drama, Romance, Sport

CONCLUSION:

In conclusion, we demonstrate the effectiveness of CNNs for multi-label image classification tasks such as genre prediction from movie poster images. The model shows promise in accurately predicting multiple genres, but further optimization and evaluation are necessary for real-world applications. With additional experimentation and refinement, CNN-based models can be valuable tools for content-based recommendation systems and movie genre classification.

Training and Validation Loss
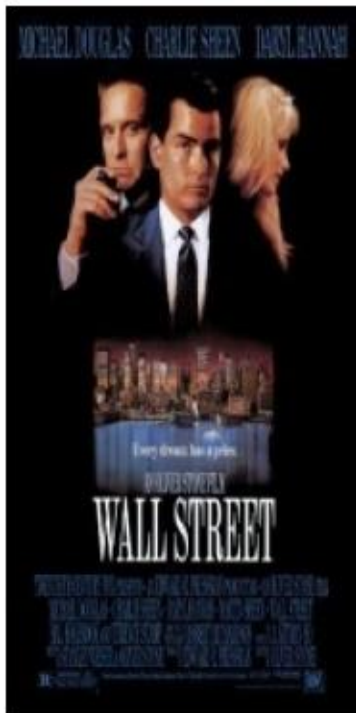

Training and Validation Precision

Training and Validation Recall


```
23/23 [==============================] - 7s 308ms/step
```

Predicted Genres: Action, Drama, Thriller
Ground Truth Genres: Action, Adventure, Thriller

Predicted Genres: Drama, Horror, Thriller
Ground Truth Genres: Crime, Drama

Predicted Genres: Drama, Action, Thriller
Ground Truth Genres: Drama, Romance, Sport

Predicted Genres: Drama, Action, Thriller
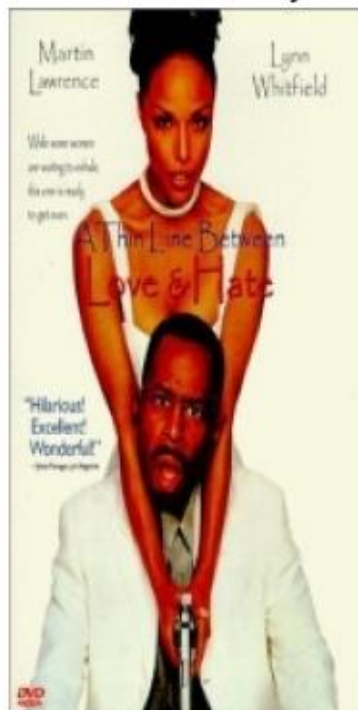Ground Truth Genres: Drama, History, Romance

Predicted Genres: Drama, Crime, Horror
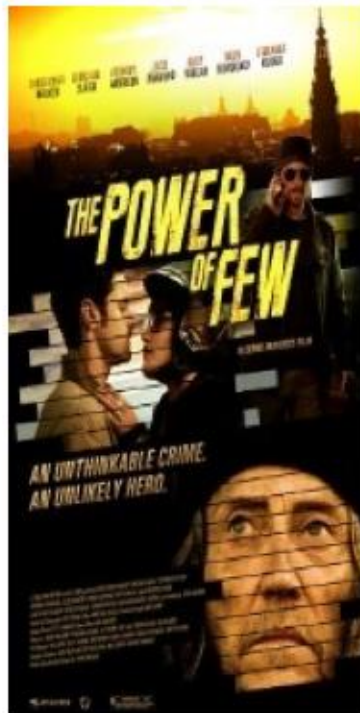Ground Truth Genres: Thriller

Predicted Genres: Comedy, Drama, Romance
Ground Truth Genres: Comedy, Drama, Romance

Predicted Genres: Drama, Action, Romance
Ground Truth Genres: Comedy, Crime, Drama

Predicted Genres: Drama, Crime, Comedy
Ground Truth Genres: Action, Crime, Drama

Predicted Genres: Horror, Drama, Mystery
Ground Truth Genres: Drama, Mystery, Thriller

Predicted Genres: Drama, Documentary, Horror
Ground Truth Genres: Action, Adventure, Fantasy