

MULTIMODEL IMDB ANALYSIS WITH KERAS - REPORT

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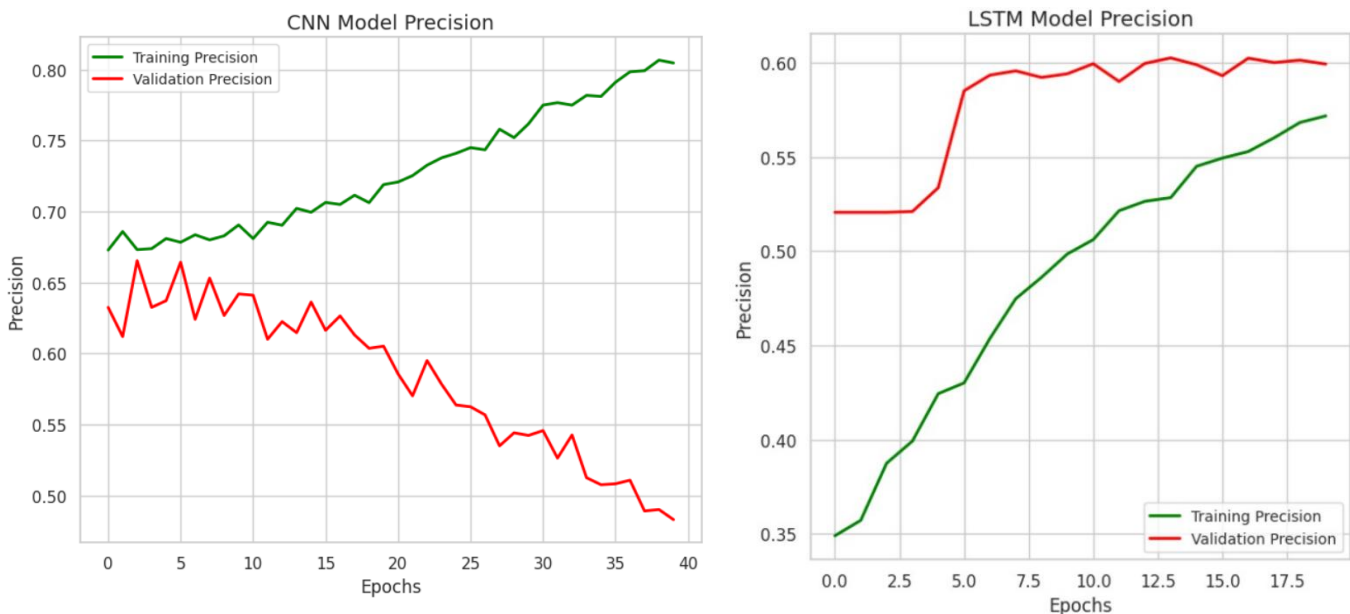
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GITHUB LINK: <https://github.com/SaiTejaBorgam/Applied-Data-science-2>

INTRODUCTION:

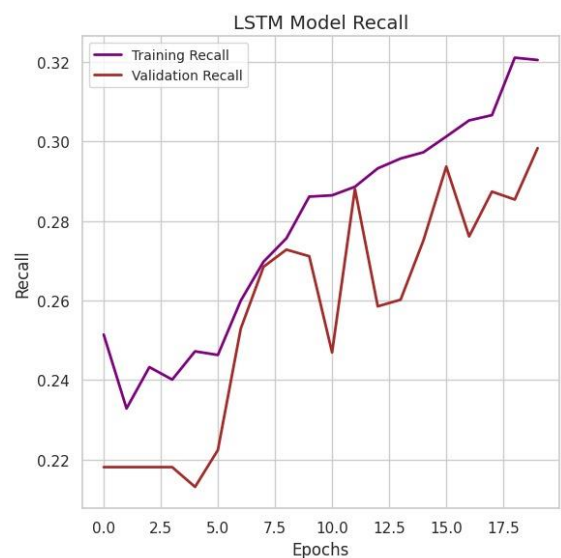
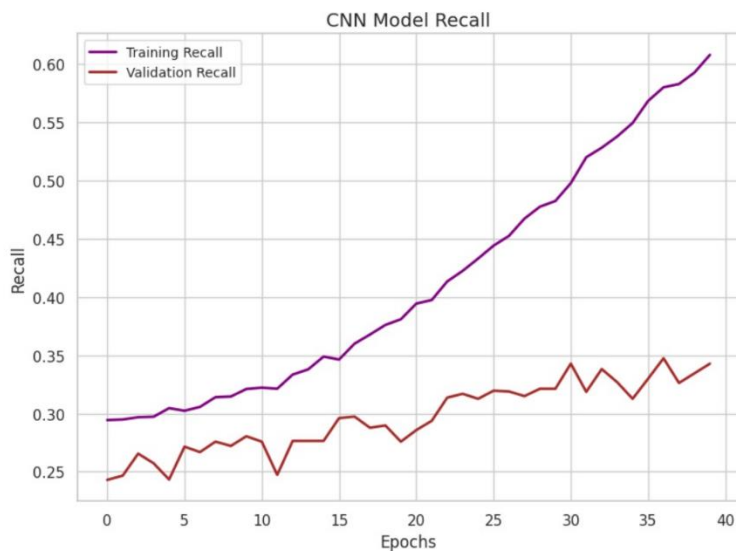
CNN and LSTM are few of the most important and famous model, here those both have been used to predict the genres of the movies from a IMDB movies dataset which contains films overview and film posters and then later compare these both model predictions with the true genres of the films. We train both models independently; our CNN model classifies the film genres by posters and LSTM will classifies them using the overview of the films.

Now let's see each model's training using few plots and then compare both in predicting film genres

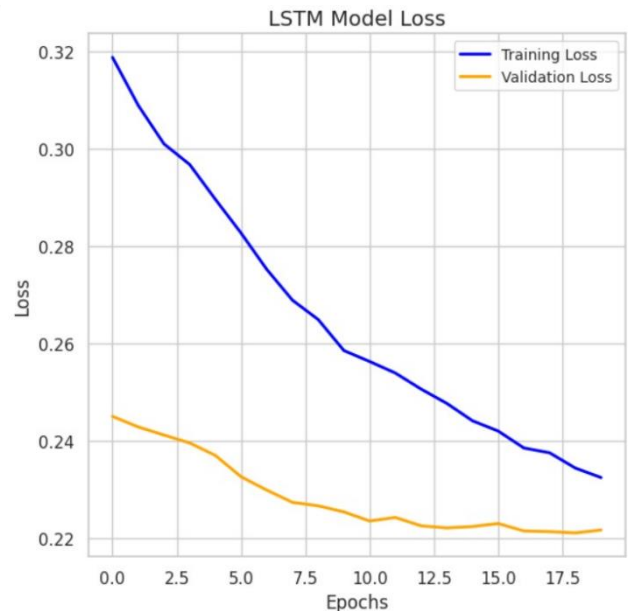
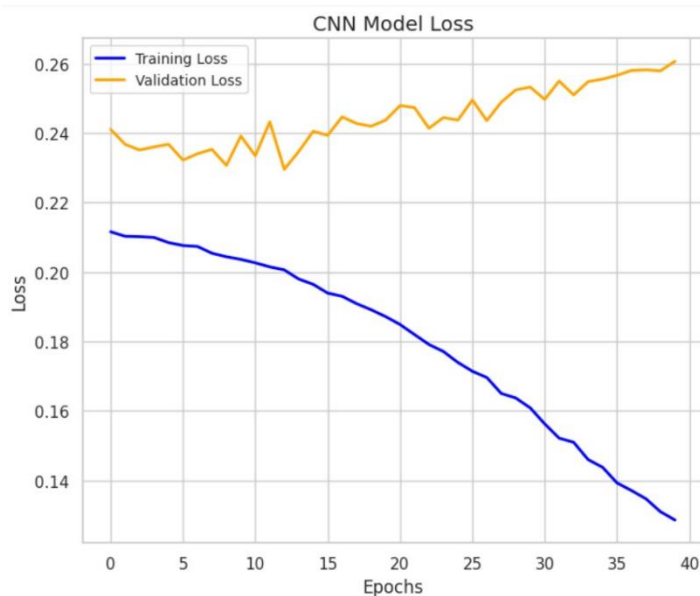


If you look at this precision plot of CNN for the training and validation, you see that training precision increases over the time very well as we move from 0 to 40 epochs indicating CNN learning the training dataset effectively but at the same time there is a continuous decrease in the validation precision which is unseen data suggesting the model is over-fitting. The model performs very well on the trained data with 81% of precision but struggles with the unseen data. On the other hand, LSTM model training precision steadily increases over each epoch reaching 57% from 35% and validation precision also increasing over time reaching to 60% and stabilizes there, validation precision for the LSTM is higher than the training precision, suggesting that the model generalizes better than the CNN as there is a significant drop in validation precision while training precision improves indicates the model is memorizing the training data but failing to generalize. So, the main difference between two models on precision can be said as high training precision but declining validation precision for CNN and for LSTM it has moderate precision but stable validation.

In the same way if we observe Recall plots of both models, the training recall of the CNN model starts at 30% and reaches more than 60% after training but the validation fluctuates around 30% reaching maximum of 35%, the huge gap in the training and validation recall indicates over fitting over training data, model learns well from the training data well but might struggle to generalize.



For LSTM there is gradual increase in both training and validation both reaching 32% and 30% respectively indicating model is identifying more true positives as it shows more balanced increase in both training and validation recall, indicating less overfitting and better generalization.



For CNN model the training loss gradually decreases after the model is being training for 40 epochs as precision and recall increases gradually which we saw in previous plots which is good but if you see the validation loss is increasing over time, but in the LSTM model there is a steady decrease in both training loss and validation loss and they reach almost around same point at the end of the LSTM last epoch. CNN model is clearly over fitting the dataset as there is a significant difference between training and validation loss and LSTM has very less over fitting of the data.

CNN is good at training data but overfitting few unseen data on the other hand LSTM is reaching less precision and less recall percentages but it's not overfitting. By this we can see that CNN can predict most of the trained data correctly but might face difficulty in identifying all relevant instances in the validation set. But the LSTM generates fewer predictions which might be accurate but might not predict all the data, this is evident from its precision and recall values.

CNN Strengths: High training precision and recall

LSTM Strengths: Balanced performance between training and validation and better generalization

CNN Weaknesses: Significant overfitting and poor generalization to validation data

LSTM Weaknesses: Precision and recall values are lower compared to CNN

Poster for Film 3027



Overview for Film 3027:

A young man in a small Midwestern town struggles to care

Ground Truth Genres: ['Drama', 'Romance']

Top-3 CNN Predictions: ['Drama', 'Comedy', 'Romance']

Top-3 LSTM Predictions: ['Drama', 'Comedy', 'Romance']

Poster for Film 3780



Overview for Film 3780:

John Riley, an Irish immigrant soldier recruited in the A

Ground Truth Genres: ['Action', 'Drama', 'History']

Top-3 CNN Predictions: ['Drama', 'Romance', 'Action']

Top-3 LSTM Predictions: ['Drama', 'Comedy', 'Action']

Poster for Film 1098



Overview for Film 1098:

When the leader of a team of scientists volunteers to be t

Ground Truth Genres: ['Horror', 'Sci-Fi']

Top-3 CNN Predictions: ['Drama', 'Thriller', 'Horror']

Top-3 LSTM Predictions: ['Action', 'Drama', 'Thriller']

Poster for Film 161



Overview for Film 161:

After the death of one of his friends, a writer recounts a

Ground Truth Genres: ['Adventure', 'Drama']

Top-3 CNN Predictions: ['Drama', 'Adventure', 'Comedy']

Top-3 LSTM Predictions: ['Drama', 'Comedy', 'Crime']

Poster for Film 2792



Overview for Film 2792:

A young soprano becomes the obsession of a disfigured and murd

Ground Truth Genres: ['Drama', 'Musical', 'Romance']

Top-3 CNN Predictions: ['Drama', 'Thriller', 'Mystery']

Top-3 LSTM Predictions: ['Drama', 'Comedy', 'Romance']

Poster for Film 2482



Overview for Film 2482:

Young boy's dream to become

Ground Truth Genres: ['Action', 'Drama', 'Sport']

Top-3 CNN Predictions: ['Drama', 'Action', 'Adventure']

Top-3 LSTM Predictions: ['Drama', 'Comedy', 'Romance']

Here we can see that for these movies for the film no. 3027 the genres are Drama and Romance, both of our models predicted them and also an additional genres comedy is predicted by both in their top 3 predictions, here we can see that models are performing well on this dataset, but when we see the film 1098 the true genres are horror and sci-fi, CNN predicted Horror correctly but in its 3rd genre while drama and thriller are its top 2 predictions showing the overfitting of the data, on the other side LSTM failed to predict any genre of the film in top 3 showing its weak training metric values. For the film 2792 CNN just predicted one out of three genres correctly which is Drama but failed to predict musical and romance but LSTM performed better for this instance by predicting both drama and romance indicating LSTM's better generalization on textual data. But both the models failed to predict music genre

CRITICAL ANALYSIS OF THE PREDICTIONS MADE BY CNN AND LSTM

CNN tends to overfit the visual features of the posters, making it less reliable for less visually distinctive genres while LSTM generalizes better across a range of films by relying on descriptive context but may miss genres requiring visual interpretation.

CNN might struggle with genres like Sci-Fi or Music which might not visually interpret the genre correctly but works well with genres such as Action, Thriller which are visually more predictable. Text context helps LSTM to predict genres such and Drama, Romance well but might predict comedy and drama genre more frequently which we can see in above examples

CNN can be good for predicting **Visually-Driven genres** such as Action, Thriller, Horror because color, design, text, and graphical visuals associated with posters plays important role in training it

LSTM can be good at predicting **Context-Driven genres** such as Drama, Romance, Comedy because context, keywords and relationships in the movie overview plays important role in training it

Overall, both models struggle to predict subtle genres like Sci-Fi, Music and Sport