

# Genre Prediction from Movie Posters: Model Analysis and Recommendations

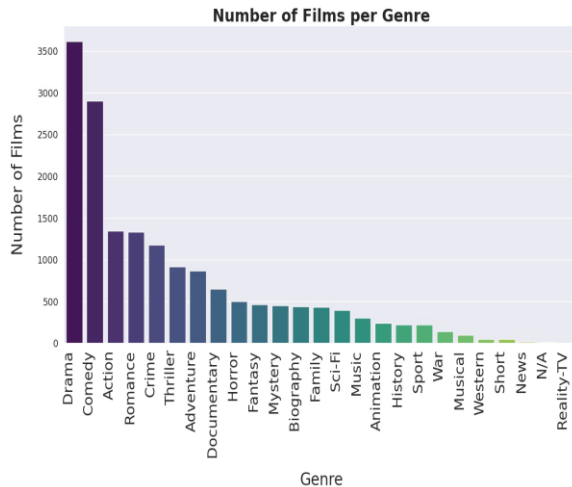
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## 1. Introduction:

In this report, we conduct a thorough analysis of a Convolutional Neural Network (CNN) architecture designed for genre prediction from movie posters. Our evaluation encompasses various aspects including data imbalance, model performance, overfitting indicators, classification accuracy, and critical assessment.

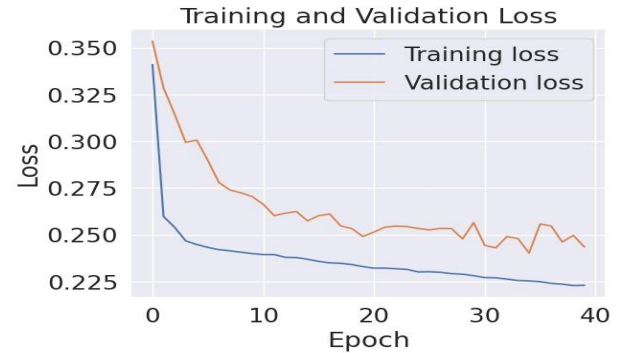
## 2. Data Evaluation:

The dataset exhibits significant class imbalance, with the Drama genre being predominant while others, such as News, are underrepresented or absent. This inherent imbalance can introduce biases and hinder the model's ability to generalize effectively.

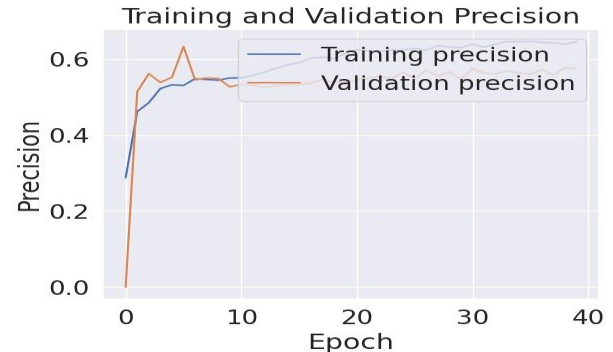


## 3. Model Evaluation:

**Training Loss:** While training loss displays a consistent downward trend, validation loss exhibits fluctuations and minor increases over epochs, suggesting challenges in generalization to new data.



**Precision and Recall:** Precision and recall metrics improve on the training set, albeit with some disparity, indicating enhanced detection of true positives. However, during validation, both metrics fluctuate considerably, with recall values being notably lower and erratic, hinting at potential overfitting or dataset dissimilarity.



**Overfitting Indicators:** The disparity between improving training metrics and fluctuating validation metrics raises concerns about overfitting, wherein the model may be learning patterns specific to the training data, thus compromising its ability to generalize.

**Classification Performance:** The model demonstrates a tendency to predict Drama more frequently, likely influenced by the imbalanced dataset. Genres with fewer samples, such as Music and Sci-Fi, suffer from incorrect predictions, reflecting the impact of data scarcity on model performance.



Truth genres:  
['Comedy', 'Drama', 'Romance']

Predicted genres:  
['Romance', 'Drama', 'Comedy']



Truth genres:  
['Drama', 'Mystery', 'Romance']

Predicted genres:  
['Horror', 'Thriller', 'Drama']



Truth genres:  
['Crime', 'Documentary', 'Mystery']

Predicted genres:  
['Crime', 'Thriller', 'Drama']



Truth genres:  
['Comedy', 'Music']

Predicted genres:  
['Romance', 'Comedy', 'Drama']



Truth genres:  
['Documentary', 'Family']

Predicted genres:  
['Thriller', 'Action', 'Drama']

## 4. Critical Evaluation:

The model's architecture exhibits overfitting issues, as evidenced by the fluctuating validation loss. Moreover, dataset imbalance exacerbates biases, resulting in erroneous predictions, particularly for genres with limited representation.

### Area of Improvement:

**Data Augmentation:** Employ techniques like image rotation, scaling, and flipping to enhance dataset diversity, mitigate overfitting, and improve generalization.

**Class Balancing:** Address dataset imbalance through oversampling and class weights to achieve more balanced predictions across genres.

**Transfer Learning:** Leverage pre-trained CNN models such as ResNet or VGG to enhance performance with limited training data, capturing intricate features through fine-tuning.

## 5. Conclusion:

Improving genre prediction from movie posters necessitates addressing dataset biases, mitigating overfitting, and fine-tuning hyperparameters. Continuous refinement and evaluation are imperative for achieving accurate and unbiased predictions.

This report provides valuable insights into the strengths and weaknesses of the current model architecture and offers actionable recommendations for enhancement.