

Deep Learning Classification – Model Overview

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Springboard Data Science Career Track

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Introduction of Problem & Objective

- Problem
 - Family Friendly Productions, a recent 2-year startup movie production company, saw a loss of profits in movie revenue in the past 2023 financial cycle. This decline is potentially caused by lingering feelings from the COVID-19 as well as not capitalizing or marketing quick enough to their more avid movie goers.
- Objective: Potential strategy to implement in the 2024 financial year is to design a deep learning neural network image classification model to predict future Family Friendly Production movie genres based on the movie posters before the movies hit market.

Current Model Status & Improvement

Keras Image Classification Model:

- F1 Score Micro: 0.02
- ROC AUC Adventure: 0.503
- ROC AUC Action: 0.504
- ROC AUC Biography: 0.506
- ROC AUC Comedy: 0.501
- ROC AUC Documentary: 0.504

*If the model metrics above were closer to 1, this would indicate a strong performing model

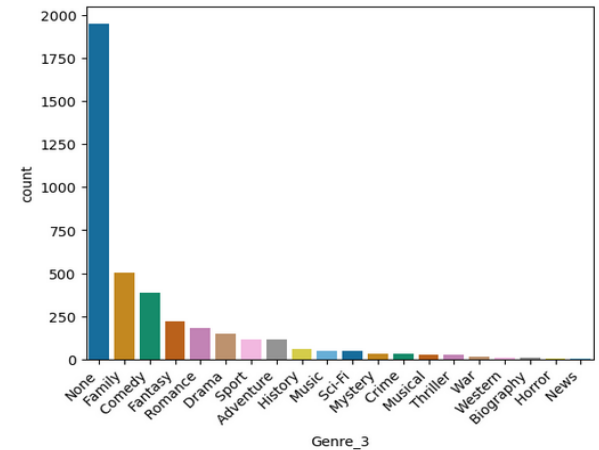
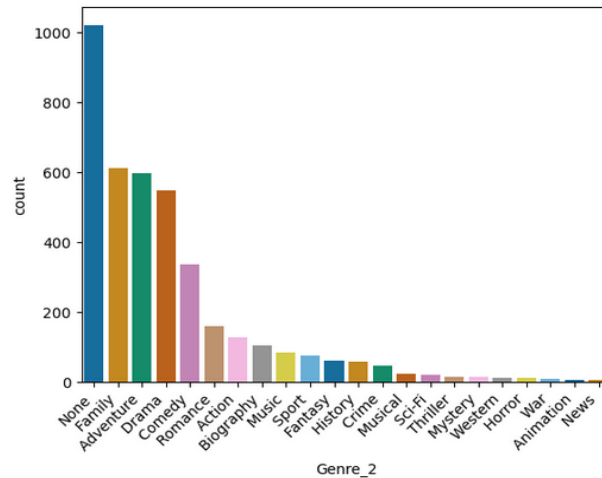
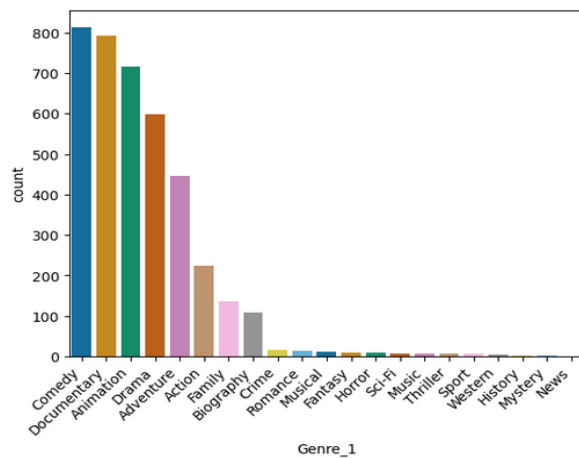


Steps to Improve:

- Enlarge sample size
- Increase computational resources (ex. Cloud)
 - Validate with standard but computationally intensive approach
- Optimize model configuration
- Expose more parameters for the model
- Test other predictive models

Assessing Genre Class

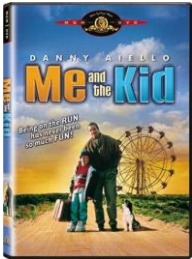
- G and PG Movies from 1990 – 2023 retrieved through paid IMDb API
- 21 Unique Genre Classes retrieved aside from 'None'



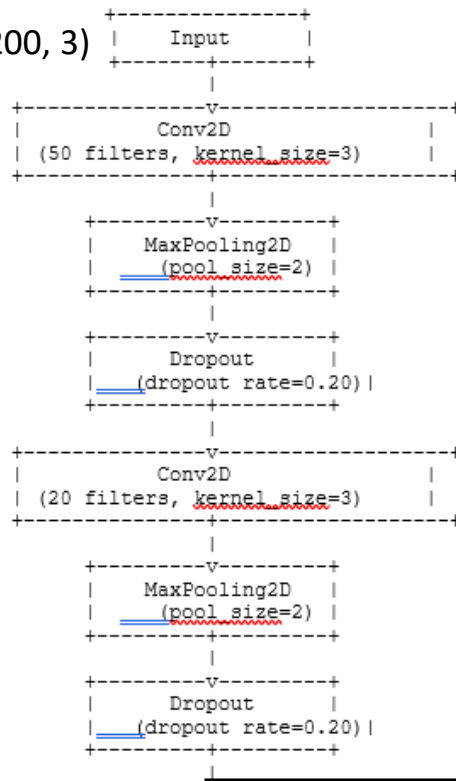
Clear imbalance of genres with the current dataset, so the model has a hard time learning to predict the different genres!

Image Classifier Model Build

RGB Input Array: (200,200, 3)



Model learns the different features of the image after each convolutional layer and then MaxPooling retrieves the most important aspects of the image



*Model layer overview provided by chatGPT

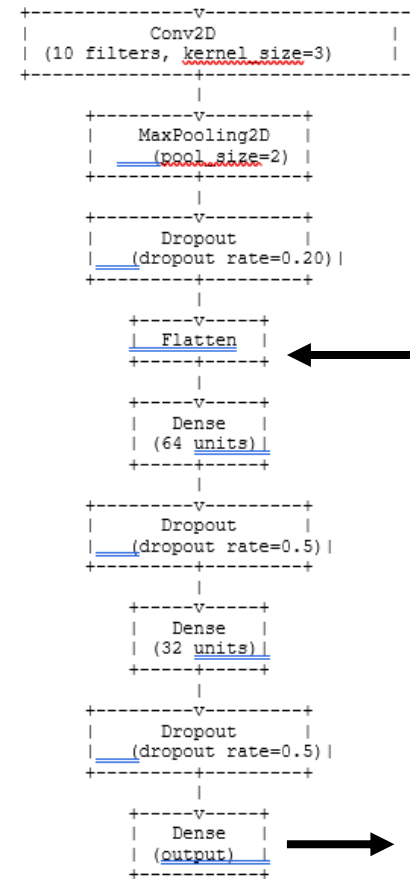


Image then is converted to a 1D array in where in the subsequent layers the model learns the features of this 1D array and then makes its prediction of genres of movies in output layer

Classification of Genre Class(es):
Comedy, Crime, Drama

Image Classifier Model Results

- 80% of the data used for training, 20% used for testing
- Model validated with slightly less computationally intensive approach
- Best parameters: SGD optimizer and 'relu' activation function
- F1_Score micro indicates how well (from a scale of 0 to 1) the model is able to predict genres. ROC AUC tells how well is the model able to predict the different genres compared to just a 50/50 random guess.

```
param_grid = {  
    'activation': ['relu', 'tanh', 'linear'],  
    'optimizer': ['SGD', 'Adagrad', 'Adam'],  
    'learning_rate': [0.001],  
    'epochs': [10],  
    'batch_size': [10]  
}  
*Current model GridSearchCV Param Grid
```

*Again, if the below model metrics were closer to 1, this would indicate a strong performing model

Model Name	F1_Score Micro	ROC_AUC_ Adventure	ROC_AUC_ _Action	ROC_AUC_ Biography	ROC_AUC_ Comedy	ROC_AUC_Documentary
Keras Image Classification Model	0.0186766	0.5028001	0.5041314	0.5062588	0.5012803	0.5037350

*Table Displaying Model Results f1_score and respective ROC AUC for few genres

Model Results Key Takeaways

- F1_score of 0.25 means there are improvements to be made prior to deploying the model to production
- Reasons for model underperformance:
 - Not enough different genre data for the model to learn
 - Overall configuration (layers, filters) of the model needs fine tuning
 - Need to validate the model's effectiveness with the standard but more computationally intensive approach
 - More parameters need to be tested to get best performing model (learning rate, activation functions, model optimizers, etc.)

Future Improvements

- **Increase** sample size of movie genres
 - Include PG-13 movies and movies dating from 1980s to 2024
- **Increase** computational resources (ex. Cloud computing)
 - Perform the standard but more computationally intensive approach to validate the model
 - Optimize the overall configuration of the model
 - Expose current model to more parameters (learning rate, activation functions, and model optimizers)
- **Develop and Test** other predictive models based on IMDb dataset

Summary

- Current Keras Image Classification model requires improvements before deploying to production.
- Suggested improvements include:
 - Enlarge movie genre sample size
 - Include PG-13 movies and movies from 1980s to present
 - Increase computational resources (ex. Cloud computing)
 - Perform the standard but more computationally intensive approach to validate the model
 - Optimize overall model configuration
 - Expose current model to increased parameters (learning rate, model optimizer, activation functions, etc.)
 - Develop and Test other predictive models based on IMDb dataset

Thank You! Questions?

https://github.com/tpoozhikala/IMDB_Classification