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| TOI Applied Mathematics |
| Deep Learning Minor |
| Assignment 2 |
| Inholland, 1 februari 2024 |

in tijden van social media.

Lectoraat Jeugd en Samenleving, 2020

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# Learning Objectives

* Preparing an image dataset for multi-label classification
* Designing a CNN-based model for multi-label classification
* Choosing correct evaluation metrics during compilation & evaluation of the model

# Problem Statement

Movies can be categorized into various genres, such as action, thriller, and comedy. The goal of this assignment is to create a model that can predict the genres of movies from the movie poster. A movie can belong to more than one genre, for example both action and comedy. For this assignment, students must predict a movie's multiple labels (genre) using its poster image. The dataset they’ll be using contains poster images of several movies. Below are a few posters from the dataset.



Image 1: movie collage

Dataset   
The dataset can be downloaded from here [Movie Genre Classification (ccu.edu.tw)](https://www.cs.ccu.edu.tw/~wtchu/projects/MoviePoster/index.html). Students must develop a neural network that inputs a movie poster and outputs its genres.

# Report format & rubrics

The report is expected to have the following sections.

Step 1: Introduction to the dataset                                                             
Explain the dataset, files, shape, and size of the dataset.

Step 2: Preprocessing/Setting up the dataset                                           
The dataset cannot be used without preprocessing; first, it must be cleaned. Explain the steps taken in preprocessing, e.g., choosing the number of movies, resizing, scaling, making a CSV file for labels, etc. How much data is kept for training, validation, and testing?    
Step 3: Designing a Model                                                           
You have to design two models; one is custom-built, and the other is pre-trained (transfer learning).  The optimizers, number of filters, window size, pooling, activation functions, and other hyperparameters should be discussed with the choices made. You should argue the choice of the pre-trained model (you have made) and how it will be used, e.g., for feature extraction or fine-tuning.

Step 4: Hyperparameter Tuning                                                                
Discuss the hyperparameters used during compilation and fitting of the model with the choices you have made. You may need to tune hyperparameters to get a better model.    
Step 5: Diagnostics Curves                                                                                      
This section should have plots based on the metrics you used during compilation and fitting. It would help if you plotted training and validation curves to show the difference.

Step 6:  Models Performance                                                                                
This section should discuss the model's performance on test images. Different evaluation metrics are used with rationale to reflect on the models' performance.

## Analytic Rubric for Multi-Label Classification of Movie Posters

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| Criteria | Poor 0 | Insufficient 1 | Sufficient 2 | Good 3 | Excellent 4 |
| Problem Definition | The problem statement is unclear or absent, lacking a clear definition of the multi-label classification task for movie posters. | The problem statement is vaguely defined, with insufficient clarity on the objectives and scope of the multi-label classification task. | The problem is adequately defined, specifying the objectives and scope of the multi-label classification task for movie posters. | The problem statement is well-defined, providing clear objectives and a comprehensive scope for the multi-label classification task. | The problem definition is exceptional, demonstrating a deep understanding of the challenges and nuances of multi-label classification for movie posters. |
| Data Collection and Preprocessing | Data collection and preprocessing steps are either absent or poorly executed, making a dataset unsuitable for model training. | Limited data collection and preprocessing, with insufficient steps taken to ensure the quality and relevance of the dataset for training. | Adequate data collection and preprocessing, ensuring a reasonably clean and relevant dataset for training the multi-label classification model. | Good data collection and preprocessing, demonstrating a thorough understanding of the dataset’s characteristics and requirements for successful training. | Excellent data collection and preprocessing, with meticulous attention to detail, addressing challenges and ensuring a high-quality dataset for model training. |
| Model(s) Architecture and Training    (Custom-Model) | The custom-built model architecture choice is inappropriate or not mentioned, and the training process is poorly described or executed. | The custom-built model architecture is mentioned but unsuitable for the task, and the training process lacks clarity or is incomplete. | The custom-built model architecture is appropriate for the task, and the training process is adequately described but with room for improvement. | A custom-built model architecture is described, and the training process is well-documented, demonstrating good understanding and execution. | An excellent choice of custom-built model architecture is justified, and the training process is thorough, reflecting a deep understanding of multi-label classification and model training. |
| Model(s) Architecture and Training    (Pre-trained Model) | The pre-trained model architecture choice is inappropriate or not mentioned, and the training process is poorly described or executed. | The pre-trained model architecture is mentioned but unsuitable for the task, and the training process lacks clarity or is incomplete. | The chosen pre-trained model architecture is appropriate for the task, and the training process is adequately described but with room for improvement. | A well-chosen pre-trained model architecture is described, and the training process is well-documented, demonstrating good understanding and execution. | An excellent choice of pre-trained model   architecture is justified, and the training process is thorough, reflecting a deep understanding of multi-label classification and model training. |
| Evaluation Metrics and Results | Inappropriate or absent evaluation metrics and results are poorly presented or incorrectly interpreted. | Basic evaluation metrics are mentioned, but there’s a lack of variety or understanding of the choice, and results are presented with limited clarity. | Adequate selection of evaluation metrics and results are presented clearly, but there may be minor gaps in interpretation or visualization. | A well-thought-out choice of evaluation metrics and results are presented accurately, with clear interpretation and appropriate visualizations. | Excellent selection of evaluation metrics, with a comprehensive understanding of their relevance, and results are presented with exceptional clarity, accompanied by insightful visualizations. |

# Grading

The grade for this assignment is computed as follows: *grade = 1+0.45\*points.* At most, one criterion can be assessed as insufficient or poor to get a passing grade. If this condition is not met but the score is still 10 or higher, the grade will be 5.0.