Automatic Essay Scoring

Abstract— **A recurrent neural network method for determining the relationship between an essay and its grade. Using Long-Short Term Memory networks to represent the meaning of texts to demonstrate that a fully automated framework is able to achieve results**

INTRODUCTION

The use of specialised computer systems to award grades to essays produced in an educational setting is referred to as automated essay scoring (AES). It is an application of natural language processing. Its goal is to sort a vast number of textual elements into a small number of discrete categories that correspond to various grades, such as 1 to 5. It can be considered a problem of statistical classification.

MODEL

The model architecture consists of 2 Long Short Term Memory (LSTM) layers with a Dense Output Layer/ The final layer of the model uses ReLU activation function. 5-Fold Cross Validation is used to train the model on the dataset and the average of all five folds is taken.

APPROACH

The system is built on recurrent neural networks, which can effectively encapsulate the information needed for essay evaluation and learn complicated patterns in data via non-linear neural layers. The link between the essays and evaluator ratings is discovered using machine learning techniques.

Recurrent neural networks have the potential to learn more complicated patterns from input and are theoretically more powerful. **Long short-term memory units** are recurrent units that have been improved to deal more efficiently with diminishing gradients. The information required for the final representation can be learned by LSTMs to be remembered or forgotten.

Over the training data, we apply the **RMSProp** optimization approach to minimise the **mean squared error** (MSE) loss function. In order to minimise overfitting, we also utilise **dropout**

regularisation. We train the neural network model for a predetermined number of epochs and track its performance on the development set after each one.

TOOLS & FRAMEWORKS USED

➔ **Tensorflow** is used as a backend framework with **Keras** as the interface.
➔ Loss is measured using **Mean Squared Error(MSE)** which is calculated as the average of the squared differences between the predicted and the actual values.
➔ Optimizer used is **RMSprop** which is a gradient based optimization technique used in training Neural Networks. It uses an adaptive learning rate instead of treating the learning rate as a hyperparameter.
➔ Metrics used for evaluation are **Mean Absolute Error(MAE)** which is a measure of errors between paired observations expressing the same phenomena.
➔ **nltk** is used for modeling of text. It provides good tools for loading and cleaning text.
➔ **scikit-learn** is a library in Python that provides many unsupervised and supervised learning algorithms.

FLOW OF THE NOTEBOOK

1. Importing Libraries and Dataset
2. Data Exploration
3. Feature Engineering
4. Topic Modelling
5. Building and Training the Model
6. Submission

REFERENCES

[1] A Neural Approach to Automated Essay Scoring, Kaveh Taghipour and Hwee Tou Ng.
[2] Automatic Text Scoring Using Neural Networks, Dimitrios Alikaniotis, Helen Yannakoudakis and Marek Rei.