JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY
SEC-62, NOIDA

MINOR PROJECT -1

(PROJECT SUMMARY)

TOPIC- "Evaluation Of Subjective Short Answers"

SUBMITTED TO:

1.Dr. Dipti Tripathi
2.Dr. Indu Chawala
3.Prof. Kashav Ajmera
4.Prof. Kirti Jain
5.Dr. Meenal Jain

SUBMITTED BY:

1.Ashutosh Pradhan - 21103242
2. Aman Upadhyay - 2110363
3. Ajit Kumar - 21103317

Under the supervision of : Dr. Shikha Jain

MOTIVATION BEHIND THE PROJECT

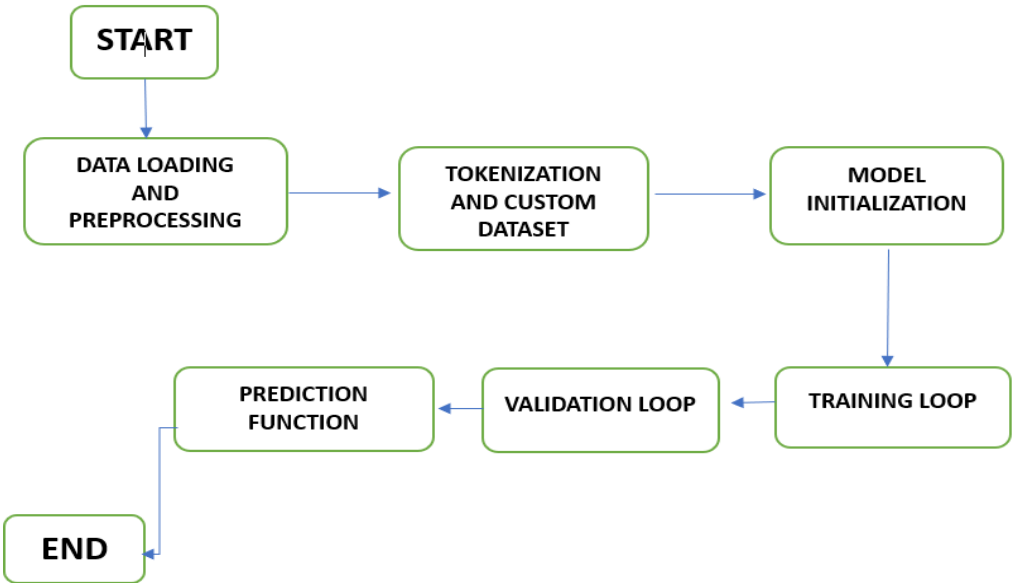
The existing method of evaluating subjective responses in scientific education poses several challenges that our project seeks to address. The manual assessment of these responses is not only time-consuming but also demands substantial resources. Teachers, who play a crucial role in imparting knowledge, find themselves spending a disproportionate amount of time grading answer sheets rather than engaging directly with their students. This creates a significant imbalance in the allocation of their time and energy.

The motivation behind our project is to bridge these gaps and enhance the educational experience. By introducing intelligent algorithms capable of analyzing subjective responses based on content and writing style, we aim to provide a more accurate, consistent, and efficient evaluation process. This not only addresses the time and resource constraints faced by educators but also ensures a fair and objective assessment for students.

TYPE OF PROJECT

- Development cum research project

FLOWCHART



Research Paper Analysis

[1] A machine learning-based method is proposed for evaluating subjective answers, involving tasks like keyword matching, answer length, and semantic analysis.

[2] An innovative approach to evaluating answer scripts using natural language processing techniques is introduced. The algorithm can quickly and accurately assess answer scripts, eliminating biased evaluations and manual checking.

[3] Automatic subjective answer evaluation using Natural Language Processing and Optical Character Recognition techniques is discussed. Various NLP approaches are reviewed, emphasizing the importance of finding word and sentence similarity in answer evaluation.

[4] The proposed system's two modules are described: preprocessing and evaluation. Text extraction and cleaning are performed in the preprocessing module, while the evaluation module employs machine learning algorithms for scoring subjective answers, utilizing techniques like Natural Language Processing, Latent Semantic Analysis, and Naive Bayes.

[5] A novel approach to scoring subjective papers using various machine learning techniques is proposed, addressing challenges related to insufficient understanding and acceptance of data in subjective paper evaluation.

TECH USED

Software Used Google Colaboratory, Vs Code, GitHub
Programming Language Python, JavaScript
Libraries/Frameworks Used:

- **Transformers(For Bert Model)**: Provides pre-trained models and tokenizers for natural language processing tasks.
- **Scikit-Learn**: Offers tools for machine learning, including data preprocessing and evaluation metrics.
- **Pandas**: A data manipulation library for working with structured data.
- **Tqdm:** A library for adding progress bars to loops for better user experience.
- **Seaborn:** A data visualization library based on matplotlib for creating informative and attractive statistical graphics.
- **Flask , NodeJS , Express**

METHODOLOGY/ ALGORITHM DESCRIPTION

BERT (Bidirectional Encoder Representations from Transformers) is considered a revolutionary natural language processing model. Unlike traditional models, context is comprehensively considered by BERT through bidirectional analysis of input sequences. The transformer architecture is leveraged by BERT, allowing intricate language nuances and contextual relationships to be captured. Pre-trained on vast text corpora, BERT excels in downstream tasks such as sentiment analysis, named entity recognition, and question answering. Its ability to grasp complex linguistic structures and adapt to diverse tasks has resulted in its status as a cornerstone in NLP, contributing to significant advancements in language understanding and generation.

Data Handling:

- Data loading and preprocessing are performed.
- Grade labels are mapped to integers.
- The data is split into training and validation sets.

Tokenization and Dataset Preparation:

- Tokenization and encoding are carried out using the BERT tokenizer.
- A custom dataset class is created.

BERT-Based Sequence Classification:

- The BERT model (BertForSequenceClassification) is employed for sequence classification tasks.

Model Setup:

- The BERT model and AdamW optimizer are initialized.
- CrossEntropyLoss is used for training.

Training:

- The model is trained over epochs.
- DataLoader is used for batching.
- Average training loss is printed.

Validation:

- Evaluation is conducted on the validation set.
- Validation accuracy is printed.

Prediction Function:

- Tokenization, encoding, and predictions are made.
- Predicted labels are mapped back to grades.

DIVISION OF THE WORK AMONG STUDENTS

1. **Aashutosh Pradhan** Model Evaluation And Application Backend
2. **Ajit Kumar** Model Training , Application Frontend
3. **Aman Upadhyay** ModeTraining,DataPreprocessing,Report Making

RESULTS

The model was trained over eight epochs on the provided dataset. The training loss consistently decreased, indicating effective learning from the training data. Upon validation, the model achieved an accuracy of approximately 70% , demonstrating its proficiency in predicting grade labels on unseen data

CONCLUSION

The project successfully trained a BERT-based model for grading student responses, with a validation **accuracy of 70%.** The achieved accuracy signifies the model's capability to effectively predict grade labels, laying the groundwork for potential deployment in educational settings. Further exploration and optimization avenues may enhance the model's performance in future iterations.

REFERENCES

1. https://ieeexplore.ieee.org/document/10064615
2. NLP-based Automatic Answer Evaluation | IEEE Conference Publication | IEEE Xplore
3. https://www.mililink.com/upload/article/945421994aams_vol_2011_september_2021_a34_p2749-2765_b._madhavi_desai_et_al..pdf
4. https://ieeexplore.ieee.org/document/9627669
5. Subjective Answers Evaluation Using Machine Learning and Natural Language Processing | IEEE Journals & Magazine | IEEE Xplore