**PROJECT CODE: 2024-P03**

**Title: Application of an Improved Convolutional Neural Network Algorithm in Text Classification**

**Abstract**

**Novelty Added in this Project: Implementation Gaussian Naive Bayes, Multinomial Naïve Bayes, Logistic Regression are added.**

In recent years, text classification has emerged as a pivotal task in natural language processing (NLP), with applications spanning various domains such as sentiment analysis, topic categorization, and spam detection. This study proposes a novel text classification model that synergistically combines a Convolutional Neural Network (CNN) with a Support Vector Machine (SVM) to enhance the classification performance. The model leverages the strengths of CNNs in feature extraction and the robustness of SVMs in classification. Specifically, an attention mechanism is integrated into the CNN architecture to simplify parameters and improve the extraction of feature words.

The proposed model is evaluated on diverse dataset which encompass a broad spectrum of text classification challenges. The inclusion of the attention mechanism allows the model to focus on the most relevant parts of the text, thus enhancing the quality of the features extracted by the CNN. By replacing the Softmax layer with an SVM, the model benefits from the SVM's superior ability to handle high-dimensional feature spaces and its robustness to overfitting, which is particularly beneficial for text classification tasks where the feature space can be vast and sparse.

Simulation experiments demonstrate that the proposed algorithm significantly outperforms traditional CNN-based models across several key performance metrics, including precision rate, recall rate, F1 score, and training time. The attention mechanism contributes to a more efficient and effective feature extraction process, while the SVM classifier provides a more accurate and generalizable decision boundary. As a result, the model achieves higher precision and recall rates, leading to better F1 scores compared to baseline CNN models. Additionally, the proposed method shows a notable reduction in training time, making it more practical for real-world applications.