# Implementation of Convolutional Neural Network Algorithm in Sentiment Analysis on User Reviews of MySAPK Application

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***Abstract- BKN launched the MySAPK application to independently update personal data and history. Sentiment analysis was conducted to evaluate the quality and performance of the MySAPK application. The data used is a user review of the MySAPK application using the Convolutional Neural Network (CNN) algorithm. The research method consists of data collection, labeling, preprocessing, processing, testing, and evaluation. The Convolutional Neural Network (CNN) algorithm produces an accuracy rate of 90% in the testing process, with positive sentiments from its users.***

***Indexed Terms- Sentiment Analysis, Convolutional Neural Network (CNN), MySAPK.***

## I. INTRODUCTION

The information and communication technology (ICT) revolution has provided an opportunity for the government to observe the development of the state apparatus by implementing an electronic-based system. To achieve this target, the State Civil Service Agency (BKN) asked all ASN and Non-ASN High Leadership Officials to update their data and history independently through the MySAPK application. MySAPK is an application that aims to improve the accuracy of personnel data. Various comments in the review column consist of criticism and criticism, complaints, and suggestions that can be useful for improving the service and performance of the MySAPK application. Therefore, to make it easier to find reviews from users, sentiment analysis can be carried out to classify these reviews using a deep learning approach. This method is efficient and significant for classifying text based on the Convolution Neural Network (CNN) model. The CNN text classification model can improve prediction accuracy and use less computational resources [2]. This research aims to implement the Convolutional Neural Network (CNN) algorithm to analyze sentiment based on user reviews on the MySAPK application and determine the level of accuracy of the Convolutional Neural Network (CNN) algorithm when conducting sentiment analysis. The study results are expected to be able to classify these reviews to find out user responses, including positive or negative sentiments.

## II. METHODOLOGY

Figure 1 shows the six steps of this research.

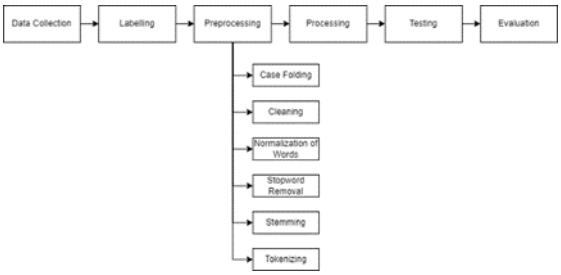


Figure 1. Methodology

The first stage begins by collecting review data on the MySAPK application by scraping using the Google Play Scraper package. The data collected amounted to 5000 most recent data. The next stage is to label the review data to classify the review into positive or negative sentiment based on the rating. Then the data will go through a preprocessing stage which consists of case folding, cleaning, normalization of words, stopword removal, stemming, and tokenizing. The preprocessed data is then divided into training data and test data. Next is to build the CNN algorithm model shown in Figure 2.

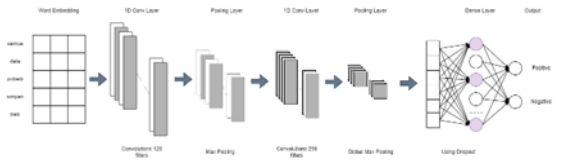

Figure 2. CNN Model

The model is defined as sequential, which contains a list of layers and the configuration used in each layer. The convolution layer used is conv1d. The activation function used is ReLU. Each Convolutional Layer is followed by a pooling layer where max pooling1d is used to reduce the number of parameters and computations in the network so that the model has more concise information. The next stage is testing carried out during the training.

## III. RESULTS AND DISCUSSION

### 3.1 Datasets

This research uses data obtained from reviews on the MySAPK application. The review data that has been labeled and ready to be used consists of 2208 positive review data and 2176 negative review data. Then the data goes to the preprocessing stage. It starts with the case folding process, which uniforms letters by changing capital letters to lowercase letters. The cleaning process removes unnecessary sentence attributes such as punctuation marks, numbers, symbols, characters, and spaces. To change non-standard words, slang words, and words that are not in the dictionary, normalization is carried out so that these words become standard words according to the KBBI. The stopword removal process is carried out to retrieve important words needed in the classification process, eliminating words that have no meaning and words that are not needed. Then the stemming process extracts words from their affixes to get the essential words. The last is tokenizing, which will break the words in the sentence into several parts called tokens. The dataset of the preprocessing results is shown in table 1.

Table 1. Preprocessing Results

| Reviews | Sentiment |
|---|---|
| semua data pribadi simpan baik | POSITIVE |
| susah masuk data sudah kali coba hasil tunggu tunggu baik tingkat aplikasi | NEGATIVE |
| bagus bantu kirim data bkn | POSITIVE |
| bantu rekam data diri pns | POSITIVE |

### 3.2 Experiment Results

The dataset is divided into training data and test data with a ratio of 80%: 20%. Among 4326 reviews, 3028 reviews were used as training data and 1298 reviews were used as test data. The data set will be represented as an integer or a number that is arranged sequentially by calling the Tokenizer class in the Keras library to use it in the CNN model. The CNN model created has a configuration consisting of conv1d with a filter size of 128 to perform convolutions with a kernel size of 5 and shifts or steps of 1. Max pooling1d layer with a kernel size of 5. Increase filter size 2-fold on the conv1d layer to 256. In the Convolutional Layer, ReLU is used as the activation function. The dropout layer used is 0.2. Furthermore, the model will be compiled and a summary of the model will be printed as shown in Figure 3.

```
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
embedding (Embedding)        (None, 120, 100)          2000000

conv1d (Conv1D)              (None, 116, 128)          64128

max_pooling1d (MaxPooling1D  (None, 23, 128)           0
)

conv1d_1 (Conv1D)            (None, 19, 256)           164096

global_max_pooling1d (Globa  (None, 256)               0
lMaxPooling1D)

dense (Dense)                (None, 256)               65792

dropout (Dropout)            (None, 256)               0

dense_1 (Dense)              (None, 1)                 257

=================================================================
```

Figure 3. Summary Model

Before entering the training stage, the researcher created a callback function to stop the training process when the conditions in the callback were met, even

though all epochs had not been executed. The callback function will stop training if the accuracy is above 99%. The training process begins by calling the fit model with a configuration of epoch 100. After the training process is complete, 99% accuracy is obtained at epoch 17. Then testing is carried out using 20% data from the dataset. The test results got accuracy at the time of testing by 90%. It can be seen in Figure 4 as a graph of the model's accuracy value from training data and validation data. There is an intersection between the training and validation accuracy graphs. This indicates that the model is overfitting even though it has added a dropout as a step to prevent overfitting.

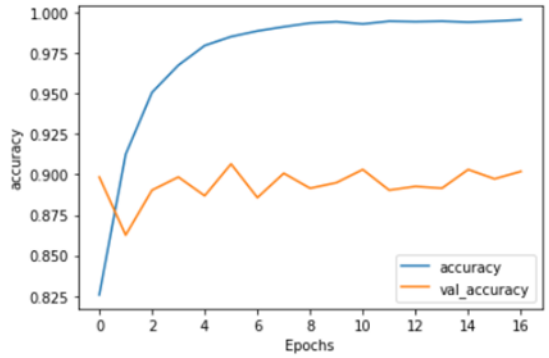


Figure 4. Model Accuracy

Figure 5 shows a graph of the training process loss model. The loss value tends to decrease while the loss value from validation increases but is not stable. This is the same as the accuracy graph, which indicates overfitting.

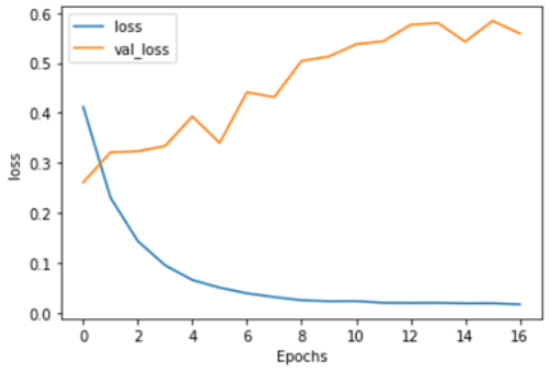


Figure 5. Model Loss

Model evaluation is carried out using a confusion matrix, which calculates the performance of the classification model shown in table 2, such as the level accuracy, precision, recall, and f1-score by first obtaining True Positive (TP), False Positive (FP), True Negative (TN), and False Negative (FN) using a confusion matrix. Figure 6 is the result of the confusion matrix.

Table 2. Model Performance Calculation

| | Positive | Negative |
|---|---|---|
| Precision | 89% | 91% |
| Recall | 91% | 89% |
| F-1 Score | 90% | 90% |

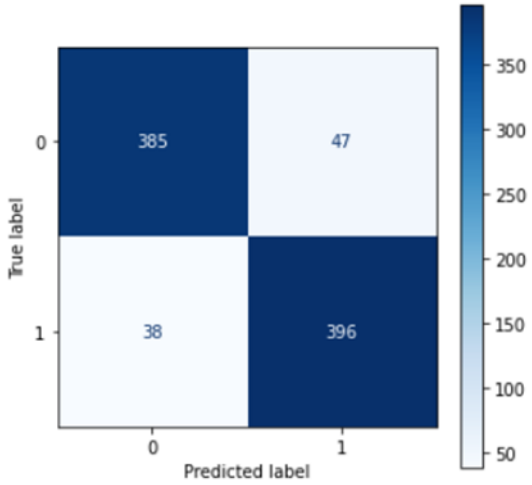


Figure 6. Confusion Matrix

## CONCLUSION

By implementing the Convolutional Neural Network algorithm, research on sentiment analysis of MySAPK application users' comments has been successfully carried out. The program can classify reviews into positive and negative sentiments. The model with the Convolutional Neural Network algorithm that has been created requires 17 epochs to get a training accuracy of 99%. Based on the test results, the Convolutional Neural Network algorithm got an accuracy of 90%, with the most positive sentiment.

## REFERENCES

[1] Sharma, A. K., Chaurasia, S., and Srivastava, D. K, ‐Sentimental Short Sentences Classification by Using CNN Deep Learning Model with Fine Tuned Word2Vec,‖ Procedia Computer Science, India, 2019, pp. 1139–1147.

[2] P. Ce and B. Tie, –An analysis method for interpretability of CNN text classification model,‖ Futur. Internet, vol. 12, no. 12, pp. 1–14, Dec 2020.

[3] Listyarini, S. N. and Anggoro, D. A, –Analisis Sentimen Pilkada di Tengah Pandemi Covid-19 Menggunakan Convolution Neural Network (CNN),‖ Jurnal Pendidikan dan Teknologi Indonesia, vol.1, no.7, pp. 261–268, Jul 2021.

[4] Qosim, A. L. et al, –Analysis Classification Opinion of Policy Government Announces Cabinet Reshuffle on YouTube Comments Using 1D Convolutional Neural Networks,‖ in 3rd 2021 East Indonesia Conference on Computer and Information Technology EIConCIT, Surabaya, 2021, pp. 30–35.