



Sentiment Analysis of Public Opinion towards the Crypto Academy Class Using the Convolutional Neural Network Method

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Abstract: Technological advances and the popularity of cryptocurrencies have encouraged many people to seek in-depth understanding through educational platforms such as Crypto Academy which is the largest cryptocurrency community in Indonesia. This research aims to analyze public sentiment towards Crypto Academy classes using the Convolutional Neural Network method. The dataset contains 3467 comments collected through scrapping from Youtube. The data goes through a pre-processing stage which includes cleansing, case folding, normalizing, tokenizing, stopwords, stemming and also TF-IDF weighting before being used in the CNN model. This research evaluates the performance of the model on two data sharing ratios of 80:20 and 70:30 and evaluates hyperparameters such as learning rate and optimizer. The results of the CNN model with optimal hyperparameters produced the best accuracy of 83.75% at a ratio of 70:30 with a learning rate of 0.0005 and an ADAM optimizer. Based on the results of sentiment analysis, it can be seen that sentiments tend to convey more positive sentiments with a total of 1580 positive comments compared to neutral sentiments totaling 1298 and negative sentiments totaling 548. This indicates that the majority of people's views on the Crypto Academy class are very good or positive.

Keywords: Sentiment Analysis, Crypto Academy, Cryptocurrency.

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Introduction

The rapid progress of the times today makes all information easily accessible via the internet [1]. The existence of the internet greatly helps humans in carrying out their daily activities, including in the digitization of the financial sector which utilizes digital currency exchange or better known as cryptocurrency as an investment tool that has high risk [2]. Digital currency trading has become popular due to its ever-increasing exchange rate [3]. Therefore, to understand more about the world of cryptocurrency and reduce investment risk, many people choose to join crypto education classes that offer in-depth knowledge and practical skills related to cryptocurrency trading [4].

Cryptocurrency began in 2009 with the creation of Bitcoin by Satoshi Nakamoto, which became the first digital currency and still holds the position as the asset with the largest market capitalization to date [5]. Over time, cryptocurrencies have grown in popularity as a medium of exchange and also as a choice of investment asset [6]. Its trading volume has increased significantly, fueled by its increasing popularity since its launch in 2009 [7]. The current cryptocurrency phenomenon has captured the attention of the public at large, not only as a digital medium of exchange, but also

as a creator of a new ecosystem that involves various elements. These assets were initially developed as a form of digital currency based on blockchain technology, designed to facilitate trade transactions with the claim that its use can reduce the time and cost required in international transactions [8].

One of the most notable figures in the cryptocurrency space in Indonesia is Timothy Ronald, a successful investor with a deep understanding of the industry. His beginnings were not glamorous, starting out as a hair oil salesman and real estate agent to support his family. However, with his determination and hard work, he entered the world of investment, especially Bitcoin, since 2015. Although he had left college to focus on developing a financial education platform related to stocks, Ternak Uang, which was later ranked in the LinkedIn Top Startup 2022 list. Timothy managed to attract the attention of many figures in the investment industry, including Sandiaga Uno, who became his mentor since the age of 19 [9]. Together with his business partner, Kalimasada, Timothy founded the Crypto Academy class in December 2022, which has now grown into the largest crypto education company and community in Indonesia. Timothy also managed to establish a Family Office called Ronald Capital thanks to the sizable value of

portfolio assets, as well as owning a number of luxury cars such as McLaren and Porsche.

The Crypto Academy is a community founded by Timothy Ronald in response to the growing interest and need for in-depth knowledge about cryptocurrencies among the public, especially in Indonesia. The educational platform was launched in late 2022 with the main objective of providing comprehensive and accessible education on crypto assets and blockchain technology. The community offers various learning modules that cover the history, development, as well as practical applications of cryptocurrencies. In addition, the platform also provides community services where users can share insights and interact directly with experts and practitioners in the crypto field. With more than 24 learning modules available, the Crypto Academy is designed to help beginners understand the basics of digital currencies to advanced topics such as Decentralized Finance (DeFi), Metaverse, and NFTs [10]. The teachers in the community consist of experienced professionals in the field, including its partner Kalimasada and are also supported by an active community that allows users to learn together and get direct guidance from experts.

However, based on observations from several people on social media who have entered or are just entering the cryptocurrency world, the views on this educational class and including the views on the character Timothy Ronald, are still not fully understood [11]. These perceptions about the usefulness and quality of the academy classes in the context of the development of blockchain technology and cryptocurrency are interesting to investigate further. With the rise of social media platforms such as YouTube as a place where people's opinions and sentiments are realized, sentiment analysis of the Crypto Academy class becomes relevant.

In this report, a sentiment analysis of the public's views on an academy class related to cryptocurrency using the Convolutional Neural Network method is conducted. This research aims to analyze the public's views on the Crypto Academy class, and identify the role of prominent figures such as Timothy Ronald in shaping the public's perception of the academy class. The reason this research chose the CNN method is because of its high ability to extract important features from text data, such as complex patterns in sentiment data [12]. This advantage makes CNN very effective for sentiment analysis. The results include an analysis of the accuracy of the model, the impact of the number of hyperparameters and optimizers used, and the ability of the model to predict sentiment on new data [13]. Thus, this research provides deep insight into the Convolutional Neural Network method in analyzing public opinion sentiment towards the Crypto Academy class. Based on the background explanation above, in this research the author raises the topic "Analysis of Public Opinion Sentiment towards the Crypto Academy Class Using the Convolutional Neural Network Method".

Methods

Convolutional Neural Network

Convolutional Neural Network (CNN) is a deep feed-forward artificial neural network with each node not forming a cycle. The

resulting pattern can be an expression, and CNN can identify it in a particular sentence regardless of the position of the words. The layers used in CNN consist of three types, namely convolutional layer, pooling layer, and fully-connected layer [14].

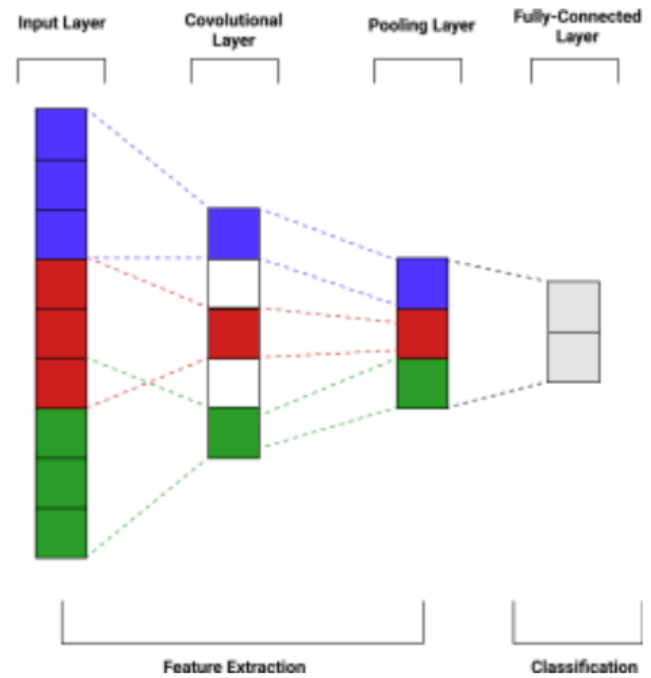


Figure 1. CNN Architecture

The convolutional layer contains a set of fixed-size filters that are used to convolve the data. The output of the convolutional layer is feature maps.

The Pooling Layer ensures that the network only focuses on the most important patterns and summarizes the data by sliding a window across the feature maps, then applying some linear or non-linear operations on the data in the window. The pooling layer has the function of reducing the dimensionality of the feature maps that will be used in the next layer.

Fully-Connected Layer is the last layer used to understand the patterns generated from the previous layers. Neurons in this layer have full connections to all activations in the previous layer. The CNN method also uses an activation function performed between the convolutional layer and the pooling layer. The activation between the two layers uses the ReLU activation function, while the output activation function uses softmax.

The softmax activation function aims to obtain classification results and produce values that can be interpreted as probabilities for each class. The last function is the loss function, which is used to calculate the loss (error value) using categorical cross-entropy [15].

Research Stages

The description of the stages of the research method is carried out to find out the processes that run in the research.

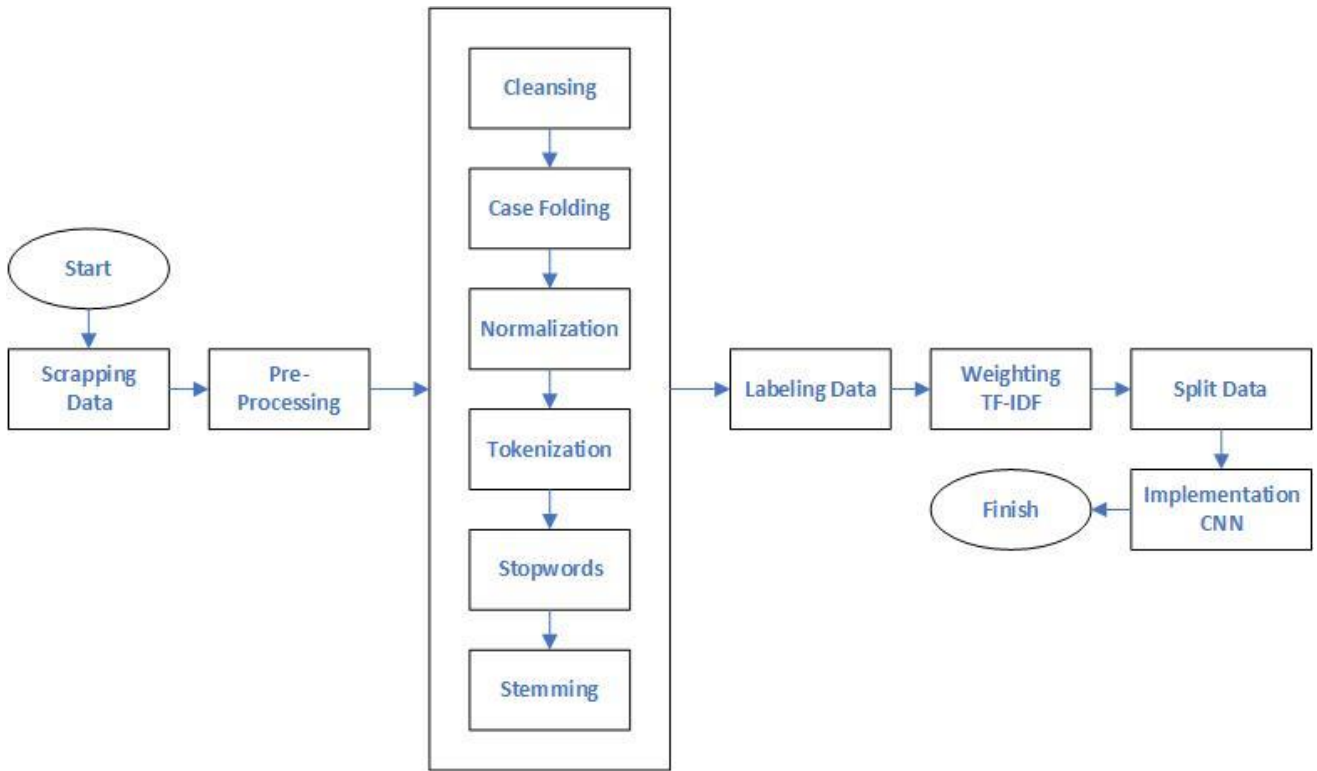


Figure 2. Research Stages

Based on Figure 2. It can be explained that the stages of the analysis research method using the Convolutional Neural Network method on public opinion sentiment data on the Crypto Academy class start from the data scrapping stage on the YouTube application. Then enter the pre-processing stage which has several stages including cleansing, case folding, normalization, tokenization, stopwords, and steaming, which serves to clean the text to make it easier during implementation. Next, perform labeling using a lexicon-based dictionary to determine the results of positive, negative, and neutral sentiment categories, then determine the vector value of TF-IDF weighting and the data will be divided into training data and test data using a ratio of 80:20 and 70:30. After that, the implementation stage of the CNN model is carried out to get the best accuracy results. Then the model evaluates the results of the analysis including several comparisons of data ratios, learning rates, and optimizers to get the best accuracy results.

Results and Discussion

A. Data Scrapping

The data used in this sentiment analysis are comments obtained on YouTube video content from the Crypto Academy channel, the vulnerable time of the data taken is from March to June 2024. The amount of data obtained amounted to 3467 raw data.

	A	B	C	D
1	Published	User Comment		LikeCount
2	2024-03-19	@Yu William panik		7
3	2024-03-19	@Gg Versi TEKNIK DARI BANG TIMOT DONG SEKAL		0
4	2024-03-19	@ah WILLIAM PANIK GA TUH		10
5	2024-03-19	@m Ty proff semoga market membaik kedepanya		9
6	2024-03-19	@ec William tek...		1
7	2024-03-19	@at Makasih bg Tim dan Kaka		2
8	2024-03-19	@da langsung ngilang awokaowk		1
9	2024-03-19	@kh Jangan berhentilah MCnya,kami masih banyak		561
10	2024-03-19	@re Dia ga pake teknikal dia fundamental lihat koi		1
11	2024-03-19	@er SELESAI TUH WILLIAM		1
12	2024-03-19	@Pi Suaranya echo		0
13	2024-03-19	@kh gw dukung bg		0
14	2024-03-19	@us mampus lu monyet monyet miskin goblok ga		0
15	2024-03-19	@ar Thank you ncek dan prof kaka, dah bener fok		2
16	2024-03-19	@Si jangan berhenti bikin MC bang,banyak yang m		1
17	2024-03-19	@12 Terimakasih banyak prof & ncek.. Sehat selalu		26
18	2024-03-19	@ak apa itu manta?		0
19	2024-03-19	@ja Jangan stop mc bangggg		0
20	2024-03-19	@us Kerennn abezzzzzzz		0

Figure 3. Youtube Comment Data Scrapping Results

B. Pre-processing

Data pre-processing is the stage of cleaning words from raw data so that they become clearer and more structured before entering the CNN method testing stage. The pre-processing stages include cleansing, case folding, normalization, tokenization, stopwords, and steaming. The results of this pre-processing data are reduced from 3467 dirty data to 3426 clean data.

Table 1. Pre-processing Results

Comment	Pre-processing Result					
	Cleansing	Case Folding	Normalize	Tokenize	Stopwords	Steaming
Thank you very much prof and ncek do not stop this kind of event is very helpful for caves whose economy is difficult there is no money to join the class thanks prof and ncek	Thank you very much prof and ncek do not stop this kind of event is very helpful for caves whose economy is difficult there is no money to join the class thanks prof and ncek	thank you very much prof and ncek do not stop this kind of event is very helpful for caves whose economy is difficult there is no money to join the class thanks prof and ncek	thank you very much prof and encek do not stop this event is very helpful for me whose economy is difficult there is no money to join the class thanks prof and encek	['receive', 'love', 'many', 'prof', 'and', 'gek', 'don't', 'at', 'stop', 'event', 'this', 'very', 'help', 'share', 'gua', 'yang', 'economy', 'nya', 'susah', 'enggak', 'ada', 'money', 'make', 'join', 'class', 'thanks', 'prof', 'gek']	['accept', 'love', 'prof', 'gek', 'stop', 'event', 'help', 'cave', 'economy', 'its', 'difficult', 'money', 'join', 'class', 'thanks', 'prof', 'gek']	thank you prof encek stop event help me economically difficult money join class thanks prof encek

C. Data Labeling

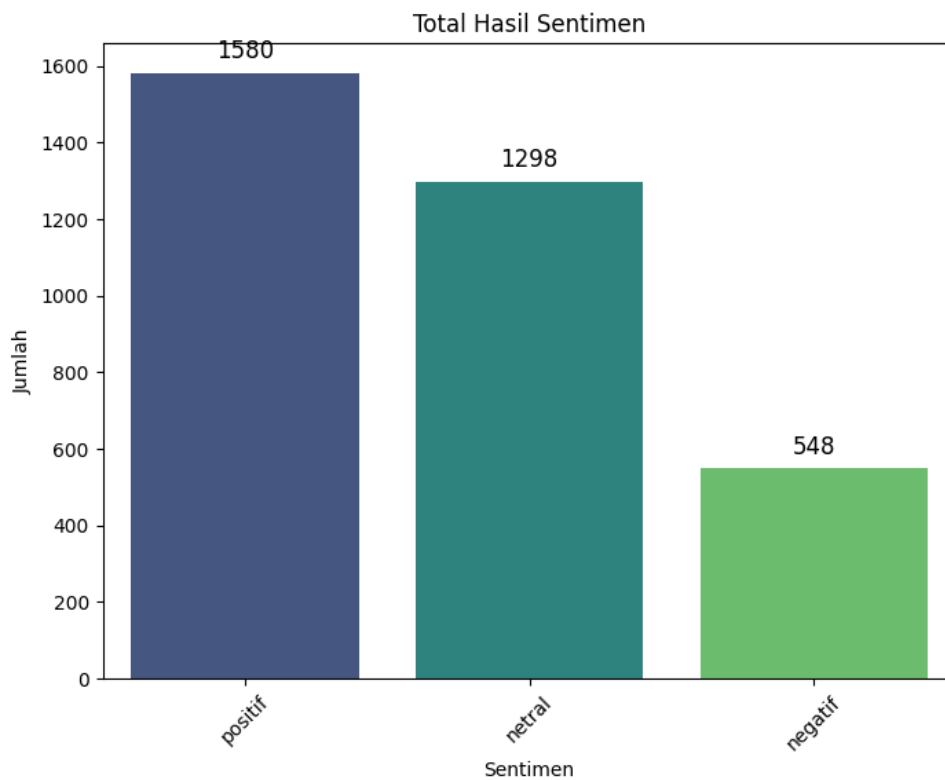


Figure 4. Data Labeling Results

The diagram above is the result of a comparison of sentiment data classification using a lexicon-based dictionary. Of the 3426 data classified into three categories, the number of positive sentiments is 1580, negative is 548, and neutral is 1298.

acara	ajar	akademi	bantu	crypto	ekonomi	encek
0.028	0	0	0.028	0	0.028	0.056
0	0	0.037	0	0.037	0	0
0	0.037	0	0	0	0	0
fomo	gua	harga	hehe	join	kalo	kasih
0	0.028	0	0	0.01	0	0.01
0	0	0	0	0.014	0.037	0.014
0.037	0	0.037	0.037	0	0	0
kelas	kerja	koreksi	mental	momen	nya	pisang
0.028	0	0	0	0	0.01	0
0	0.037	0	0	0	0.014	0.037
0	0	0.073	0.037	0.037	0	0
privat	prof	rugi	semangat	stop	susah	tercover
0	0.021	0	0	0.028	0.028	0
0.037	0.014	0	0.037	0	0	0
0	0	0.037	0	0	0	0.037

Figure 5. TF-IDF Weighting

The picture above is the result of TF-IDF weighting which has been made into a matrix form in order to make it cheaper when implementing the model.

Convolutional Neural Network Method Approval Results

In this analysis test, several tests were carried out to find the best results by comparing the results of the 80:20 and 70:30 ratios, and several CNN hyperparameters such as learning rate 0.001, 0.0001, 0.005, and 0.0005, ADAM, SGD, and RMSprop optimizers as well as the number of batch sizes 32 and 64 to get the highest accuracy results. The following are the test results.

1. 80:20 ratio

Table 2. 80:20 Ratio Testing Results

Epoch	Learning Rate	Batch Size	Optimizer	80:20 Accuracy	Loss 80:20
100	0,001	32	ADAM	83,38%	1,2801
		64		83,24%	1,2766
		32	SGD	46,06%	1,0151
		64		46,06%	1,0178
		32	RMSprop	81,78%	0,8718
		64		81,20%	0,8406
	0,0001	32	ADAM	80,90%	0,7506
		64		81,49%	0,6216
		32	SGD	46,06%	1,0301
		64		46,06%	1,0585
		32	RMSprop	77,70%	0,6269
		64		78,28%	0,6297
	0,005	32	ADAM	81,20%	1,3315
		64		83,38%	1,2172
		32	SGD	71,43%	0,7054
		64		52,92%	0,9696
		32	RMSprop	80,90%	0,8989
		64		81,78%	1,0536
	0,0005	32	ADAM	82,80%	1,2443
		64		82,80%	1,0775

		32	SGD	46,06%	1,0179
		64		46,06%	1,0180
		32	RMSprop	80,76%	0,6551
		64		81,34%	0,8375

In testing the 80:20 ratio, several training scenarios were carried out by comparing the learning rate and optimizer and the number of batch sizes. The highest accuracy results are in the hyperparameter combination with a learning rate of 0.005, batch size 64 using the ADAM optimizer, resulting in an accuracy of 83.38% and a loss value of 1.2172.

2. 70:30 ratio

Table 3. 70:30 Ratio Testing Results

Epoch	Learning Rate	Batch Size	Optimizer	70:30 Accuracy	Loss 70:30
100	0,001	32	ADAM	83,35%	1,2724
		64		82,20%	1,4205
		32	SGD	46,11%	1,0104
		64		46,11%	1,0156
		32	RMSprop	81,32%	0,7622
		64		82,88%	0,9212
	0,0001	32	ADAM	81,32%	0,8158
		64		80,16%	0,6717
		32	SGD	46,11%	1,0360
		64		46,11%	1,0556
		32	RMSprop	78,50%	0,6429
		64		78,11%	0,6295
	0,005	32	ADAM	82,30%	1,3173
		64		83,17%	1,2926
		32	SGD	67,51%	0,8441
		64		49,22%	0,9817
		32	RMSprop	82,39%	1,0336
		64		81,91%	1,3432
	0,0005	32	ADAM	82,68%	1,3655
		64		83,75%	1,1450
		32	SGD	46,11%	1,0149
		64		46,11%	1,0175
		32	RMSprop	81,13%	0,7014
		64		81,91%	0,8222

In testing the 70:30 ratio, several training scenarios were carried out by comparing the learning rate and optimizer and the number of batch sizes. The highest accuracy results are in the hyperparameter combination with a learning rate of 0.0005, batch size 64 using the ADAM optimizer, resulting in an accuracy of 83.75% and a loss value of 1.1450.

Conclusion and Suggestions

Based on the research that has been conducted on Sentiment Analysis Public Opinion on Crypto Academy Classes Using the Convolutional Neural Network (CNN) Method, the following

conclusions can be drawn: 1) The sentiment data obtained is 3467 data, then after pre-processing it produces 3427 clean data. 2) Comparison of data ratios 80:20 and 70:30 shows that these two ratios show both give good accuracy results, but the 70:30 ratio is superior because it can provide the highest accuracy value. 3) Comparison results of ADAM, SGD, and RMSprop optimizers show that ADAM optimizer is able to provide the best performance compared to RMSprop while SGD provides very low performance during model training. 4) On the performance of learning rate 0.001, 0.0001, 0.005, 0.0005 shows that learning rate 0.0005 is able to provide the highest accuracy value with a significantly low

loss value. 5) In the CNN model training scenario, the best performance is in the combination of hyperparameter learning rate 0.0005, ADAM optimizer, and batch size 64, with a ratio of 70:30 getting an accuracy result of 83.75% with a low significant loss value at a value of 1.1450. 6) Based on sentiment analysis of public views on the Crypto Academy class, it shows that the positive sentiment is 1580, neutral sentiment is 1298 and negative sentiment is 548. Taking into account the relative amount of each sentiment category, this analysis provides a strong basis for concluding that the majority of people's views on the Crypto Academy class are very positive.

Based on the results of this study, the authors suggest that future researchers can increase the amount of data used. The addition of this data aims to improve the model's ability to recognize sentiment patterns more deeply, so that the analysis results can be more accurate and relevant. In addition, exploration of hyperparameters, such as learning rate, batch size, and number of epochs, also needs to be done to understand their impact on model performance. Future researchers are also advised to try different types of optimizers, such as Adagrad, Adadelat, Nadam and FTRL, to obtain a combination that produces the best model performance.

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