Vol. 3, No. 2, 2023, pp. 37-48

Sales Prediction of Palu Arshop Clothing Using the High Order Chen Fuzzy Time Series Method

Marni Sagap[1*] , Nur'eni[2] , Iman Setiawan[3]

[1,2,3]Department of Statistics, Faculty of Mathematics and Natural Sciences, Tadulako University, Jl. Soekarna Hatta, Palu 94118, Central Sulawesi, Indonesia
e-mail: sagapmarni@gmail.com

ARTICLE INFO

Keywords
Sales Prediction,
High-order Chen fuzzy time series,
Arshop Palu

ABSTRACT

Introduction: Arshop is one of the clothing stores in Palu City that is in great demand by the community. As one of the many clothing stores in Palu City Arshop to find a strategy to increase sales. One way that can be used is to make predictions to determine strategies to increase sales. **Method**: Higher-order Chen fuzzy time series method to predict the time series data of Arshop Palu clothing sales. Chen's high-order fuzzy time series is a time series analysis that can capture varied data patterns, one of which is seasonal patterns, and is formed based on two or more data in the past. **Results and Discussion**: The results of this study indicate that the high-order Chen fuzzy time series method has an accuracy rate of MAPE 15.59%, which is categorized as good the prediction results of the comparison between various orders show that the fourth-order Chen fuzzy time series is the best for predicting clothing sales of Arshop Palu. **Conclusion**: The prediction of clothing sales at Arshop Palu using the higher-order Chen fuzzy time series method resulted in a MAPE of 15.59%, which shows good accuracy because it is less than 20%. Based on the comparison of the accuracy values of the four orders, the fourth-order FTS proved to be the most effective for predicting the clothing sales of Arshop Palu.

1. Introduction

Competition in the business world is growing rapidly, not a few companies have gone out of business due to not being able to maintain the survival of their business. A company must be able to anticipate any threats that will occur in the future and prepare itself. One of the important decisions in the company that must be made by management is to determine the production level of goods and services that must be prepared for the future [1]. Today's business development is very diverse, characterized by many businesses in related fields that compete with each other. Indonesia is one of the countries that has entered the era of global business competition, both small, medium, and large [2]. The unstoppable momentum of global business competition has resulted in small businesses being unable to compete with middle and upper-class companies in the business world. One of the business industries that is being cultivated is the fashion industry (clothing). The fashion industry is a very rapidly in accordance with the conditions of the times and current technological developments [3].

Fashion trends in Central Sulawesi, especially in the city of Palu, have changed a lot due to the emergence of many clothing stores that offer trendy, affordable, and quality clothing. The emergence of many clothing stores in Palu City that continue to develop and compete to market their products [4]. Arshop is one of the clothing stores in Palu City. This shop is in great demand by the public because it sells women's fashion needs with modern styles and affordable prices. As one of the many clothing stores in Palu City Arshop to find a strategy to increase sales. Arrangement of interior and exterior displays at Arshop Palu is a strategy that is carried out to encourage consumer desires through the attraction of direct purchases. To increase product sales, techniques are needed to analyze this. The technique that can be used is time series analysis in predicting Arshop Palu clothing sales [5].

Prediction is the process or act of testing the prevailing conditions and then estimating future events so as to prepare actions to anticipate future conditions [6]. Therefore, the role of prediction is very important in determining the amount of demand and increase in the company from the previous period's sales data [7]. There are two general approaches to prediction, qualitative and quantitative (mathematically calculated data). Quantitative methods are generally used to predict using time series [8]. Along with the development of time series methods, the fuzzy theory also developed, Song and Chissom proposed a new concept called fuzzy time series [9].

Fuzzy time series is a data forecasting method that uses fuzzy principles as its basis. Forecasting using fuzzy time series can capture patterns from historical data and then be used to project future data [10]. In 2002, Chen again modified the fuzzy time series method with the n-order concept, which is referred to as the higher-order Chen fuzzy time series [11]. Chen's high-order fuzzy time series can capture seasonally patterned data and is formed based on two or more data in the past of each period called fuzzy logic relation (FLR) [12]. Usually, the accuracy of the forecasting results on the data is seen by calculating the accuracy rate or the size of the forecasting accuracy. There are many methods used to calculate the level of accuracy or measure of accuracy, for example by using the Mean Squared Error (MSE), Mean Absolute Percentage Error (MAPE), and Mean Absolute Error (MAE) methods.

Several previous studies have been conducted related to the high-order Chen FTS method, among others, Febriana applied the high-order Chen FTS method to forecast the number of passengers and ship vehicles [11]. From the analysis results, the best order is obtained, namely second-order FTS with a forecasting value for passenger data of 171,237 with MAPE 26.003% and vehicles of 298,907 with MAPE 14.33% for the October 2017 period. Other research was also conducted by Adiputra (2020) forecasting the number of sea ship passengers at PT. Pelabuhan Indonesi IV. get second-order results with a MAPE value size of 0.143%. Halis (2022) has also conducted research by comparing the forecasting results of the high-order Chen fuzzy time series method with the

Saxena-Easo fuzzy time series method on inflation in Indonesia. The results obtained with MAPE of 18.5172%.

2. Research Methodology

2.1 Data Sources and Research Variables

The data used in this research is secondary data obtained from *Arshop* Palu.

2.2 Analysis Method

Data analysis in this study was carried out using Chen's high-order *fuzzy time series* method with the help of *Excel software*. The stages of the analysis carried out are as follows:

1. Inputting data.
2. Data exploration. Data exploration is carried out to identify patterns in Palu *Arshop* clothing sales data over time.
3. Formation of the universe set. The universe set was formed using the minimum and maximum values and the values of $\boldsymbol{D_1}$ and $\boldsymbol{D_2}$ determined by the researcher.
4. Determining the number of *fuzzy* sets. The number of *fuzzy* sets is determined using the Sturges rule
5. Defining *fuzzy* sets and *fuzzyfication*. Defining *fuzzy* sets and *fuzzyfication* aims to simplify by converting numerical data into linguistic data.
6. Determining the FLR. The FLR is identified based on the historical data that has been *fuzzified in* the previous stage.
7. Determining FLRGs. FLRG formation is done by grouping all the FLRs formed into interconnected FLRGs.
8. *Defuzzyfication*. *Defuzzification* is done by converting the *fuzzy output* into a firm (numeric) value that produces a predicted value.
9. Evaluation of prediction results. Evaluation of prediction results is done using MAPE.
10. Interpreting prediction results
11. Conclusion.

3. Results and Discussion

3.1 Data Exploration

Data exploration is used to determine the pattern of *Arshop* Palu clothing sales data. The data analyzed in this study is the sales data of Palu *Arshop clothing* from the period October 10, 2021, to January 22, 2023.

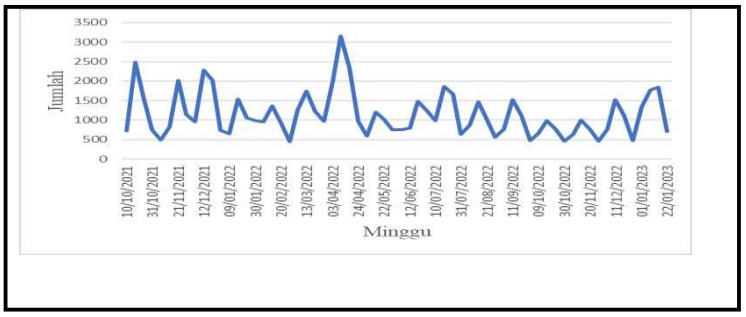

Fig 1. *Time Series* Plot Number of Clothes Sold at Palu *Arshop*

In Figure 1, it can be seen that the data on the number of clothes sold has a seasonal pattern. It is known that the movement of data on the number of clothes sold during the period October 10, 2021, to January 22, 2023, using weekly data has seasonal changes that indicate instability over time. This can be seen in the period 07 November 2021 experiencing a decrease in clothing sales. Furthermore, there was a significant increase in the period November 21, 2021. Then, it continues to change from time to time, so based on this, it can be indicated that Palu Arshop clothing sales data often changes in a short period of time. In addition, the graph shows that the highest sales of Palu Arshop clothing occurred on April 10, 2022, namely 3,163 pcs.

3.2 *Chen's Fuzzy Time series* method

The higher-order Chen fuzzy time series method has several stages of analysis. The following are the steps in predicting clothing sales at Arshop Palu using Cheng's higher-order fuzzy time series method.

3.2.1 Universe Set Formation

Based on sales data for Palu *Arshop* clothing from October 10, 2021, to January 22, 2023, the lowest sales were 437 pcs and the highest was 3,163 pcs.

3.2.2 Establishment of the Number of *Fuzzy* Sets

Determination of the number of *fuzzy* sets on *Arshop* Palu clothing sales data is calculated using the *Sturges* rule. the steps in determining the *fuzzy set* are as follows:

1. Determine the interval length(R) with the following equation.
2. Determine the number of class intervals by applying the *Sturges* equation.

Determine the width of the interval using Equation (2.4) as follows. From the calculation of the number of fuzzy sets, the results obtained are 7 fuzzy sets with an interval length of 390. U in each fuzzy set is partitioned by 7 sets. Then the set of fuzzy intervals formed is

presented in Table 1 as follows.

Table 1. Fuzzy Set Interval

The i-th *Fuzzy* Set	*Fuzzy* Compound Interval
u_1	[436 ; 826]
u_2	(826 ;1216]
u_3	(1216 ; 1606]
u_4	(1606 ; 1996]
u_5	(1996 ; 2386]
u_6	(2386 ; 2776]
u_7	(2776 ; 3166]

3. Calculation of the middle value of the *fuzzy* set using Equation (2.5) The results of the calculation of the *fuzzy set*m_i are presented in Table 2 below.

Table 2.Fuzzy Set Center Value

The i-th *Fuzzy* Set	Center Value (m_i)
u_1	631
u_2	1.021
u_3	1.411
u_4	1.801
u_5	2.191
u_6	2.581
u_7	2.971

Based on Table 2, the middle value of the 1st *fuzzy set* to the 7th *fuzzy* set is obtained using Equation (2.5). The following is the calculation of the center value of the 1st *fuzzy set*(m_1).

$$m_1 = \frac{Batas\ Atas\ u_1 + Batas\ Bawah\ u_1}{2}$$

$$m_1 = \frac{436 + 826}{2}$$

$$m_1 = 631$$

3.2.3 Defining *Fuzzy* Set Membership Degrees againstA_i and *Fuzzification*

Defining the degree of membership of the *fuzzy* set toA_i is based on the *fuzzy set* formed. It is assumed that the *fuzzification* value of the linguistic variable of *Arshop* Palu clothing sales data is $A_1, A_2, A_3, \dots, A_7$. Each *fuzzy* set$u_i$ where$i = 1,2,3, \dots ,7$ is defined againstA_i using Equation (2.6). The following is the definition of the *fuzzy* set onA_i.

$$\mu_{A_1(u_1)} = {}^{1}/_{u_1} + {}^{0.5}/_{u_2} + {}^{0}/_{u_3} + \cdots + {}^{0}/_{u_7}$$

$$\mu_{A_3(u_3)} = {}^{0}/_{u_1} + {}^{0.5}/_{u_2} + {}^{1}/_{u_3} + \cdots + {}^{0}/_{u_7}$$

? = ? + ? + ? + ?+ ?

$$\mu_{A_n(u_7)} = {}^{0}/_{u_1} + {}^{0}/_{u_2} + {}^{0}/_{u_3} + \cdots + {}^{1}/_{u_7}$$

In the definition of each *fuzzy* setA_i, it can be seen thatA_7 has a definition, namely the degree of membership of $u_i(u_1, u_2, u_3, \ldots u_7)$ toA_7 is 0, the degree of membership ofu_6 toA_7 is 0.5, and the degree of membership of tou_7 A_7 is 1. The *i-th fuzzy* set,u_i is expressed by the number symbolized "/" to indicate the degree of membership of tou_iA_i. Please note that the "+" sign in defining the degree of membership of the *fuzzy* set toA_i does not indicate the addition operation, but represents the complete set of elements ofu_i i.e.$(u_1, u_2, u_3, \ldots u_7)$.....Based on defining the degree of

membership of the *fuzzy* set toA_i. *The fuzzification* results for 7 *fuzzy* sets are obtained. These results can be seen in Table 3 below.

Table 3. Fuzzification Result

Fuzzification	**Linguistic Value**
A_1	Level 1
A_2	Level 2
A_3	Level 3
A_4	Level 4
A_5	Level 5
A_6	Level 6
A_7	Level 7

Description:

The naming of the linguistic value level is carried out in the order of the smaller the interval value of the *fuzzy* set (Table 4.1), the smaller the linguistic value level, which means the more drastic the decline in Palu *Arshop* clothing sales data.

From Table 3, 7 *fuzzyfication* values are obtained. For example,A_1 is the result of *fuzzification* obtained from defining the degree of membership of the *fuzzy* set(u_i) toA_1. The results of this definition obtained the membership degreeu_1 of 1, then the membership degreeu_2 of 0.5, and the membership degreeu_3 tou_7 of 0. The maximum membership degree lies inu_1 which is 1 and the interval isu_1[436; 826]. Based on the maximum membership degree, the *fuzzyfication* result of a value in the interval[436; 826] isA_1. Likewise, the *fuzzification of* defining the membership degree ofu_i toA_i follows the previous steps.

Based on the degree of membership in defining the *fuzzy* set atA_i in the *fuzzification process*, the *fuzzification* process for *Arshop* Palu clothing sales data from October 10, 2021, to January 22, 2023, is presented in Table 4.

Table 4. Fuzzification of Palu Arshop Clothing Sales Data

Priode	***Arshop* Palu Clothing Sales (Pcs)**	***Fuzzification***	**Level**
Oct 10, 2021	721	A_1	Level 1
Oct 17, 2021	2.487	A_6	Level 6
Oct 24, 2021	1.610	A_4	Level 4
Oct 31, 2021	748	A_1	Level 1
⋮	⋮	⋮	⋮
Jan 15, 2023	1.846	A_4	Level 4
Jan 22, 2023	704	A_1	Level 1

Based on Table 4, shows the results of *the fuzzification of Arshop* Palu clothing sales data from October 10, 2021, to January 22, 2023. For example, the sales value of Palu *Arshop clothes* on October 10, 2021. The *fuzzyfication* result isA_1, this result occurs because the sales value of Palu *Arshop clothing* on October 10, 2021, was 721 pcs. This value is included in the 1st *fuzzy* set with the interval[436;825]. The process of *fuzzifying the* sales value of other Palu *Arshop clothes* has the same steps as the *fuzzification* process.

3.2.4 Determination of *Fuzzy Logical Relationship* (FLR)

Fuzzy Logical Relationship (FLR) determination involves 1 historical data symbolized byF_{t-1}? F_t. In this paper, the symbolF_{t-1} is a *fuzzyfication of the* previous data (*current state*) andF_t is a *fuzzyfication of the current* data (*next state*). The results of the FLR of Palu *Arshop* clothing sales data are presented in Table 5

Table 5. First-order FLR of Clothing Sales Data of *Arshop* Palu

Priode	***Fuzzification***	**Level**
Oct 10, 2021	-	-
Oct 17, 2021	A_1? A_6	Level 1 → Level 6
Oct 24, 2021	A_6? A_4	Level 6 → Level 4
Oct 31, 2021	A_4? A_1	Level 4 → Level 1
⋮	⋮	⋮
Jan 15, 2023	A_4? A_4	Level 4 → Level 4
Jan 22, 2023	A_4? A_1	Level 4 → Level 1

Based on Table 5, the FLR relationship for each period is obtained based on historical data. FLR on October 10, 2021, has no value or is empty, this is because the formation of FLR is based on the results of *fuzzification of the* previous data$F_{(t-1)}$. Then, on October 17, 2021, the FLR result formed isA_1. A_6 . Where,A_1 is the result of *fuzzification* in the previous period $F_{(t-1)}$, namely on October 10, 2021, andA_6 is the result of *fuzzification of the* current period$F_{(t)}$, namely the period October 17, 2021. FLR in the next period has the same steps as the formation of FLR in the period October 10 to October 17, 2021.

3.2.5 *Fuzzy logical relationship group* (FLRG) formation

The formation of the *fuzzy logic relationship group* (FLRG) has the same steps as the FLR formation stage on the Palu *Arshop* clothing sales data. *Fuzzyfication* groupings that have the same *current state are* then grouped into one group in the *next state*. The results of the FLRG for Palu *Arshop* clothing sales data are presented in Table 6.

Table 6. First-order FLRG of Clothing Sales Data of *Arshop* Palu

Group	FLRG
1	A_1? A_1, A_2, A_3, A_4, A_5, A_6
2	A_2? A_1, A_2, A_3, A_4, A_5
3	A_3? A_2, A_3, A_4
4	A_4? A_1, A_2, A_4, A_7
5	A_5? A_1, A_2, A_5
6	A_6? A_4
7	A_7? A_5

Table 6 shows that all the FLRs formed are grouped into interconnected first-order FLRGs. There are 7 groups formed in the FLR of Palu *Arshop* clothing sales data. For example in Table 4.6 in group 3, the FLRs formed areA_3? A_2 as many as 6,A_3? A_3 as many as 1 andA_3? A_4 as many as 2, so the FLRG for group 3 isA_3? A_2, A_3, A_4 because it is a set of parts of group 3. The formation of FLRGs in other groups has the same steps as the FLRG process in first-order group 3.

3.2.6 *Defuzzification*

The results of the formation of the previous FLRG, there are 7 groups formed, for example in group 1 using the *fuzzy logic relations group* (FLRG)A_1, A_2, A_3, A_4, A_5, A_6 so thatA_1 uses the midpoint value of$u_1(m_1)$ andA_2 using the midpoint value of$u_2(m_2)$ andA_3 using the midpoint value of$u_3(m_3)$ and so on. The results of calculating the *defuzzification* value of each group or group

are as follows with equation (2.14). In group 1 there is FLRGA_1. A_1, A_2, A_3, A_4, A_5, A_6 with the following equation.

$$\hat{Y}(1) = \frac{m_1 + m_2 + m_3 + m_4 + m_5 + m_6}{6}$$

$$= \frac{631 + 1021 + 1411 + 1801 + 2191 + 2581}{6}$$

$$= 1606$$

In the calculation above, the first-order *defuzzification* result in group 1 is 1.606. *Defuzzification* in the next group has the same steps as *defuzzification* in group 1 first order. The results of first-order *defuzzification of* the 7 groups formed are presented in Table 7.

Table 7. First-order *Defuzzification* Results

Group	FLRG	*Defuzzification*
1	A_1? A_1, A_2, A_3, A_4, A_5, A_6	1.606
2	A_2 ? A_1 , A_2 , A_3 , A_4 , A_5	1.411
3	A_3? A_2, A_3, A_4	1.411
4	A_4? A_1, A_2, A_4, A_7	1.606
5	A_5? A_1, A_2, A_5	1.281
6	A_6? A_4	2.581
7	A_7? A_5	2.971

3.2.7 Evaluation of Prediction Results

The predictive value for clothing sales of *Arshop* Palu from October 10, 2021, to January 22, 2023, using weekly data is obtained from the results of first-order FLRG group *defuzzification*, the previous dataF_{t-1} which has obtained a first-order *fuzzification value* which will be used to obtain a predictive value for the *t-period* time data(F_t). The prediction results are presented in Table 8

Table 8. First-order Palu *Arshop* Clothing Sales Prediction Results

No.	Priode	*Fuzzification*	Number of Clothes Sold (Pcs)	Prediction
1	Oct 10, 2021	A_1	721	-
2	Oct 17, 2021	A_6	2.487	1.606
3	Oct 24, 2021	A_4	1.610	2.581
4	Oct 31, 2021	A_1	748	1.606
⋮	⋮	⋮	⋮	⋮
63	Jan 15, 2023	A_4	1.846	1.606
64	Jan 22, 2023		704	1.606

The next step is to see the accuracy of the prediction results by calculating the MAPE value of the first-order Chen FTS prediction results. The MAPE value in this study is calculated using Equation (2.15). The calculation of the MAPE value of the first-order Chen FTS prediction results can be seen in Table 9.

Table 9. Calculation of MAPE Value of First-Order Prediction Results

No.	Period	*Fuzzification*	Y_t	$\hat{Y}_t$	$\frac{\lvert Y_t - \hat{Y}_t \rvert}{Y_t}$
1	Oct 10, 2021	A_1	721	-	-
2	Oct 17, 2021	A_6	2.487	1.606	0,354242
3	Oct 24, 2021	A_4	1.610	2.581	0,603106
4	Oct 31, 2021	A_1	748	1.606	1,147059
⋮	⋮	⋮	⋮	⋮	⋮
63	Jan 15, 2023	A_4	1.846	1.606	0,130011
64	Jan 22, 2023	A_1	704	1.606	1,28125
$\sum_{t=2}^{64} \frac{\lvert Y_t - \hat{Y}_t \rvert}{Y_t}$					45,5492
$MAPE = \left(\frac{1}{N} \sum_{i=1}^{N} \frac{\lvert Y_t - \hat{Y}_t \rvert}{Y_t} \times 100\% \right)$					72,30%

In accordance with Table 9, the MAPE value obtained on the first-order *Arshop* Palu clothing sales data is 72.30%. The MAPE value shows that the prediction results of *Arshop* Palu clothing sales are in the low category because the MAPE value is more than 50%. So it is necessary to continue evaluating the results of the prediction of higher-order Chen FTS using the second order which aims to minimize the error rate in predicting the sales of Palu *Arshop clothing*.

3.5 Interpretation of Prediction Results

From the prediction results obtained, a time series plot of the prediction results and the actual data of Arshop Palu clothing sales can be made.

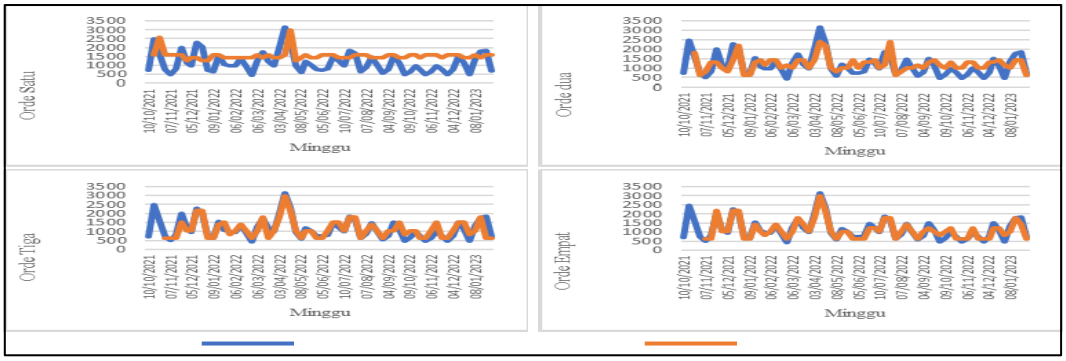

Figure 2. Plot Comparison of Actual Data and Predicted Data on the Number of Clothes Sold at Palu *Arshop*

Based on Figure 2, it can be seen that the *time series* plot of the prediction results of Chen's *Fuzzy time series of the* first, second, and third orders does not have the same pattern as the actual data pattern on *Arshop* Palu clothing sales data. It can be said that the *Fuzzy time series* Chen method of orders one, two, and three is not well used in predicting the sales of Palu *Arshop clothing*. Meanwhile, the fourth order almost has the same pattern as the actual data pattern so it can be said that the data pattern in the fourth order is good to use to predict the sale of Palu *Arshop clothes*, so the research stops at the calculation with the fourth order Chen *Fuzzy time series* method.

4. Conclusion

Based on the results and discussions that have been carried out previously, it can be concluded that the accuracy level of the prediction results of *Arshop* Palu clothing sales using the high-order Chen *fuzzy time series* method obtained a MAPE value of 15.59%. This shows that the prediction results of *Arshop* Palu clothing sales are in a good category because it is less than 20%. The pattern of the results of predicting the sales of Palu *Arshop clothing* using the high order Chen fuzzy *time series* method based on the comparison of the accuracy values of the four orders, it can be concluded that the fourth order FTS is good for predicting the sales of Palu *Arshop clothing*.

References

[1] Warda., sri., & Iskandar. (2016). Sales Forecasting Analysis of Packaged Banana Chips Products (Case Study: Home Industry Arwana Food Tembilahan). *Journal of Technical Industry, Vol.XI, No.3*

[2] Tamin, Rahadian, Z, Yulianto, K Ariga, W Malonga, M. (2022). Graduate School, Study Program, Master of Management, and University of Technology. *"Analysis of Coffee Shop Selection Using the Analytical Hierarchy Process (AHP) Method" 6 (4)*: 2258–64. https://doi.org/10.36312/jisip.v6i4.3660/http.

[3] Mubarok, E. S. (2017). *Human Resource Management Introduction to Competitive Advantage. Bogor*: In Media Publisher.

[4] Saudah, W. A. (2023). Implementation of the ECLAT (Equivalence Class Transformation)

Algorithm for Product Sales Data at Inara Collection Boutique. Thesis. Tadulako University

[5] Sri, M.M. (2022). The Effect of Price Perception, Product Diversity, and Trust on Repurchase Interest in Fashion Products at Arshop in Palu City. Thesis. Tadaulako University, Palu.

[6] Admirani I. (2018). Application of Fuzzy Time Series Motode for Profit Prediction in Companies. JUPITER Journal, Vol 10, No 1, pp. 19-31

[7] Jamila, A.U., Siregar, B.M. & Yunis, R. (2021). Time Series Analysis to Predict the Number of New Students with the Arima Model, Paradigma. *Journal of Computers and Informatics, 23(1),* 85-92.

[8] Maricar, M.A. (2019). Comparative Analysis of Accuracy Value of Moving Average and Exponential Smoothing for Revenue Forecasting System at XYZ Company. *Journal of Systems and Informatics, 13 (2),* 36-45.

[9] [Nugroho, K. (2016). Prediction Analysis Model Using Fuzzy Time Series Method. *Gaussian Journal, 5(4),* 541-556.

[10] Ujianto, Y., & Irawan, M. I. 2015. Performance Comparison of Modified Fuzzy Time Series Forecasting Method and Backpropagation Artificial Neural Network (Case Study: JCI Closing Price). ITS Journal of Science and Arts. 4(2): 31-36

[11] Febriana, E.T. (2018). Fuzzy Time Series Chen High Order to Forecast the Number of Passengers and Ship Vehicles. Thesis. Faculty of Mathematics and Natural Sciences, *Universitas Islam Indonesia, Yogyakarta.* https://dspace.uii.ac.id/bitstream/handle/123456789/7826/Tugas%20Akhir_Ella%20Tasia%20Febriana_1 4611019. pdf?sequence=1

[12] Yulianto, M., Soeparmi, Cari, F. Anwar et al. 2021. Lung Cancer Classification Using Naïve Bayes with Filter Variations and Gray Level Co-Occurance Matrix (GLCM) Feature Extraction. Indonesian Journal of Applied Physics Vol.11 No.2. Page. 257-258.