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# K-Means Clustering Algorithm Measuring the Satisfaction Level of MNC TV Muslim I'murojaah Program Viewers

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***Keywords***

*Audience Satisfaction; I'Muorjaah Program; K-means Clustering.*

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***Abstract***

Television remains one of the most influential mass media platforms for disseminating information and entertainment to the public, with one notable example being the I'Murojaah program aired by Muslim TV on MNC Channels. The objectives of this study are to identify the level of viewer satisfaction with the I'Murojaah program, determine the indicators influencing viewer satisfaction, classify viewers based on their satisfaction levels, and provide recommendations to program managers to improve quality and viewer satisfaction. This study employs a qualitative approach using the K-Means Clustering algorithm. The data used in this study were obtained through a survey distributed to 100 respondents, covering several viewer satisfaction indicators such as content quality (6 questions) and program presentation (6 questions). The collected data were then grouped and analyzed. The results of the first cluster iteration distance calculation consisted of 84 viewers who were very satisfied, while the second cluster consisted of 16 viewers with relatively low satisfaction levels. The Davies Bouldin Index values were -0.674 for class 2 clustering, -2.001 for class 3 clustering, -1.961 for class 4 clustering, and clustering class 5 (-2.000). In conclusion, the best clustering performance results were for classes 2, 3, 4, and 5. The smallest Davies Bouldin Index value was for clustering class 2. Recommendations for program improvement include enhancing image and sound quality, ensuring that the equipment and technology used can produce optimal quality.

## 1. Introduction

Television is still one of the mass media that has a great influence in delivering information and entertainment to the public. In Indonesia, various television programs that contain religious values get special attention from viewers, one of which is the I'Murojaah program aired by Muslim TV on MNC Channels. This program aims to spread Islamic values and provide useful religious education for all levels of society. However, with the increasing competition in the world of television and the many choices of religious programs available, the manager of the I'Murojaah program needs to know the level of audience satisfaction. The level of audience satisfaction is one of the key indicators that can show the extent to which the program has successfully met the expectations and needs of the audience. In addition, knowing the level of audience satisfaction is also important for evaluating and improving the program to keep it relevant and interesting [1].

Based on an initial survey, there are several indicators that need to be considered regarding audience satisfaction, namely the quality of the content presented, the interaction between the host and the audience, and the way the program is presented. Some viewers complained that the picture and sound quality were not optimal, while others felt that the interaction with the audience was less intensive and the presentation of the program was sometimes monotonous. To analyze the level of audience satisfaction, an appropriate and effective method is needed. The K-Means Clustering algorithm is one technique that can be used to group audience data based on their level of satisfaction. This method can group the audience into several clusters based on the similarity of certain attributes, such as content quality, interaction, and audience interest. This study aims to determine whether student attendance affects the effectiveness of the learning process for fourth-grade students with mild intellectual disabilities. The results of the study used the Product Moment correlation test with a significance level (α) of 0. 05 or 5%, and the result obtained was 0. 51, which is greater than the Product Moment correlation value in the table with df = 108 – 2 = 106, which is 0.195[2].

Several studies have demonstrated the effectiveness of the K-Means algorithm in improving student grouping processes. For instance, research [3] shows that K-Means enhances accuracy and efficiency in assigning new students to appropriate majors, such as Light Vehicle Engineering, Motorcycle Engineering, and Software Engineering at SMK Muhammadiyah Paguyangan. This helps align student interests with suitable programs, thereby increasing their potential for academic success. For other study, the optimal number of clusters was determined using the Davies-Bouldin Index (DBI), with the best DBI value of 0.878 at k = 2. The resulting clusters High (Cluster_0) and Low (Cluster_1) can support the university in designing more targeted promotional strategies" [4]. Another implementation was conducted at Saschio Banyuwangi Math Tutoring [5], where a custom application built using Visual Studio Code, CodeIgniter, and MySQL was developed to group students based on their level of understanding. This system allowed for more tailored class grouping.

Similarly, a study at SMK Negeri 1 Jambi City [6] found that using K-Means clustering to group students by major based on 2018–2019 data helped mitigate mismatches between student interests and program placement, which often affect academic performance. In Tomohon City [7], researchers used K-Means to process school recommendation data for prospective high school students. Clustering data from ninth-grade students in the 2021/2022 academic year resulted in placement recommendations across five school regions, ranging from 61 to 117 students per region. In another study [8], the optimal number of clusters was determined using the Davies-Bouldin Index, which reached its lowest value of 1.5 at k = 8. After applying K-Means clustering, further analysis was conducted using a feature correlation heatmap. This visual tool highlighted the relationships between variables, with correlation coefficients ranging from -0.4 (negative correlation) to 1.0 (strong positive correlation), offering deeper insights into student data patterns.

Several prior works have demonstrated the K-Means algorithm's strength across diverse domains from clustering epidemiological data in Malang to segmenting customer sentiment and moderating cyberbullying content on social media. Notably, in other study utilized K-Means for epidemic mapping in Malang, showing its potential to uncover data patterns [9]. The other study applied the algorithm to customer satisfaction assessments, yielding clear sentiment clusters[10]. Similarly, a 2023 study used K-Means to classify Instagram

comments related to cyberbullying, effectively distinguishing toxic messages from neutral ones[11]. These studies together reinforce the algorithm's flexibility and effectiveness in structuring heterogeneous datasets.

Previous research on how to apply the K-Means Clustering algorithm to analyze viewer satisfaction with the I'Murojaah program broadcast by Muslim TV on MNC Channels has not specifically focused on analyzing viewer satisfaction with religious television programs. The purpose of this study is to identify and group viewers based on their satisfaction levels, group the indicators that influence satisfaction, and provide practical recommendations for program managers to improve the quality and appeal of the Muslim TV program I'Murojaah. This study employs a qualitative approach using the K-Means Clustering algorithm. Data was collected through a survey of 100 respondents, covering several viewer satisfaction indicators such as content quality (6 questions) and program presentation (6 questions), which were then analyzed using the K-Means Clustering algorithm for grouping.

The research hypothesis is that there is a significant relationship between indicators of content quality, interaction, and program presentation with viewer satisfaction levels. The independent variables in this study include content quality, interaction, and program presentation, while the dependent variable is viewer satisfaction levels. It can be concluded that the results of the first cluster iteration distance calculation consist of 84 viewers who are very satisfied, the second cluster consists of 16 viewers with relatively low satisfaction levels. The Davies Bouldin Index values are as follows: clustering class 2 (-0.674), clustering class 3 (-2.001), clustering class 4 (-1.961), and clustering class 5 (-2.000). The conclusion is that the best clustering performance results are for classes 2, 3, 4, and 5. The smallest Davies Bouldin Index value is for clustering class 2. Recommendations for program improvement include enhancing image and sound quality and ensuring that the technological equipment used can produce good quality.

## 2. Research Method

The series of research in this study is depicted in Figure. The initial process involves analyzing data on the level of satisfaction of the audience of the i'murojaah Muslim tv mnc channels program with the k-means algorithm method.

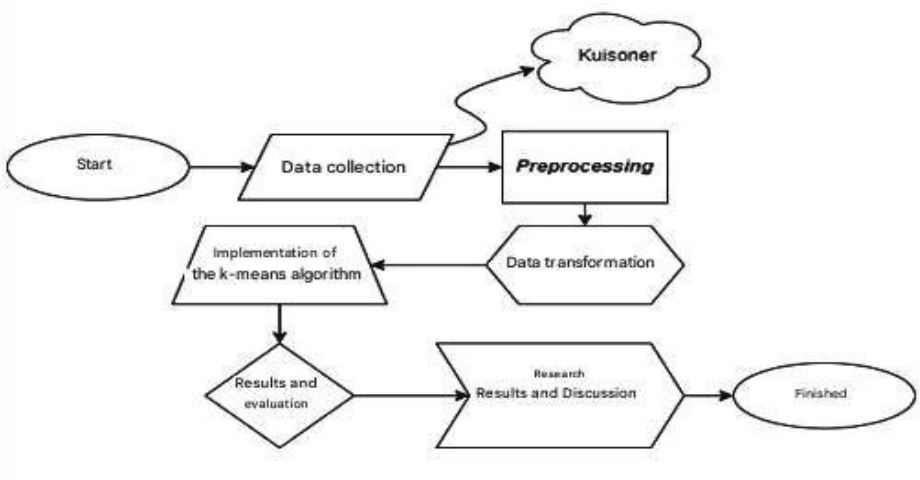


*Figure 1: Research flow*

Data collection was carried out by distributing questionnaires to a number of respondents who were viewers of the I'Murojaah program offline and online. "The use of Google Form allows researchers to easily create online questionnaires that can be accessed and filled in by respondents electronically. This significantly reduces the use of paper, making the data collection process more environmentally friendly and efficient"[12]. The questionnaire covers various indicators related to audience satisfaction, such as content quality, interaction between the host and the audience, and program presentation. To measure the attitudes, opinions, and perceptions of an individual or group of people toward a social phenomenon, a Likert scale is used. Rating Scale:

Using a 1-5 Likert scale, where Strongly Disagree: 1, Disagree: 2, Neutral: 3, Agree: 4, Strongly Agree: 5, the variables to be measured are translated into variable indicators. These indicators are then used as a starting point to develop instrument items, which can be statements or questions[11]. After the questionnaire is distributed, the data collected from respondents will be summarized and stored for the next stage of the research process. The target number of respondents for this data collection is 100 people.[13]. After the questionnaire is distributed, the data collected from the respondents will be recapitulated and stored for the next step in the research process. The number of respondents targeted for this data collection is 100 people. Research Sample To facilitate research and analysis, samples were taken from the audience population of the I'Murojaah program. "Samples were taken using simple random sampling to ensure fair representation of the entire population."[14]

Data preprocessing is an important stage in Data Mining, the accuracy and effectiveness of machine learning models that aim to process raw data into quality data that is ready for further processing" [15], the accuracy and effectiveness of machine learning models that aim to process raw data into quality data that is ready for further processing. This process is crucial because the quality of the input directly affects the quality of the output of the data analysis. At this stage, it is important to ensure that the data is consistent, accurate and has no gaps or duplicates. Even if the data collected looks complete, there are often still problems such as typos, incorrect values due to improper formatting, or duplicate data. These errors must be corrected to ensure accurate analysis results. Therefore, various preprocessing processes must be done carefully to ensure that the data used in data mining is quality and reliable. The preprocessing stages are data reducing, data cleaning, anda data tranformation. Data reduction is the process of reducing or reducing dimensions, attributes, or a number of data that are not needed. Data reduction is very useful for getting attributes and a number of data that will be used in this study. Data cleaning is the process of filling in missing values or missing or incorrect entries, correcting inconsistent data and detecting data redundancies, namely data accumulation or data duplication. Researchers conducted the data cleaning process with the Microsoft Excel application by filtering each column and looking for empty or missing data. Data transformation is the process of changing data to get better quality data or in accordance with the needs. After the file goes through the data reduction and data cleaning process, researchers have obtained attributes that match the needs.

The K-Means algorithm is an algorithm that requires k input parameters and divides a set of n objects into k clusters so that the similarity between members within a cluster is high, while the similarity with members in other clusters is very low[16]. The k-means method seeks to group existing data into several groups, where the data in a group has different characteristics from the data in other groups. The basis of the k-means algorithm is as follows[3]:

a. Prepare the dataset in the research
b. Determine the number of clusters or groups, in this study 2 clusters were determined, namely active clusters and inactive clusters.
c. Randomly select the centroid point
d. Initialization of cluster centers can be done in various ways. But most often done randomly. The cluster centers are given initial values with random numbers.
e. Allocation of all object data to the nearest cluster. The closeness of two objects is determined based on the distance of the two objects. Likewise, the proximity of data to a particular cluster with the distance between the data and the cluster center. In this stage, it is necessary to calculate the distance of each data to each cluster. The distance between one data and a particular cluster will determine which cluster a data belongs to. To calculate the distance of all data to each cluster center point, we can use the Euclidean distance theory which is formulated as follows:

$$d(x,y)=||x-y||=\sqrt{\sum_{i=1}^{n}(xi - yz)2 \ ; i = 1,2,3,...n}$$

Description:
D(xy) = Data distance to i to cluster center j
*X*i = Data to i on the kth data attribute
yi = Center point to i at the kth attribute

f. Recalculate the cluster center with the current cluster membership. The cluster center is the average of all data/objects in a particular cluster. If desired, you can also use the median of the cluster. So the average (mean) is not the only measure that can be used. The formula for determining the number of new cluster centroids is the result value divided by the number of results.
g. Reassign each object using the new cluster center, if the cluster center does not change then the Clustering process iteration is complete.

K-Means is one of the most popular and simplest clustering algorithms. This algorithm works by grouping data into a predetermined number of clusters. The KMeans process begins with selecting the desired number of clusters (k) and selecting the starting point used as the centroid of each cluster. Then, each data point is classified into the cluster whose centroid is closest to that data point. After all data points are classified, the centroid of each cluster is updated based on the average of all data points classified into that cluster. This process is repeated several times until there are no further changes in the data classification[17][].

Clustering is the act of grouping data, observations, or classes with similar objects known as clustering. The difference between clustering and classification is that the clustering procedure does not have a goal variable. "Clustering is one of the techniques known in data mining. The definition of clustering in data mining is a grouping of several data or objects into clusters so that each cluster will contain data that is as similar as possible and different from objects in other clusters"[3]. The purpose of clustering is to find structures in data that were previously unknown [18].

After the raw data obtained from the questionnaire is processed in the preprocessing stage and a dataset is ready to be processed, the next stage is to apply the k-means clustering algorithm to the dataset. In this study, researchers applied the k-means clustering algorithm using Microsoft Excel. The application requires several stages of the process as follows:

a. Determining the Cluster Center Point

The cluster center point, also known as the centroid, is the average point used to measure the distance between each data point in a cluster. The determination of the centroid location can be done randomly based on the researcher's preference, as long as the centroid value is within the range of data values on each attribute.

b. Calculating Data Distance to Each Cluster

After getting the center point value of each cluster, the next process is to calculate the distance of the data to each available cluster or can be called distance. The way to calculate the distance value in Excel is to use the SQRT formula or root function. With this function, the researcher does the calculation once and if it is successful, the researcher drags down to the lowest dataset.

c. Allocating Data into Clusters

After the process of calculating the data distance to each cluster is complete, the next process is to allocate data into each cluster formed. The data allocation is based on the results of the distance between the data to each cluster, if the distance value between the first data to cluster one is smaller than the distance value between the first data to cluster two. This data allocation is done to determine the center point of the new cluster in the next process. In this process, researchers allocate data using the IF function in Microsoft Excel, the function is as follows: =IF =Q2(N321<O321; "Cluster1"; "Cluster2"). After the process of allocating data or clustering this data is complete, researchers get the results, namely data that goes into clusters 1, and 2. These results researchers put into a new column next to the distance column.

d. Results of K-Means Application Using Microsoft Excel

After going through the stages of the k-means clustering process using the Microsoft Excel application, the next process is to display the results of the application.

To analyze audience satisfaction levels, an appropriate and effective method is required. The K-Means Clustering algorithm is one technique that can be used to group audience data based on satisfaction levels. "This method is able to group audiences into several clusters based on the similarity of certain attributes, such as content quality, interaction, and audience interest." [19].

RapidMiner adalah platform perangkat lunak yang kuat untuk ilmu data dan pembelajaran mesin. Ini menyediakan beragam alat untuk persiapan data, pemodelan, evaluasi, dan implementasi. RapidMiner dirancang untuk mudah digunakan dan memungkinkan pengguna untuk dengan mudah membangun dan menguji berbagai model, bahkan tanpa pengalaman pemrograman[20]. At evaluation stage, an evaluation is carried out to find the optimal cluster resulting from the k-means algorithm using the rapid miner application and the Euclidian Distance calculation.

The testing process is carried out to ensure that the resulting model is valid and consistent with the results of the calculations performed. The knowledge gained shows how efficiency of the analysis of the level of audience satisfaction with the i'murojaah program. Opinions from each viewer can be seen as a reference for satisfaction in watching the program, a reference for potential viewers, as well as feedback to the production team and program makers as input for the next program. Because of this, the opinion data generated from various programs or shows is very large and diverse. The phenomenon of an increase in program platform users is of course accompanied by increasingly diverse audience needs, such as how audiences interpret a platform from the aspects of use, experience, advantages, and disadvantages of the platform used and how different approaches to watching a show in terms of motivation with audience activities to bring satisfaction in a person when consuming a broadcast program from the platform used[21]. There are various factors that influence the assessment of this Muslim TV program. The assessment is influenced by the expectations of the audience before watching the show. Then the assessment can be concluded as the level of audience satisfaction. The audience will feel satisfied if the results they get after watching a match exceed their expectations before watching. In addition, the audience will feel dissatisfied if what they expect is not fulfilled when they have watched the program.

Data mining is the process of discovering patterns, relationships, or useful information from large data sets using statistical, mathematical, artificial intelligence, and machine learning techniques. The main purpose of data mining is to extract previously unknown and useful information from existing data[22]. Data mining stages are a series of steps or processes carried out to obtain valuable knowledge from a collection of data. These stages usually involve understanding the data, preparing the data, modeling, and evaluation. This is commonly referred to as KDD[23]. The data mining stage involves several steps that must be passed to get the desired results.

a. The first step is business understanding, which is understanding the goals and requirements of the data mining project from a business perspective. At this stage, the problem to be solved and the goal to be achieved are clearly defined.
b. The second step is data understanding, which involves collecting relevant data and understanding the characteristics of the data. This involves an initial exploration of the data to identify data quality issues or interesting patterns.
c. The next stage is data preparation, where the data that has been collected is cleaned and converted into a format suitable for analysis. This includes removing missing values, handling inconsistent data, and transforming the data into the required format.
d. Once the data is ready, the modeling stage is performed by selecting and applying appropriate data mining techniques, such as classification, clustering, or association, to extract patterns from the data.
e. Evaluation is the stage where the models that have been built are evaluated to ensure that they meet the business objectives and provide accurate results.

f. The results of the model are analyzed to determine whether the model is reliable and useful in the specified business context. The final stage is deployment, where the evaluated and approved model is applied in a real environment to make decisions or predict future outcomes. At this stage, the results of data mining are used to provide useful insights to the organization.

Data mining and knowledge discovery in database (KDD) are often used interchangeably to describe the process of extracting information hidden in a large database. Actually, the two terms have different concepts, but they are related to each other. And one of the stages in the whole KDD process is data mining.One of the stages in the whole KDD process is data mining. Existing data cannot be directly processed using a data mining system. The data must be prepared first so that the results obtained can be maximized, and the computation time is more minimal. This data preparation process itself can reach 60% of the entire process in data mining. The KDD process generally consists of 5 stages, namely data selection, pre-processing or cleaning, transformation, data mining, and interpretation/evaluation. The stages taken in the implementation of this research are as follows[7]:

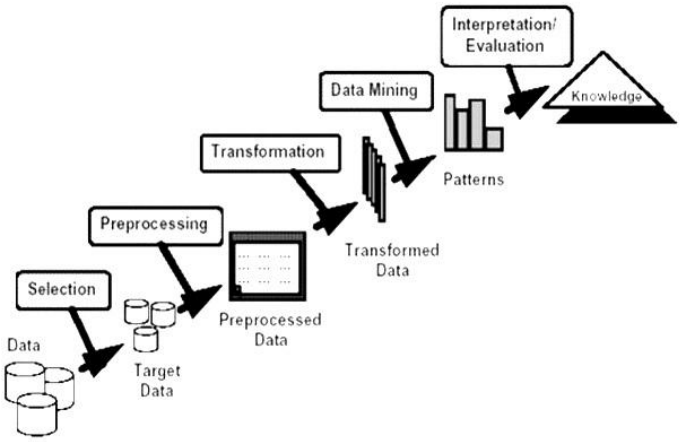


*Figure 2. KDD*

Data collection activities are carried out by utilizing Google Form services where the data collection process starts from distributing Google Form links to research subjects, namely viewers of the I'Murojaah Muslim Tv program in Jakarta directly or online through Muslim TV media followers, for example Instagram and Tiktok. Before the data is processed using the K-means Clustering method, the data first goes through a cleaning process which aims to remove duplicate data, check for inconsistent data, and correct errors in the data. Transformation process is carried out to adjust the value of the data range by initializing the variables in the data into certain values so that the data can be processed into the K-means Clustering method. At data mining stage, the author applies the K-means Clustering method. The K-means Clustering method was chosen for data processing in this study as the most familiar data mining processing method for the author with some experience managing data using the K-means Clustering method before. In this final stage is interpretation/evaluation. The results of data processing with the K-means Clustering method in Data Mining are then displayed for examination.

## 3. Result and Discussions

Data collection was carried out by distributing questionnaires to a number of respondents who were viewers of the I'Murojaah program offline and online. The questionnaire includes various indicators related to the level of audience satisfaction, such as content quality, interaction between the host and the audience, and program presentation. After the questionnaires are distributed, the data collected from the respondents will be recapitulated and stored for the next step in the research process. The targeted number of respondents for this data collection is 100 people.

*Table 1. Sample Data of The Questionnaire*

| Name | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 | P11 | P12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rivaldi Ahmad | 3 | 4 | 4 | 2 | 4 | 2 | 5 | 1 | 3 | 5 | 4 | 3 |
| Dwi Yuliati | 3 | 3 | 2 | 1 | 2 | 4 | 5 | 3 | 3 | 4 | 4 | 5 |
| Yasser Javier | 4 | 5 | 3 | 4 | 4 | 2 | 4 | 3 | 3 | 2 | 5 | 4 |
| Asgari Pradigta | 4 | 3 | 3 | 2 | 5 | 3 | 4 | 3 | 4 | 4 | 3 | 4 |
| Noval Satria | 3 | 4 | 5 | 3 | 4 | 5 | 1 | 2 | 4 | 3 | 4 | 5 |
| Farrel Ikhsan | 4 | 3 | 5 | 3 | 5 | 4 | 5 | 4 | 3 | 4 | 5 | 4 |
| Yohan Jauzan | 5 | 4 | 3 | 4 | 5 | 3 | 4 | 5 | 3 | 4 | 5 | 4 |
| Galendra Mahatma | 5 | 4 | 3 | 4 | 5 | 4 | 5 | 3 | 4 | 5 | 4 | 5 |
| Hans Arfred | 5 | 3 | 4 | 4 | 5 | 4 | 5 | 4 | 3 | 4 | 5 | 4 |
| Alyara Ginzly | 5 | 3 | 4 | 4 | 5 | 3 | 5 | 4 | 3 | 4 | 5 | 4 |
| Firman | 3 | 3 | 4 | 3 | 4 | 2 | 3 | 3 | 4 | 5 | 4 | 4 |

P1.How fast is the quality of the material conveyed in the I'Murojaah program?
P2.How relevant is the program content to everyday life
P3.How interesting are the topics discussed in this program
How innovative and creative is the way this program is presented
How satisfied with the way the program is presented as a whole
How consistent is the picture and sound quality during the program
P7.How does the I'murojaah program affect religious learning?
How effective was the way the program engaged the audience in discussion
P9.How satisfied with the opportunity to participate
P10.How likely to recommend the I'Murojaah program
P11.How often the program is modeled
P12.How much hope to continue watching this program in the future

The calculation of the k-means clustering algorithm is carried out by using the data from the questionnaire distributed to 100 viewers of the Muslim TV program distributed via the Google form link. The following data is the result of the questionnaire diagram of the Muslim TV program audience as follows::

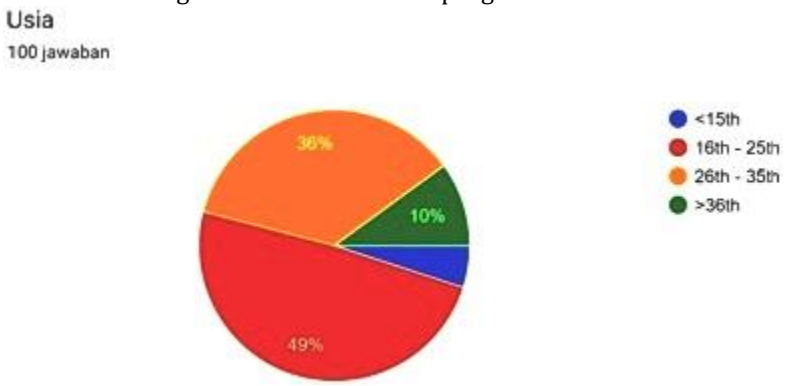


*Figure 3. Age Diagram*

In implementation and testing here we use a RapidMiner Studio Software Version 2024.0.1, by testing data using software we will compare how the results of data processing are manually with the results of data processing using a software. The number of clusters used in the questionnaire results above is 2 clusters, which are randomly selected data.

*Table 2 Initial Centroid*

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rivaldi Ahmad | 3 | 4 | 4 | 2 | 4 | 2 | 5 | 1 | 3 | 5 | 4 | 3 |
| Firman | 3 | 3 | 4 | 3 | 4 | 2 | 3 | 3 | 4 | 5 | 4 | 4 |

The distance between data points and cluster centers is calculated using Euclidean distance. To calculate all distances between data points and each cluster center.

*Table 3. Table of cluster data distance calculations in the first iteration*

| Name | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 | P11 | P12 | C1 | C2 | Closest Distance | Cluster |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rivaldi Ahmad | 3 | 4 | 4 | 2 | 4 | 2 | 5 | 1 | 3 | 5 | 4 | 3 | 0 | 3,5 | 0 | Cluster1 |
| Dwi Yuliati | 3 | 3 | 2 | 1 | 2 | 4 | 5 | 3 | 3 | 4 | 4 | 5 | 8,4 | 4,8 | 4,795831523 | Cluster0 |
| Yasser Javier | 4 | 5 | 3 | 4 | 4 | 2 | 4 | 3 | 3 | 2 | 5 | 4 | 5,7 | 4,4 | 4,358898944 | Cluster0 |
| Asgari Pradigta | 4 | 3 | 3 | 2 | 5 | 3 | 4 | 3 | 4 | 4 | 3 | 4 | 4,6 | 2,8 | 2,828427125 | Cluster0 |
| Noval Satria | 3 | 4 | 5 | 3 | 4 | 5 | 1 | 2 | 4 | 3 | 4 | 5 | 9,7 | 4,6 | 4,582575695 | Cluster0 |
| Farrel Ikhsan | 4 | 3 | 5 | 3 | 5 | 4 | 5 | 4 | 3 | 4 | 5 | 4 | 5,5 | 3,9 | 3,872983346 | Cluster0 |
| Yohan Jauzan | 5 | 4 | 3 | 4 | 5 | 3 | 4 | 5 | 3 | 4 | 5 | 4 | 6,5 | 4,1 | 4,123105626 | Cluster0 |
| Galendra Mahatma | 5 | 4 | 3 | 4 | 5 | 4 | 5 | 3 | 4 | 5 | 4 | 5 | 8,4 | 4,1 | 4,123105626 | Cluster0 |
| Hans Arfred | 5 | 3 | 4 | 4 | 5 | 4 | 5 | 4 | 3 | 4 | 5 | 4 | 6 | 4,2 | 4,242640687 | Cluster0 |
| Alyara Ginzly | 5 | 3 | 4 | 4 | 5 | 3 | 5 | 4 | 3 | 4 | 5 | 4 | 5,7 | 3,9 | 3,872983346 | Cluster0 |
| Firman | 3 | 3 | 4 | 3 | 4 | 2 | 3 | 3 | 4 | 5 | 4 | 4 | 4,3 | 0 | 0 | Cluster2 |

*Table 4 New centroid of the fourth interaction*

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C0 | 2,1 | 1,9 | 2,0 | 1,8 | 1,8 | 1,9 | 2 | 1,69 | 1,81 | 2,19 | 1,88 | 2,13 |
| C1 | 4,3 | 4,1 | 3,9 | 3,9 | 4,1 | 4,0 | 4,3 | 4 | 3,86 | 4,11 | 4,05 | 4,24 |

The results of repeated iterations up to the fourth iteration using data from the third iteration, with C1 having 16 data points and C2 having 84 data points, show that there is no change between the third and fourth iterations for each cluster within the centroid distance.

Determine the clustering of Class 2, Class 3, Class 4, and Class 5 using Cluster Distance Performance to see which is the best difference between clustering. The figure 3 below shows questionnaire data that will be processed using Rapid Miner with the k-means method to determine the best class clustering performance value.

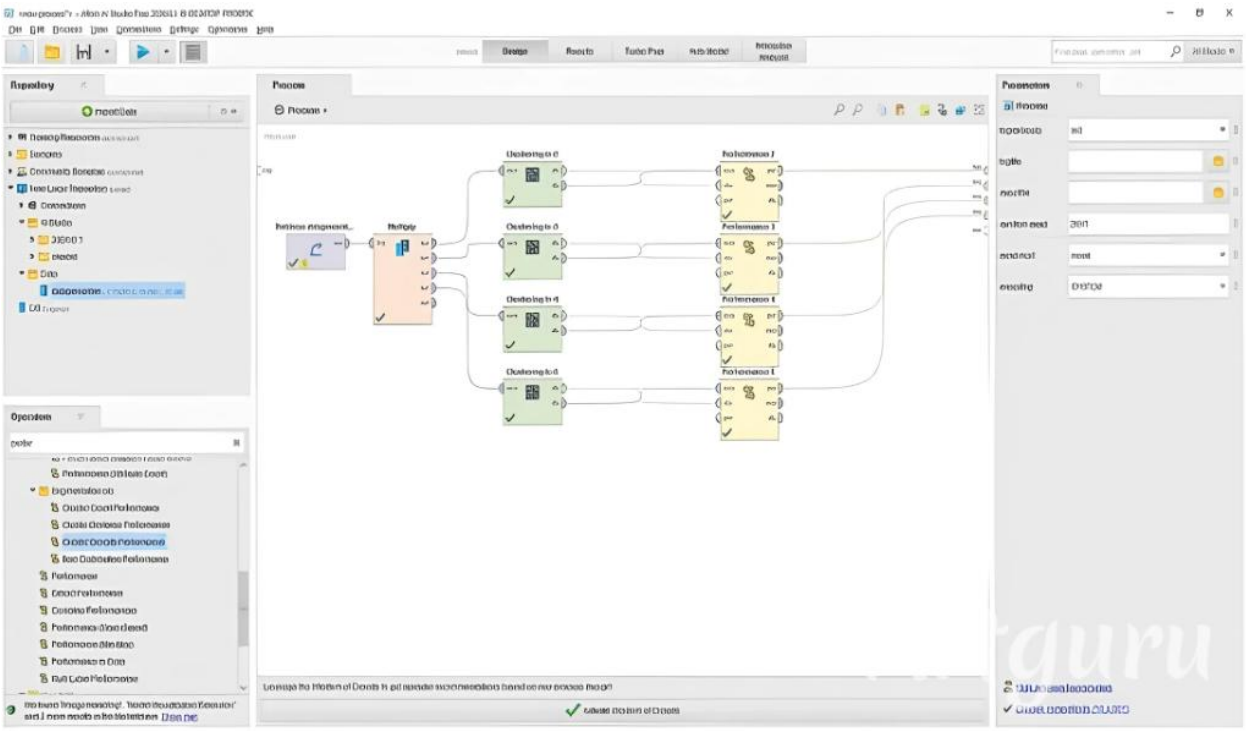

*Figure 4. Measurement process of clustering performance*

In Figure 4, the questionnaire data will be processed using Rapid Miner with the k-means method to determine the performance values of clusters Class 2, Class 3, Class 4, and Class 5**.** Cluster Distance Performance will be used to see which clustering is the best. The data was processed using RapidMiner and produced the best clustering performance value according to the Davies Bouldin Index. In Table 5, the best cluster and the smallest Davies Bouldin Index (DBI) value is clustering 2.

*Table 5. Performance Clustering*

| Cluster | Davies Bouldin Index |
|---|---|
| *cluster* 2 | **-0.674** |
| *cluster* 3 | **-2.001** |
| *cluster* 4 | **-1.961** |
| *cluster* 5 | **-2.000** |

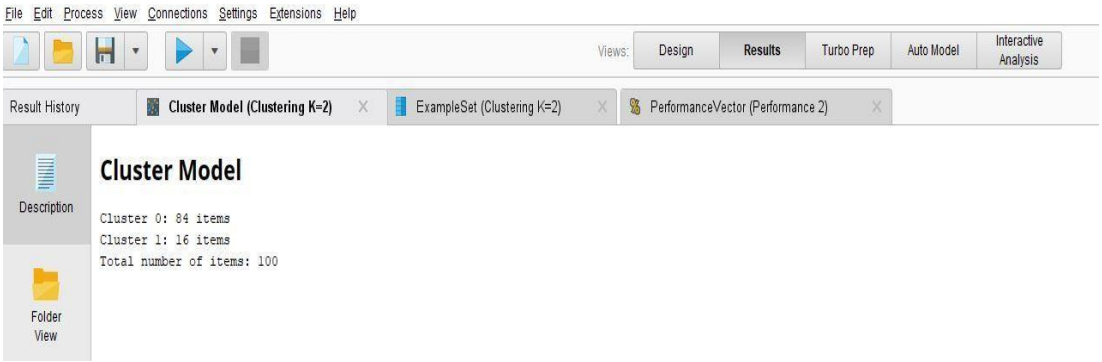


*Figure 5. Data from the Clustering Process Using Rapid Miner Software*

Figure 5 below shows a visualization using a packed bubble plot. The clustering process using the k-means 2 cluster method, where blue indicates cluster 0, which consists of 84 clusters, and green indicates cluster 1, which consists of 16 clusters.

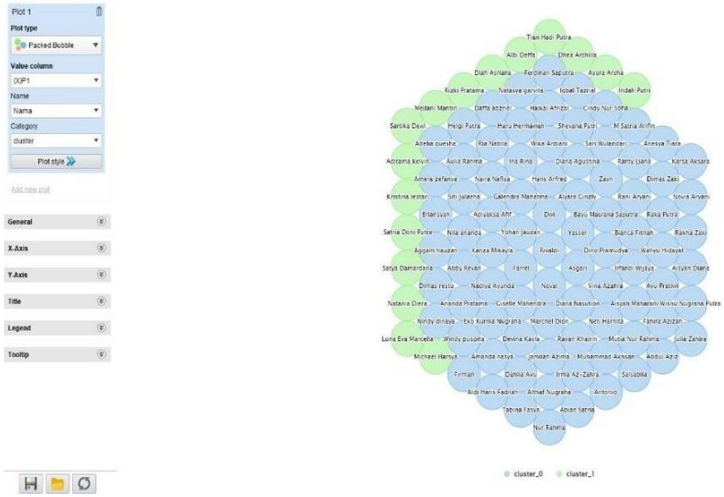


*Figure 6. Visualization of the Clustering Process Using the K-Means Method*

Figure 6 shows the best clustering results for cluster 2 using Rapid Miner software, which produced 84 clusters in cluster 0 and 16 clusters in cluster 1. It can therefore be concluded that 84 respondents were satisfied with the Muslim TV MNC Channels program and 16 respondents were dissatisfied.

## 4. Conclusions and Future Works

From the results of the study, it can be concluded that the level of audience satisfaction with the I'Murojaah program broadcast by Muslim TV on MNC Channels can be grouped into two clusters. The results of the first cluster iteration distance calculation consisted of 84 viewers who were very satisfied, while the second cluster consisted of 16 viewers who had relatively low satisfaction levels. The Davies-Bouldin Index values are as follows: clustering class 2 (-0.674), clustering class 3 (-2.001), class 4 clustering (-1.961), and class 5 clustering (-2.000). In conclusion, the best clustering performance results for classes 2, 3, 4, and 5 are those with the smallest Davies Bouldin Index values, which are found in class 2 clustering. Recommendations for program improvement include enhancing image and sound quality, ensuring that the equipment and technology used can produce high-quality results.

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