

# Neural Network Model Analysis in the Context of Tourist Attraction in Bandung City

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**Abstract:** This research is a development of sentiment analysis research on social media using a varied method or algorithm, namely the Neural Network to find out, understand, and analyze the sentiment analysis of Twitter users towards tourist attractions in Bandung City. Bandung City one of the top ten tourist cities in Indonesia, has a great interest in this tourism sector. Around 30% of Bandung City's Regional Original Revenue (Pendapatan Asli Daerah) in 2020 or around 210 billion came from the tourism sector, so it can be said that the life and death of Bandung City depends on the success of the tourism sector. However, there are still several problems that need to be observed so that the tourism sector in Bandung City can remain contributive and sustainable in the future. One of the things that needs to be observed based on the Accountability and Government Performance Report of the Bandung City Tourism and Culture Office in 2021 is that tourists have begun to feel bored when visiting Bandung City. The research method that researchers use is the Mix Method with Explanatory sequential design. The qualitative stage includes crawling data with text characters from Twitter, processing data, and interpreting and analyzing data. As a result, the boredom of tourists is partly due to the lack of variety of tourist attractions and the lack of new tourist attractions in Bandung City.

**Keywords:** neural network model, tourism, attraction, local government.

## 1. INTRODUCTION

Urban tourism is a tourism activity that takes place in cities where historical heritage is not the main attraction, although urban settlements have some buildings that date back to the Industrial Revolution. Urban tourism includes a wide range of activities and experiences from sightseeing, visits to cultural attractions (such as galleries, concerts, operas, shows, museums etc.), attending special events, shopping, eating and drinking in restaurants, meeting people (family and relations), dancing and so on [1].

Urban areas were recognized as important venues for tourism decades ago, cities have always attracted people to visit tourist attractions and experience a variety of activities, including iconic attractions, cultural and artistic events, shopping facilities, and cuisine, the diversity of these environments. Tourism became the attraction of choice for such cities, which saw opportunities to boost their economies and improve their facilities through these activities. In the early 21st century, policymakers in most cities became aware of the potential of urban tourism as a means of regenerating historic city centers, these neighborhoods are now considered important tourist attractions by many visitors [2].

People are attracted to cities because big cities are considered centers of opportunity and high social activity. Therefore, leisure has also served people well in the city because the facilities in the city are easily accessible. With the development of infrastructure in some of the world's major cities, visitors to cities are not only urbanites looking for better livelihood opportunities, but urbanites also look to cities for

cheap and accessible recreation. Tourists visit big cities to shop, enjoy food and drink, learn about culture, see special events, watch theaters and casinos in Hall [3].

An urban tourist is someone who lives within the city or outside the city and intentionally travels to visit a city. They may be residents of the country or even of another city or town (resident). A more restrictive definition of tourists is for those who spend at least one night in their destination city. They may stay in tourist lodgings, or with friends and relatives.

Urban areas were recognized as important places for tourism only a few decades ago, cities have always attracted people interested in visiting and experiencing a variety of activities, including iconic attractions, cultural and artistic events, shopping facilities, and cuisine, as well as people interested in experiencing the vivacity, excitement, and diversity of these areas.

**Table 1** Ranking of Tourism Cities in the World

Ranking	2010	2012	2014	2016	2018
1.	London	Bangkok	London	Bangkok	Bangkok
2.	Paris	Paris	Paris	London	Paris
3.	Bangkok	London	Bangkok	Paris	London
4.	New York	Singapore	Dubai	Dubai	Dubai
5.	Kuala Lumpur	Dubai	New York	Singapore	Singapore
6.	Singapore	New York	Singapore	New York	Kuala Lumpur
7.	Dubai	Kuala Lumpur	Kuala Lumpur	Seoul	New York
8.	Hong Kong	Istanbul	Istanbul	Kuala Lumpur	Istanbul
9.	Shanghai	Hong Kong	Seoul	Tokyo	Tokyo
10.	Rome	Seoul	Hong Kong	Istanbul	Antalya
11.	Istanbul	Barcelona	Tokyo	Hong Kong	Seoul
12.	Barcelona	Milan	Barcelona	Barcelona	Osaka
13.	Seoul	Rome	Amsterdam	Amsterdam	Makkah
14.	Amsterdam	Amsterdam	Milan	Milan	Phuket
15.	Milan	Shanghai	Rome	Taipei	Pattaya
16.	Vienna	Vienna	Taipei	Rome	Milan
17.	Tokyo	Prague	Shanghai	Osaka	Barcelona
18.	Taipei	Tokyo	Vienna	Vienna	Palma de Mallorca
19.	Lima	Taipei	Prague	Shanghai	Bali
20.	Riyadh	Los Angeles	Los Angeles	Prague	Hong Kong

Source: Based on data from the Mastercard index (2014, 2017, 2019).

Furthermore, urban areas are places where innovation happens, wealth is created and skill complexes are developed. They are also places where people live, shop, or enjoy leisure activities, making cities an engine of growth for the regions in which they are located, or even for entire countries. This is particularly true for capital cities such as Seoul, Athens, Tokyo, Paris, etc. Large cities in particular serve as hubs for development as they are places where businesses concentrate, and accommodation and transportation facilities are developed, thereby providing excellent infrastructure for tourism activities [3].

On the other hand, Bandung, as one of the top ten tourist cities in Indonesia, has a great interest in the tourism sector. Approximately 30% of its Regional Original Revenue in 2020 or around 210 billion came from the tourism sector. It can be said that the life and death of Bandung depends on the success of its tourism sector. However, despite its considerable contribution to the economic growth of Bandung City, the tourism sector still has several problems that need to be examined to be able to remain contributive and sustainable in the future. One of the things that is quite interesting to observe is that based on the Government Accountability and Performance Report of the Bandung City Tourism and Culture Office (*Laporan Akuntabilitas Kinerja Instansi Pemerintah*) 2021, tourists began to feel bored when visiting Bandung. This is due, among others, to the lack of variety of tourist attractions and the lack of new tourist attractions in Bandung City [4].

This research is also research that needs to be done and needs to be improved in line with the opinion of Singalen [5], namely in the form of developing sentiment analysis on social media using varied methods or algorithms (BM25, Decision Tree, K-Means, and Neural Network) and is relevant to case studies or the scope of discussion in the context of education

delivery, government bureaucratic dynamics, health facilities and services, and activities of non-governmental organizations.

## 2. METHODS

The research method that researchers use is the mixed method with an Explanatory sequential design [6]. Qualitative methods can be shown by text analysis using keywords as search material. The quantitative method is indicated by the amount of data on the opinions of Twitter users. This is done to obtain data and analyze public opinion sentiments associated with tourist attractions in Bandung City.

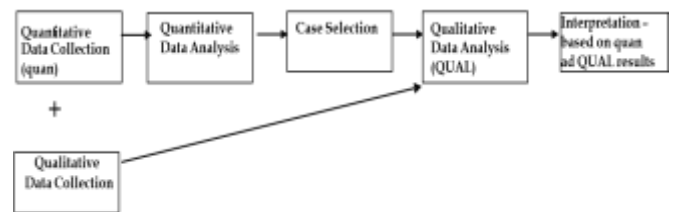


Fig. 1 Stage of Explanatory Sequential Design

The qualitative stage includes crawling data with text characters from Twitter, processing data, and interpreting and analyzing data [7]. This research uses several keyword variables. The variable measured is the number of tweets that can be identified that contain elements of keywords using text mining algorithms. The software equipment or software needed in conducting this research are:

- 1) Netlytics 3.1 software as programming to retrieve tweets data from Twitter. [8]
- 2) Orange software to process qualitative data and perform sentiment analysis. [9]

The data collected for this research consists of Twitter data obtained by crawling data using tweet element settings that contain keywords data, namely "Bandung tourist destination". Then set the tweet search from December 1, 2022, to December 17, 2022, with the condition that the language used is Indonesian. The data retrieval uses the help of Netlytics 3.1 software.

## 3. RESULTS AND DISCUSSION

### 3.1 Results

#### 1. Research Scenario

Search results using the keyword "Bandung tourist attraction" using Netlytics 3.1 software in the period December 1st – 17th, 2022. The search results using these keywords resulted in 161 tweets. The data from 161 tweets was downloaded into CSV format and then processed using Orange software [10]. Furthermore, text processing was carried out until the analysis sentiment was obtained using Orange software with the following research scenario:

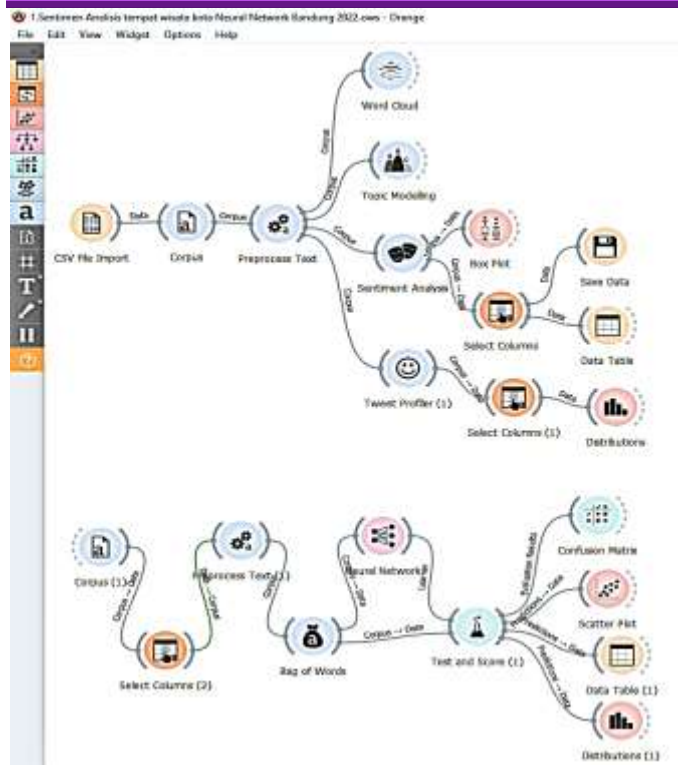


Fig. 2 Research Scenario

### 2. Processing Text

Processing Text uses Orange software to perform the transformation, tokenization, normalization, and filtering using an Indonesian dictionary that is tailored to the needs and made by the researcher himself.

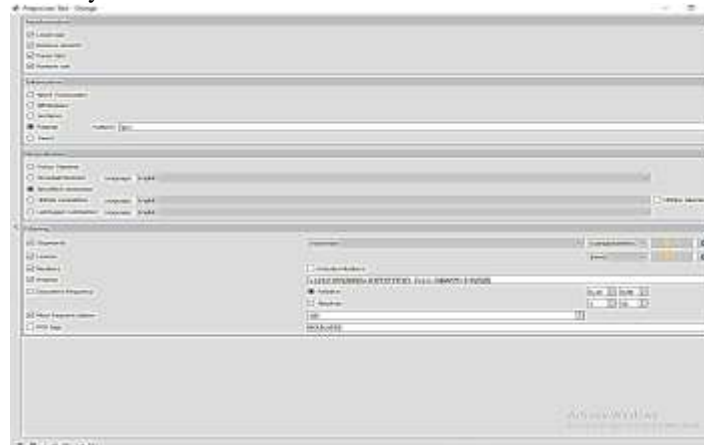


Fig. 3 Processing Text

### 3. Words Cloud

From the results of Processing Text using Orange software [11] by performing transformation, tokenization, normalization, and filtering using an Indonesian dictionary that is tailored to the needs and made by the researchers themselves, the Words Cloud is obtained as follows:



Fig. 4 Words Cloud

### 4. Topic Modeling

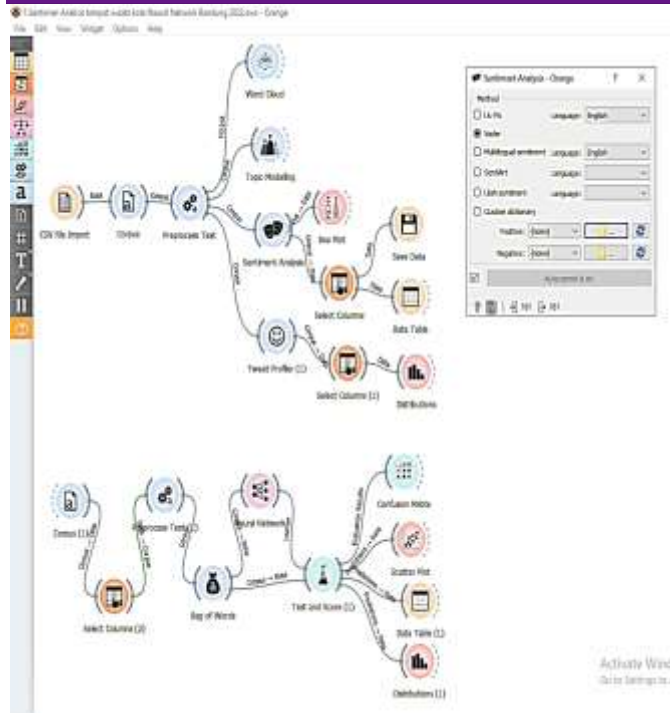
From the results of Processing Text using Orange software by performing the transformation, tokenization, normalization, and filtering using an Indonesian dictionary that is tailored to the needs and made by the researcher himself, the following topic modeling arrangement is obtained:



Fig. 5 Topic Modeling

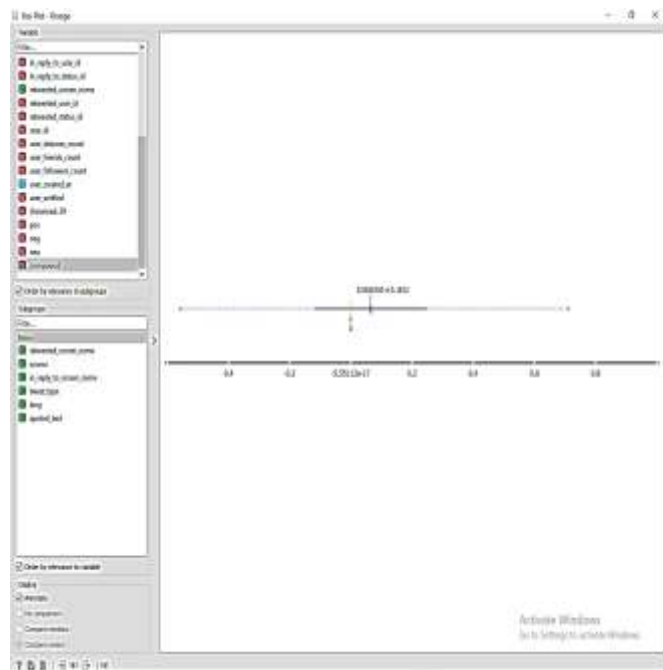
### 5. Sentiment Analysis

Then sentiment analysis is carried out with the Vader method, the Sentiment Analysis is obtained as follows:



**Fig. 6 Sentiment Analysis with Vader Method**

The results of sentiment analysis with the Vader method in the form of a Box Plot are obtained as follows:



**Fig. 7 Sentiment Analysis in the form of Box Plot**

The sentiment analysis value obtained is  $0.0650193 \pm 0.1812$  or has a value above 0 or positive. In other words, the sentiment of Twitter users towards tourist attractions in Bandung City is positive or good.

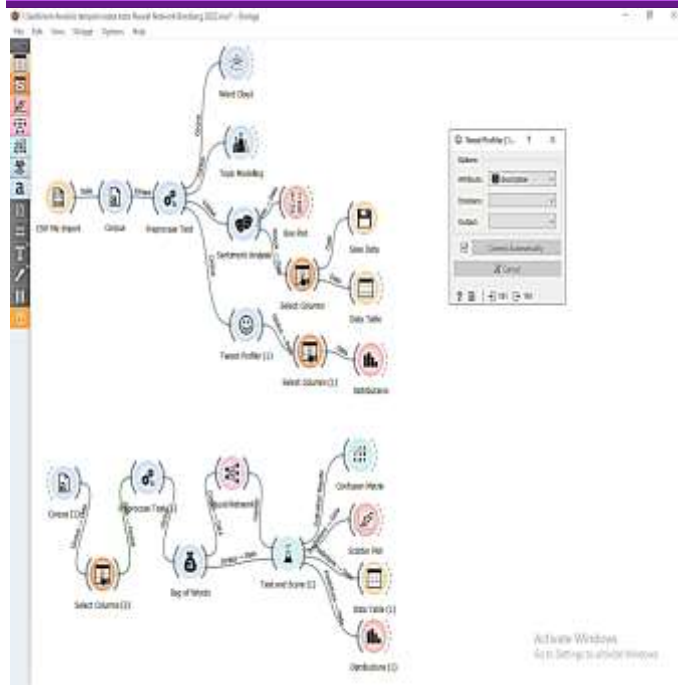
When viewed in the form of a sentiment analysis table, the results are as follows:

**Table 2 Categories of Sentiment Analysis**

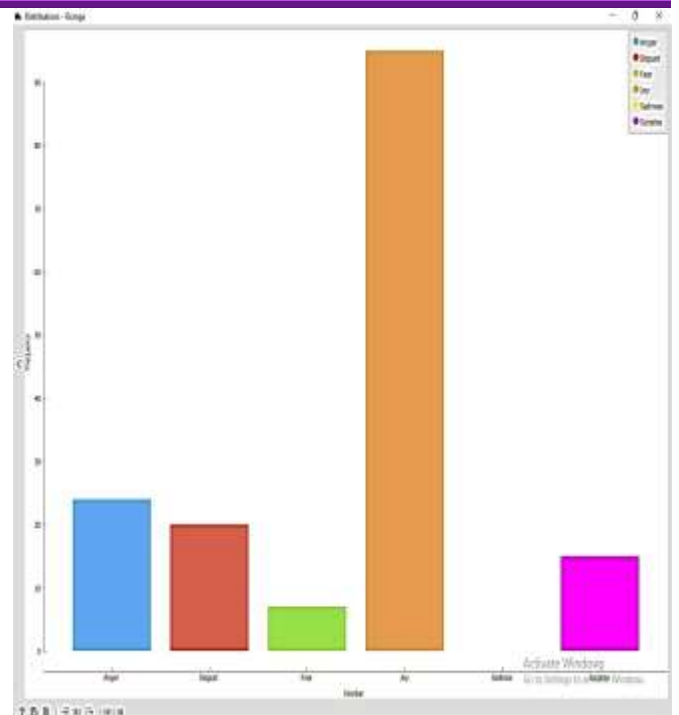
### 6. Tweet Profiler

The Tweet Profiler retrieves sentiment data from the server for each given tweet (or document). The widget sends the information to the server, where the model calculates probabilities and/or emotion scores. The widget supports 3 emotion classifications, namely Ekman's, Plutchik's, and Profile of Mood States (POMS). There are 3 categories of emotion classification, namely Ekman's, Plutchik's, or Profile of Mood States [12].

Multi-class classification will produce a single emotion that is very likely to be a single document, while multiple labels will create values in columns for each emotion. This research will use Content attributes for analysis, Ekman emotion classification with multi-class options, and choose to observe the Emotion variables that have been grouped with orange data mining. This study uses data from 161 tweets about tourist attractions in Bandung City. Data that has been crawled using widgets from orange data mining with Corpus and connected to Tweet Profiler.



**Fig. 8** Tweet Profiler



**Fig. 9** Distribution

### 7. Distribution

The Distribution widget displays the distribution of discrete or continuous attribute values. If the data contains a class variable, the distribution can be conditioned on the class. After doing a tweet profiler on the widget, the next step connects the corpus to the distribution. The results will show 6 forms of emotion from the Twitter data that has been input. In this study, the widget displays the emotions of Twitter users with the keyword "Bandung tourist attraction". From the results of these 6 emotions, the data shows that the response from Twitter as of December 1-17, 2022 is Joy and Anger.

There were 95 tweets or 59.01% that felt Joy while 24 tweets or 14.91% felt Anger. This is interesting because two extreme emotions dominate which are Joy and Anger and no one expressed Sadness.

### 8. Neural Network Model

Sentiment analysis data with xls extension that has been labeled and then imported through the corpus widget in Orange Data Mining. Next, a select column is used to select only the Sentiment and Content columns that will be used for further analysis. Table data is used to display tweet data based on the columns we have selected as shown in the table below.

Table 3 Sentiment Data Analysis

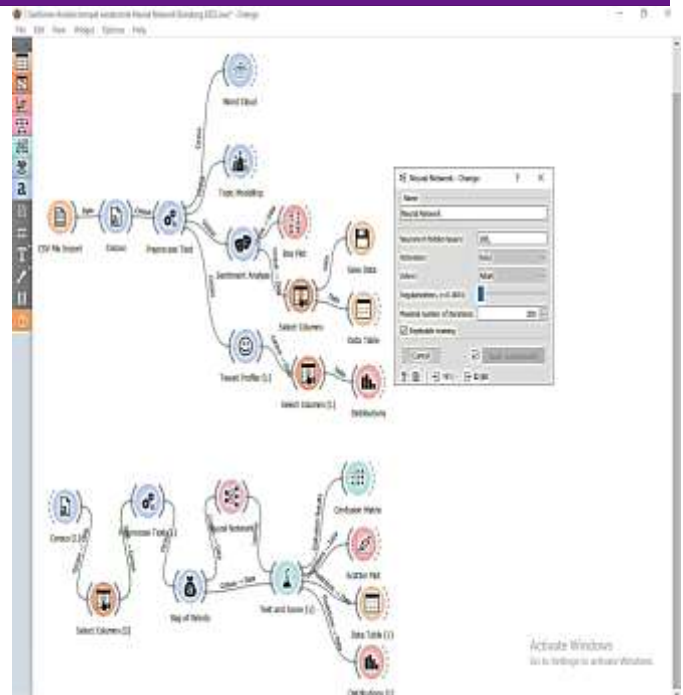


Fig. 10 Neural Network

Furthermore, the sentiment data is preprocessed again as before, the difference here is that it is necessary to add a most frequent tokens filter component so that it can be limited to what words are important to process. Next, a bag of words is used to convert text data into vectors that can be understood by computers. This method helps to calculate the frequency of word occurrence in the entire document. Each word occurrence frequency is calculated and given the probability of occurrence of positive, negative, and neutral classes [13].

To make predictions, it can be done by matching each word in the testing data and then calculating the probability per word in the corpus. The three classes will be compared which is the highest to provide a decision that a tweet can be classified into positive, negative, or neutral classes. In this research, the classification of sentiment analysis is carried out using the Neural Network algorithm.

### 9. Neural Network Algorithm.

The method applied in this process is the Multilingual Sentiment method in the Indonesian language using the Sentiment Analysis widget in Orange Data Mining software [9]. The Multilingual Sentiment database on the range of Data Mining software is sourced from the Data Science Lab website which stores lexicon or word dictionaries from various languages in the world. The Indonesian Lexicon on the Data Science Lab website has two files containing a collection of words that have positive and negative sentiment values.

Each text data is analyzed and goes through a calculation process to find the score of each label or sentiment value. The sentiment with the highest score will then be the result of a prediction from the application of classification with the Neural Network algorithm. Through the help of the confusion matrix widget, it is possible to evaluate the performance of the Neural Network algorithm using the confusion matrix reference. Based on the confusion matrix results as presented in Figure 10, we can calculate and determine accuracy, precision, and recall. The test & F1 score widget automatically calculates accuracy, precision, recall, and F1 score with the following results:

- 1) Accuracy: 90,60 %
- 2) Precision: 90,60 %
- 3) Recall: 91,30 %
- 4) F1 score: 90,60 %

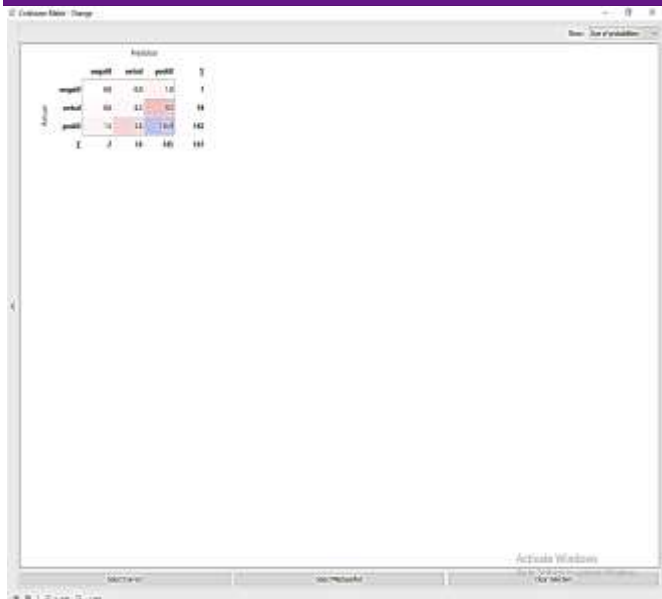


Fig. 11 Confusion Matrix Result

Visualization of sentiment classification results using the Neural Network algorithm can be seen in Figure 11. Visualization is done using the Distributions widget.

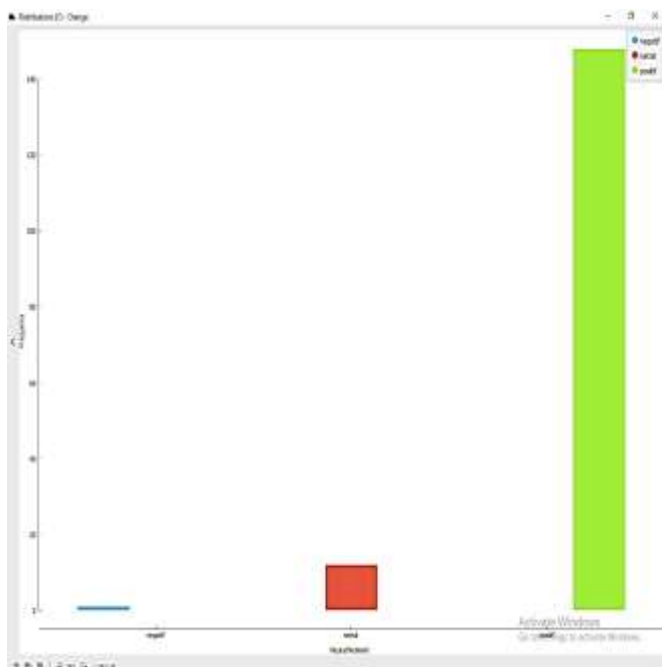


Fig. 12 Neural Network Distributions

According to the analysis of the Neural Network algorithm model, it can be seen that the positive sentiment of Twitter users towards tourist attractions in Bandung City is 148 tweets or 91.93%. While the negative sentiment of Twitter users towards tourist attractions in Bandung City is 1 tweet or 0.62%. While the neutral sentiment of Twitter users towards tourist attractions in Bandung City is 12 tweets or 7.45%.

### 3.2 Discussion

The results of crawling data from 161 Twitter users' Tweets about tourist attractions in Bandung City are as follows:

1. The value of sentiment analysis is  $0.0650193 \pm 0.1812$  or in other words, the sentiment of Twitter users towards tourist attractions in Bandung City is generally good.
2. Sentiment analysis of the Neural Network algorithm model shows that Twitter users' opinions of tourist attractions in Bandung City that provide positive sentiment are 148 tweets or 91.93%, negative sentiment is 1 tweet or 0.62% and neutral sentiment is 12 tweets or 7.45%.
3. The description of Twitter users' emotions towards tourist attractions in Bandung City is Joy and Anger. Twitter users who feel Joy are 95 tweets or 59.01% while those who feel Anger are 24 tweets or 14.91%.
4. Based on the results of accuracy, precision, and recall. widget test & F1 score obtained values above 80% so it can be said that the Neural Network algorithm can perform sentiment analysis accurately on tourist attractions in Bandung City.
5. Based on the results of the description that has been explained, it is found that the sentiment analysis value of Twitter users towards tourist attractions in Bandung City is  $0.0650193 \pm 0.1812$ , which has a value above 0 or positive. In other words, the sentiment of Twitter users towards tourist attractions in Bandung City is generally good. Through sentiment analysis of the Neural Network algorithm model, it can be seen that the positive sentiment of Twitter users towards tourist attractions in Bandung City is 148 tweets or 91.93%. While the negative sentiment of Twitter users towards tourist attractions in Bandung City is 1 tweet or 0.62%. While the neutral sentiment of Twitter users towards tourist attractions in Bandung City is 12 tweets or 7.45%.
6. While the emotions of Twitter users are Joy and Anger. Twitter users who have Joy are 95 tweets or 59.01% while those who feel Anger are 24 tweets or 14.91%. This is interesting because two extreme emotions dominate which are Joy and Anger and no one expressed Sadness. Other findings are based on the results of accuracy, precision, and recall. widget test & F1 score obtained using Orange Data Mining tools can produce values above 80% so it can be said that the Neural Network algorithm can perform sentiment analysis accurately on tourist attractions in Bandung City.

This research shows that tourist attractions in Bandung City are generally pleasant for tourists who come to visit them, even so, they still have several shortcomings that give a sense of dissatisfaction to tourists due to existing shortcomings such as facilities, location access, and traffic congestion. However, this does not make tourists feel disappointed. Tourists want improvements to tourist attractions in Bandung City to reduce existing inconveniences, and Bandung City is considered to provide

joy or Joy and a city without sadness or Sadness. In the opinion of this researcher, it shows that tourist attractions in Bandung City are fun even though it still gives a sense of dissatisfaction due to some existing shortcomings such as facilities, location access, and congestion, however, it does not make them feel disappointed. Tourists want to improve tourist attractions in Bandung City to reduce the existing inconvenience, and Bandung City is considered to provide joy or Joy and a city without sadness or Sadness.

In addition to tourist attractions, the existence of adequate accommodation must certainly be considered. Kurniansah argues that urban tourism is a form of tourism that utilizes urban resources such as economic activities, museums, city parks, malls, cafes, and eating places as tourist attractions [1]. Furthermore, Utama argues that a city deserves to be developed as urban tourism must have several main components, namely the existence of a city hall, a street area that means myth and nostalgia, a city monument that means historical, typical city culinary, campus or university, mall or shopping center, traditional market, square, city park, city museum, night market, and other resources [14].

The component is a tourist attraction, to further support the components of urban tourism must be integrated with the components of tourism products such as amenities (hotels, restaurants, and travel agents), Accessibility (roads and transportation equipment), and Ancillary (government and non-government organizations). With the main components and supporting tourism product components, it can provide an overview that the tourist attraction in an area is ready to organize tourism activities [15].

Food/culinary has social and symbolic meanings, namely first, as a social expression, second, as identity, third, as an expression of solidarity, fourth, food as part of tradition and heritage or cultural heritage, fifth as a treatment and others [16]. These functions and meanings make food authentic and unique, rare because of its historical, traditional, and philosophical value. Then supported by the quality of taste, aroma, color, shape, nutritional content and nutrition, hygiene, service, and the integrity of supporting facilities such as interior design or layout, which sometimes retain the original concept but are arranged in such a way as to maintain comfort for tourists.

Traditional food is food that is processed from local food products, whose process of making it has been mastered and the result is a product whose taste, shape, and way of eating are known and characterize a particular community [17]. Traditional food/culinary is one of the cultural treasures that must be explored again through revitalization and transformation processes. So that it can be sustainable. This needs to be done to offset the invasion of foreign culinary and culinary franchise models as a result of free markets and globalization [18].

UNWTO in its presentation in the Global Report on Food Tourism (UNWTO). conveyed that several things can attract tourists to culinary-based tourist attractions (UNWTO, 2018). The presentation said that 79% of tourists stated that their motivation for traveling was to attend culinary activities or

events (food events) held in a tourist destination. 63% stated that they wanted to feel the sensation of culinary tourism activities (food tours), and as many as 62% of tourists stated their motivation was to learn local food by doing hands-on cooking practices (cooking workshops).

According to Sulistyono as a determinant of Indonesia's tourism development, communities in each region need to adjust the tourism industry according to their respective branding slogans. Maintaining local wisdom and building a positive mental attitude in the local community is not so easy but very important, the spirit and intention to participate in socialization branding to change their lives for the better[20].

The role of local communities requires agreement from other parties related to the rules and commitment to realize the high awareness set out in government policies and regulations, by improving the attitudes and behaviors of local communities on the concept of branding their respective cities.

The future aspect of urban tourism in Bandung City should start creating thematic villages, which is one of the good examples of social innovation. According to Kłoczko-Gajewska, a thematic village is a village where the community decides to develop their area based on an idea or topic that can make the village easily recognizable and one of the best [21]. Then according to Atkočiūnienė & Kaminaitė, thematic villages have the aim of overcoming poverty, especially the problem of fulfilling basic needs, encouraging the local economy by exploring the potential of the community economy as a stimulus for regional development, and improving the quality of the community's living environment..

#### 4. CONCLUSION

Urban tourism in Indonesia has received important attention since the 2000s and began to be seriously developed by the Ministry of Tourism and Creative Economy along with the City Government in Indonesia. The implementation of urban tourism has a positive impact as an alternative tour in addition to natural and rural tourism that has been well developed so far so that it can generate economic growth and sustainable development in the community.

The neural network model analysis of Twitter users towards tourist attractions in Bandung City is as follows: first, Twitter users' sentiments towards tourist attractions in Bandung City are generally positive or good. Afterward, based on the results of accuracy, precision, and recall. widget test & F1 score obtained values above 80% so it can be said that the Neural Network algorithm can perform sentiment analysis accurately on tourist attractions in Bandung City.

The limitation of this research is that the sampling data is not comprehensive and holistic from four types of social media where the research sample is only taken from the perspective of microblogging social media applications, namely Twitter. Further research on neural network model analysis of tourist attractions in Bandung City, needs to be carried out on types of video sharing media (Video Sharing)



such as YouTube, Vimeo, and DailyMotion, social network sharing social media such as Instagram, as well as professional network sharing social media such as LinkedIn, Scribd, or SlideShare.

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