Parameter: Journal of Statistics
Available at https://bestjournal.untad.ac.id/index.php/parameter
Vol. 4 No. 2 2024, 54 - 64
DOI: *https://doi.org/10.22487/27765660.2024.v4.i1.17143*
eISSN: 2776-5660

BUSINESS INTELLIGENCE PRESIDENTIAL CANDIDATES BASED ON SOCIAL NETWORK ANALYSIS WITH TWITTER DATA

Ichsan Ali[1], Abba Suganda Girsang[2*]

[1]Computer Science Department, BINUS Graduate Program-Master of Computer Science, Bina Nusantara University, Jakarta, Indonesia 11480.
[2]Computer Science Department, BINUS Graduate Program-Master of Computer Science, Bina Nusantara University, Jakarta, Indonesia 11480

***e-mail**: agirsang@binus.edu

ABSTRACT

The twitter social network is widely used to discuss all kinds of topics, including those related to politics. Analyzing online conversations on Twitter to map the popularity of political figures as candidates for the Indonesian presidential election is a popular and challenging research area. In the Twitter network, citizens can express themselves and communicate with political figures. The conversational data in Twitter is very complex, so Business Intelligence is needed to transform raw data into meaningful and useful information to see the popularity of Indonesian presidential election candidates. The analysis used is Social Network Analysis (SNA) by measuring Degree Centrality, Eigenvector Centrality, Betweenness Centrality, Closeness Centrality. The presidential candidates in this study, Ganjar Pranowo with a twitter account "ganjarpranowo", Puan Maharani with a twitter account "puanmaharani_ri", and Anies Baswedan with a twitter account "aniesbaswedan". The actor "aniesbaswedan" excels in the value of degree centrality and betweenness centrality. The "aniesbaswedan" account is the actor who has the most influence on social network interactions based on the total number of interactions generated, then the account also becomes a bridge or liaison in the interactions of other actors in the network.

Keywords: centrality, degree, density, SNA

Cite: Ali, I., & Girsang, A. S. (2024). *Business Intelligence Presidential Candidates Based on Social Network Analysis with Twitter Data. Parameter: Journal of Statistics, 4(2), 54–64,* https://doi.org/10.22487/27765660.2024.v4.i2.17143.

*Received: June 2024; Reviewed: June 2024; Published: Dec 2024

INTRODUCTION

The growth of internet users is increasing every year. Indonesia has 202.6 million internet users out of the total population of Indonesia which reaches 274.9 million people (We Are Social, 2021). This number is increased 27 million or 16 percent compared to the previous year. As many as 61.8% percent of the people use the internet to access social media equivalent to 170 million people. One of the popular media in Indonesia is Twitter. In 2021 the number of twitter social media users is 65% (We Are Social, 2021).

As social media, twitter has the advantage of displaying trending topics and updating topics of conversation on social media that are currently being discussed (Maclean et al, 2013). Twitter users can share opinions, activities, and interactions with other users. Twitter's social media communication structure utilizes a network (network). Data analysis can identify the structure of social media networks using Social Network Analysis (SNA) (Wasserman & Faust, 1994).

The presence of SNA is useful in reading the dynamics of interaction between network users and then analyzing it. The SNA method is able to analyze patterns in the form of paths, neighborhoods, and densities, centrality, centralization, clicks, positions, sets, clusters, network dynamics, and their changes over time (Pappi & Scott, 1993).

Previous research on SNA for mapping on online community groups on Facebook (Yuliana, Santosa, & Setiawan, 2015). SNA analysis with node and vertex measurements using Microsoft NodeXL software. Tuhuteru & Iriani conducted analytical research on scientific research collaboration of faculty X lecturers by conducting social network analysis (SNA) research (Tuhuteru & Iriani, 2018). The centrality used in this study, namely degree centrality, betweenness centrality and closeness centrality. SNA analysis using the UCINET v6.6280 program and visualized with the NetDraw v2.160 program.

Inayah and Purba conducted research on social network analysis on the spread of corona virus information on twitter by using measurements to measure degree centrality, closeness centrality, and eigenvector centrality scores. The software used in the data processing is Rstudio 4.0.2, and Gephi 0.9.2. Rstudio is used in the process of retrieval and cleaning of tweet data, and Gephi is used to perform Social Network Analysis (SNA) (Inayah & Purba, 2020).

Other research, namely social network analysis on Twitter on Covid-19 vaccinations. The measurement of SNA analysis in this study uses centrality and modularity (Yanuarti, 2021). Software in SNA analysis using Python, Gephi, and word cloud. Tweets data cleaning is done using the NLTK library in Python. Gephi is used as a tool to analyze centrality and modularity measurements generated from twitter data. While the word cloud is to show the relationship between the number of words by enlarging the words that are more often used related to the topic of Covid-19 vaccination in Indonesia.

SNA has not been comprehensive in displaying the results. Business Intelligence (BI) is required to display results comprehensively to support various decisions ranging from operational to strategic (Loya & Carden, 2018). This study aims to create a BI based on SNA on Twitter social media. BI will display the network attribute value and the centrality value of a Twitter social network based on the position of each related individual in the network structure. In addition, this application will also visualize in the form of a graph of existing relationships. So that with this BI, it can provide convenience in interpreting data in the Twitter social media network.

Research with the topic of social network analysis most commonly uses measurements of degree centrality, closeness centrality, betweenness centrality, and eigenvector centrality. Here are some studies on social network analysis. Research on social network analysis with a twitter social network case study using centrality measurements, namely betweeness centrality and closeness centrality (Susanto, Lina, & Chrismanto, 2012). From the results of the study, it was found that the centrality of Twitter's social network in terms of friends, namely being followed and following has been able to represent the calculation process in determining the centrality of a network.

Research on social media network analysis for mapping on online community groups on Facebook. Measurements use nodes and vertices (Yuliana, Santosa, & Setiawan, 2015). SNA analysis using Microsoft NodeXL. From the research results obtained are able to identify and classify clusters of users who are influential and have a close relationship with users. There are two other platform options that can be applied under the umbrella of (social) psychology research, namely sentiment analysis and SNA (Yusainy, Chawa, & Kholifah, 2017). The results of the SNA research become the right analytical tool to calculate relational data. There are several basic calculations in SNA which can simply be grouped into three parts, namely Degree Centrality, Closeness Centrality, and Betweenness Centrality. Software that can be used to perform SNA analysis is Gephi for network visualization, Tableau for

aesthetic presentation of research results, processing packages based on Python and R programming languages. In addition, commercial applications such as RapidMiner are available.

Social network analysis research on the spread of "Wonderful Indonesia" country branding on the top three social networking platforms, namely Google Plus, Twitter and Facebook by calculating the network attribute values, namely total nodes, total edges, average degree, average weighted degree, average path length, density, network diameter and number of community, and calculating the value of centrality, namely degree centrality, closeness centrality, betweeness centrality and eigenvector centrality to identify influential actors with a high number of interactions (Setatama & Tricahyono, 2017).

Research analysis of scientific research collaboration of faculty X lecturers by conducting SNA research (Tahalea & SN, 2019). The centrality used in this study, namely degree centrality, betweenness centrality and closeness centrality. SNA analysis using UCINET v6.6280 program and visualized with NetDraw v2.160 program. Based on the results of the centrality measurement, it is known that there are two actors who are dominant and have the most influence in the network, namely actors #12 and #21.

The research to identify the central actor of the crime group uses semantic social network analysis. The measurement uses relationship weight, ontology, central actor identification, and actor engagement (Zusrony, Purnomo, & Prasetyo, 2019). Based on the results of the research and the results of system testing, it can be concluded that the use of Semantic SNA is able to identify the main actors with an accuracy of 80.39%. This is due to the small amount of data used in research and the relationship between actors. Many actors have the same relationship, resulting in the same overall centrality that each actor has in a single case.

SNA research mapping employee communication networks using measurements of density, degree centrality, closeness centrality, betweenness centrality, clique, and sociogram (Kurniawan, Iriani, & Manongga, 2020). The results showed that the density in the network or density was below 50%, so that the bond was considered weak.

Social network analysis research on network evaluation and interaction of the 2019 election success team using measurements of degree centrality, betweeness centrality, density, and clicks/cliques (Fitriani, Sembiring, & Hartomo, 2020).

Density results show high with a value of 0.976, and the number of clicks (groupings) formed on the network is 23 clicks involving more than 4 members. The process of network formation begins with establishing contacts by actors who have the power and experience in being a successful team and have a history of good relationships with other actors. The actor who is central to this successful team network is actor id#02 who establishes contact with various actors with heterogeneous political backgrounds to get maximum votes.

Research on SNA of employee collaboration at PT. Arum Mandiri Group with measurements of density, degree centrality, closeness centrality, betweenness centrality, clique, and sociogram (Yanuarti, 2021). The results of calculations using UCINET 6 software show a weak bond with a density value indicator of 14.9% (network density level is less than 50%). Actors (nodes) that have a degree centrality value (often contacted) are actors in the laundry SPV section (senior employees).

SNA research on the spread of corona virus information on Twitter by using measurements measuring degree centrality, closeness centrality, and eigenvector centrality scores. The software used in the data processing is Rstudio 4.0.2, and Gephi 0.9.2. Rstudio is used in the process of retrieval and cleaning of tweet data, and Gephi is used to perform SNA (Inayah & Purba, 2020).

The results of the study showed that there were six accounts that had a major influence in disseminating information related to Covid-19 on Twitter. The @PratiwiHAM account has the highest score of degree centrality, closeness centrality and eigenvector centrality compared to the other five accounts.

Research SNA Analysis on Twitter of Covid-19 vaccination (Wasserman & Faust, 1994). Measurement in SNA analysis using centrality and modularity. Software in SNA analysis using Python, Gephi, and word cloud. Tweets data cleaning is done using the nltk library in Python. Gephi is used as a tool to analyze the measurement of centrality and modularity generated from tweet data. While the word cloud is to show the relationship between the number of words by enlarging the words that are more often used related to the topic of covid-19 vaccination in Indonesia.

The results of this study indicate that from the analysis visualization in the form of graph tweets, 185 nodes and 101 edges are generated, the value of modularity: 0.815, the number of communities is 20 groups, and the influential users are tvOneNews, ryolandafi, renatarecreio, and detikcom.

MATERIALS AND METHODS

The stages of research carried out in this study went through several stages as depicted in Figure 1. The first stage was data collection and the second stage was BI which consisted of data analytics and data visualization.

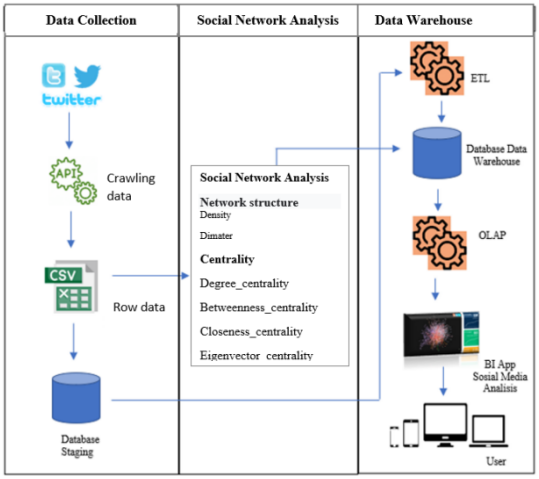

Figure 1. Framework

Framework

This research is based on conversations of Twitter social media users about political figures who have a great chance to become candidates for the Indonesian presidential election in 2024. All Twitter social media users are open to expressing opinions and sending tweets on Twitter (Fatoni & Anestha, 2021). With the large possibility of increasing data over time, making data from social media large and requiring special handling so that the data can be used in decision making using SNA implemented with BI. Using BI will provide consideration in decision making so that it can be used for monitoring and analyzing SNA.

Research Steps

Social Media Intelligence This research was carried out in three phases, namely the data collection phase, the social network analysis phase, and the data warehouse.

Data Collection Phase

The data in this research is Twitter social media data from three presidential election candidates, (1) Ganjar Pranowo, (2) Puan Maharani, and (3) Anies Baswedan. Crawl data based on twitter account. Ganjar Pranowo with a twitter account "ganjarpranowo", Puan Maharani with a twitter account "puanmaharani_ri", and Anies Baswedan with a twitter account "aniesbaswedan".

The criteria for selecting three presidential candidates are based on a survey. Ganjar Pranowo and Anies Baswedan based on a survey by Saiful Mujani Research and Consulting (SMRC) on 10-17 May 2022. Ganjar Pranowo is at the top with an electability of 22.5%, Anies Baswedan in third at 13,5% (Kamil, 2022). Respondent data used in this study were 1220 people. Puan Maharani is based on her position as the daughter of the general chairman of the PDIP party, which has a strong chance to become a candidate for the 2024 presidential election. PDI-P as a party can nominate itself without a coalition because it meets the presidential nomination threshold (Farisa, 2019).

Data collection uses a public or authenticated API, such as the open Twitter API. Withdrawing data from twitter using the help of nodexl software (Hansen, Shneiderman, & Smith, 2011). Furthermore, the data taken by social media that has been saved into csv format is imported into the staging database. The data obtained are as in table 1 and table 2.

Table 1. Twitter Post Metadata

Column	Data Type
id	Number
username	String
text	Text
date	Date
retweet	Number
replies	Number
permalink	String

Table 2. Twitter Comment Metadata

Column	Data Type
id	String
username	String
text	String
date	Date
retweet	Number
replies	Number
Post_id	String

The results of the data collection process are stored in a *comma separated value (csv)* format file. This data is used for the process of social network analysis and stored into a staging database for further processing in this research.

Social Network Analysis (SNA)

SNA is an application of text mining. Text mining is a methodology and processing of textual data that is carried out to produce quality and actionable information and insights (Wasserman & Faust, 1994) (Salem, Aljarrah, Alqaraleh, & Ali, 2021).

The concept of the SNA approach is to describe the pattern formed from the relationship between nodes or actors by calculating the value of the network structure and determining the central node in a network, as follows (Eriyanto, 2020):

Calculating the value of the Network Structure

Network structure is an overview of social networks or topics that are discussed on social media. The SNA used as a measurement of the value of the network structure is density, diameter, and centralization.

Density is the ratio of the number of links (ties) in the network to the highest number of possible links(Wasserman & Faust, 1994). Density shows the intensity between network members in communicating. Density value ranges from 0 to 1. Networks with high density are networks in which actors interact with each other. The larger the value, the higher the density of the network. The formula for determining density is as follows (Zusrony, Purnomo, & Prasetyo, 2019):

$$D = \frac{1}{n(n-1)} \quad (1)$$

The notation D is the density, 1 is the actual number of links in the network, n is the number of actors in the network.

Diameter is the furthest distance between one actor and another in a network (Wasserman & Faust, 1994). Centrality is the level of network concentration on actors who have the most ties (Wasserman & Faust, 1994).

Determine The Centrality or Identify the Dominant Actor in The Network

SNA identifies the dominant actors in the network, namely degree centrality, closeness centrality, betweenness centrality, and eigenvector centrality.

Degree Centrality

Degree centrality shows the popularity of actors as indicated by the number of links to and from actors in the network (Needham & Amy, 2003). The vulnerable value of degree centrality is in the number 0 to 1. Number 1 means all actors contact each other and number 0 means none of the actors are contacted or contacted. Calculation of degree Centrality is represented in the following formula (Tuhuteru & Iriani, 2018) :

$$Cd(i) = \frac{d(i)}{n-1} \quad (2)$$

Where : $Cd(i)$: Degree Centrality of node i, $d(i)$: Number of connections (links) node i, $n-1$: Maximum possible connections for a node.

Closeness Centrality

Proximity centrality describes how close an actor is to all actors in the network. This centrality measures which actor is the fastest in reaching all actors in the network. Proximity here is measured by how many steps an actor can call or be contacted. Nodes with high proximity scores have the shortest distance from all other nodes (Needham & Amy, 2003). The proximity centrality number is 0 to 1. The formula for calculating proximity centrality is:

$$C_c(i) = \frac{n-1}{\sum d(i,j)} \quad (3)$$

Where : $C_c(i)$: Closeness Centrality of node i, n : Total number of nodes in the network. $d(i,j)$: Shortest path distance between node i to node j.

Betweenness Centrality

Intermediary centrality is a measurement that determines the amount of influence an actor has as an intermediary from the actor's relationship with other actors in the network. The formula for calculating the intermediary level is:

$$Cb = \frac{\frac{g_{ij}P_k}{g_{ij}}}{\text{n2}-3n+2} \quad (4)$$

Where : Cb : Betweenness Centrality, $g_{ij}P_k$: number of shortest paths of actor, g_{ij} : the number of paths in the network, and $\text{n2} - 3n + 2$: maximum value.

Eigenvector Centrality

Eigenvector centrality performs measurements that give higher weight to nodes connected to other nodes that also have high centrality values (Setatama & Tricahyono, 2017). To calculate the eigenvector centrality of a node, it can be done using the following formula:

$$Ci\ (\beta) = \sum(\alpha + \beta cj)Aji \quad (5)$$
$$C\ (\beta) = \alpha(\text{I} - \beta A)_{-1}A\text{I}$$

Where : α = normalization constant (vector scale). β = symbolizes how much a node has a centrality weight in a node that also has a high centrality value.

Where A is the adjacency matrix, I is the identity matrix and 1 is the matrix. The magnitude of is the radius power of a node. If is positive, then it has a high centrality bond and is connected to people who are central. Meanwhile, if is negative, then it has a high centrality bond but is connected to people who are not central. If = 0, it will get degree centrality.

Fase Data Warehouse

The data warehouse phase to be used in this research involves applying the nine-step methodology recommended by Ralph Kimball in his book (Kimball & Ross, 2010). This methodology serves as the foundation for designing a data warehouse.

Business Intelligence Design

The business intelligence design method that will be used in this research is the business intelligence design recommended by Carlo Vercellis. In his book he said that in developing a business intelligence in a company there are 4 main phases or stages that must be done (Vercellis, 2009).

Design

In this study, a BI will be built which has a design according to Figure 2 below. Data warehouse is the main component in making BI, where BI is displayed in the form of a dashboard that can be accessed by interested users.

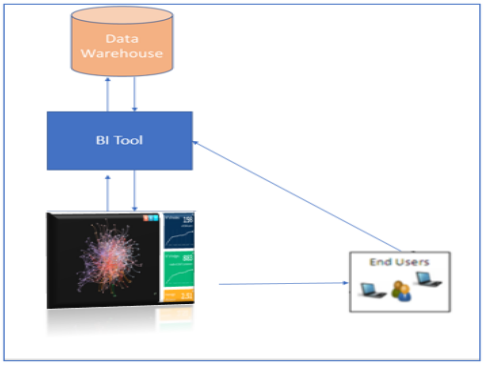

Figure 2. Business Intelligence Design Model

RESULTS AND DISCUSSION

Data Collection Results

The results of data collection on Twitter social media from three presidential election candidates with twitter accounts "@ganjarpranowo", "@puanmaharani_ri", and "@aniesbaswedan", obtained 244.330 conversations. Furthermore, from this data, SNA analysis was made using NedeXl software (Hansen, Shneiderman, & Smith, 2011).

Result Analysis

Anis Baswedan

Network Structure

The number of actors in the Twitter social network with conversations about @anisbaswedan is 8.825 actors with 151.411 interactions. Anis Baswedan's network density is shown in Figure 3 is 0,0005 which means the network density is low or the relationship between all actors is still low. The communication between the actors in this social network is still lacking in interaction.

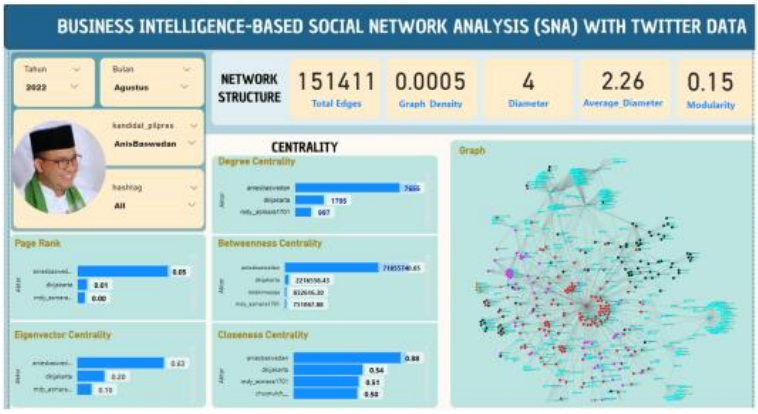

Figure 3. BI @anisbaswedan

The farthest distance between actors and other actors (diameter) with a value of 4, then the farthest distance between actors in the network is 4 steps. The length of the relation in the network is 4. The average diameter in the network is 2,26.

Centrality or identification of dominant actors in the network

1. Degree Centrality and Eigenvector Centrality

In Table 3 Shows 3 actors with the highest degree centrality value in the network. The actor "aniesbaswedan" is the central actor in the network, because it has a degree centrality value of 7.655 networks. The next high value of degree centrality actors are "dkijakarta" with a value of 1.795, and "mdy_asmara1701" with a value of 997.

Table. 3 Degree Centrality Value

No	Actor	Degree
1.	aniesbaswedan	7.655
2.	dkijakarta	1.795
3.	mdy_asmara1701	997

Table 4. Eigenvector Centrality Results

No.	Actor	Score
1.	Aniesbaswedan	0,63
2.	Dkijakarta	0,20
3.	mdy_asmara1701	0,10

In Table 4. there are 3 actors with high eigenvector centrality values. Actor "aniesbaswedan" with a value of 0,63. The actor "aniesbaswedan" demonstrates a quality network. Eigenvector centrality does not indicate how many friends we have but rather highlights the importance of the people we know or the relationships we have with key actors, enabling connections to all actors in the network.

The actor "aniesbaswedan" demonstrates a quality network. Eigenvector centrality does not indicate how many friends we have but rather highlights the importance of the people we know or the relationships we have with key actors, enabling connections to all actors in the network.

2. Betweenness Centrality and Closeness Centrality

The results of the betweenness centrality measurement of the 3 actors with the highest value from the collaboration network are shown in Table 5 Based on the results of the table, it is known that the actor "aniesbaswedan" has a high value betweenness centrality, which is 71,855,741, meaning that the actor "aniesbaswedan" has a great influence on the flow or bridge of information intermediaries from one actor to another.

Table 5. Betweenness Centrality Results

No.	Actor	Score
1.	aniesbaswedan	71.855.741
2.	dkijakarta	2.216.558
3.	mdy_asmara1701	751.067

Table 6. Closeness Centrality Result

No.	Nama Aktor	Score
1.	aniesbaswedan	0,88
2.	dkijakarta	0,54
3.	mdy_asmara1701	0,51

The results of the analysis of closeness centrality, 3 actors with the highest score as shown in Table 6 the actor "aniesbaswedan" has a closeness centrality value of 0,88. Shows the proximity of the average actor to all other actors on the existing network.

Ganjar Pranowo

Network Structure

The number of actors in the Twitter social network with conversations about @GanjarPranowo is 6.075 actors with 58.314 interactions. Ganjar Pranowo network density shown in Figure 4 of 0,0005 which means the network density is low or the relationship between all actors is still low. The communication between the actors in this social network is still lacking in interaction.

The farthest distance between actors and other actors (diameter) with a value of 4, then the farthest distance between actors in the network is 4 steps. the length of the relation in the network is 4. The average inner diameter of the network is 2.31.

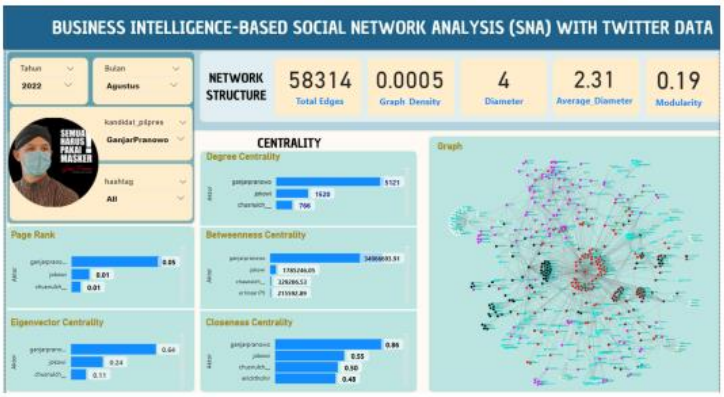

Figure 4. BI @GanjarPranowo

Centrality or identification of dominant actors in the network

1. Degree Centrality and Eigenvector Centrality

In Table 7. Shows 3 actors with the highest degree centrality value in the network. The "ganjarpranowo" actor is the central actor in the network, because it has a degree centrality value of 5.121. The value of degree centrality is then followed by actors "jokowi" with a value of 1.520, and "chusnulch__" with a value of 766.

Table. 7 Degree Centrality Value

No	Actor	Degree
1.	ganjarpranowo	5.121
2.	jokowi	1.520
3.	chusnulch__	766

Table 8. Eigenvector Centrality Results

No.	Actor	Score
1.	ganjarpranowo	0,64
2.	jokowi	0,24
3.	chusnulch__	0,11

In Table 8. there are 3 actors with high eigenvector centrality values. Actor "ganjarpranowo" with a value of 0,64. Shows that this actor has a quality network. The “ganjarpranowo” actor has a relationship with an important actor to be able to reach all actors in the network.

2. Betweenness Centrality and Closeness Centrality

The results of the betweenness centrality measurement of the 3 actors with the highest value from the collaboration network are shown in Table 9. Based on the results of the table, it is known that the actor "aniesbaswedan" has a high value betweenness centrality, which is 34.066.694, meaning that the actor "ganjarpranowo" has a great influence on the flow or bridge of information intermediaries from one actor to another.

Table 9. Betweenness Centrality Results

No.	Actor	Score
1.	ganjarpranowo	34.066.694
2.	jokowi	1.785.246
3.	chusnulch__	329.206

Table 10. Closeness Centrality Results

No.	Actor	Score
1.	ganjarpranowo	0,86
2.	jokowi	0,55
3.	chusnulch__	0,50

The results of the analysis of closeness centrality, 3 actors with the highest score as shown in Table 10. the actor "ganjarpranowo" has a closeness centrality value of 0,86. Shows the proximity of the average actor to all other actors on the existing network.

Puan Maharani

Network Structure

The number of actors in the Twitter social network with conversations about @PuanMaharani is 2.735 actors with 21.494 interactions. Ganjar Pranowo network density shown in Figure 5. of 0,28 which means the network density is low or the relationship between all actors is still low. The communication between the actors in this social network is still lacking in interaction. The farthest distance between actors and other actors (diameter) with a value of 4, then the farthest distance between actors in the network is 4 steps. the length of the relation in the network is 4. The average diameter in the network is 2,62.

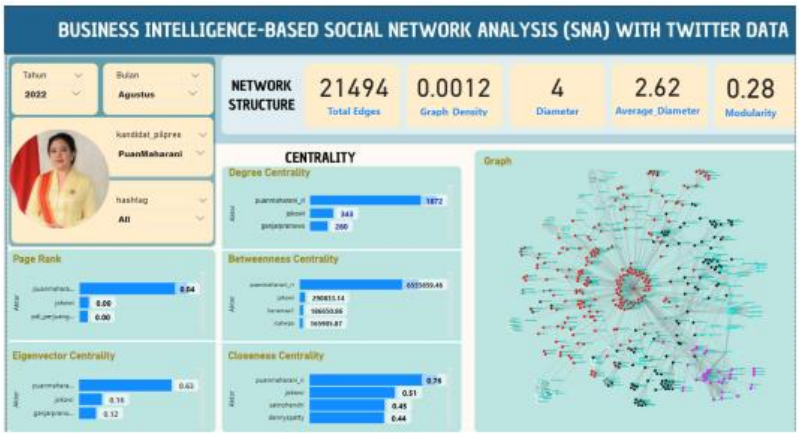

Figure 5. BI @PuanMaharani

Centrality or identification of dominant actors in the network

1. Degree Centrality and Eigenvector Centrality

In Table 11. Shows 5 actors with the highest degree centrality value in the network. The actor "puanmaharani_ri" is the central actor in the network, because it has a degree centrality value of 1.872. The value of degree centrality is then followed by actor "jokowi" with a value of 343, and "ganjarpranowo with a value of 260.

Table 11. Degree Centrality Value

No.	Actor	Degree
1.	puanmaharani_ri	1.872
2.	jokowi	343
3.	ganjarpranowo	260

Table 12. Eigenvector Centrality Results

No.	Actor	Score
1.	puanmaharani_ri	0,63
2.	jokowi	0,16
3.	ganjarpranowo	0,12

In Table 12 there are 3 actors with high eigenvector centrality values. Actor "puanmaharani_ri" with a value of 0,63. Shows that this actor has a quality network. The actor "puanmaharani_ri" has a relationship with an important actor to be able to reach all actors in the network.

2. Betweenness Centrality and Closeness Centrality

The results of the betweenness centrality measurement of the 5 actors with the highest value from the network are shown in Table 13. Based on the results of the table, it is known that the actor "puanmaharani_ri" has a high value betweenness centrality, which is 6,555,859, meaning that the actor "puanmaharani_ri" has a great influence on the flow or bridge of information intermediaries from one actor to another.

Table 13. Betweenness Centrality Result

No.	Actor	Score
1.	puanmaharani_ri	6.555.859
2.	jokowi	290.833
3.	herumax1	186.650

Table 14. Closeness Centrality Results

No.	Actor	Score
1.	puanmaharani_ri	0,76
2.	jokowi	0,51
3.	satriohendri	0,45

The results of the analysis of closeness centrality, 3 actors with the highest score as shown in Table 14. the actor "puanmaharani_ri" has a closeness centrality value of 0,76. Shows the proximity of the average actor to all other actors on the existing network.

SUMMARY OF THREE PRESIDENTIAL ELECTION CANDIDATES

The measurement results are as in Table 14. Shows that crawling data with Anis Baswedan's account is 8,825 actors and the number of networks is 151,411. Furthermore, Ganjar Pranomo's account is 6075 actors with a network of 58,314, and the third is Puan Maharani's account with 2,735 actors with 21,494 relationships. When the candidates have the same diameter i.e. 4. The same average i.e. 2 reach to other actors. Analysis with density shows that the three actors network density is very low or the relationship between all actors is still low. The communication between the actors in this social network is still lacking in interaction.

Table 14. Measurement of Network Structure of Three Presidential Election Candidates

Analisis	AniesBaswedan	GanjarPranowo	PuanMaharani
Aktor	8825	6075	2735
Total Edges	151411	58314	21494
Diameter	4	4	4
Average_Diameter	2.26	2.31	2.62
Density	0.00046	0.00050	0.00121

CONCLUSIONS

Conclusion

Based on the results of the research that has been done, it can be concluded that:

1. The network structure of the three presidential candidates (Anis Baswedan, Ganjar Pranowo, and Puan Maharani) has the same diameter with the value of 4. The average is the same, which is 2 reach to other actors.
2. Density analysis shows that the three actors (candidates for the presidential election) have a very low network density or the relationship between all actors is still low with a value close to zero.
3. The value of degree centrality and betweenness centrality of three presidential election candidates (Anis Baswedan, Ganjar Pranowo, and Puan Maharani). Anisbaswedan has a degree value of 7,655 and a betweenness of 185,5741. It means that the actor "Anis Baswedan" has a great influence on the flow or bridge of information intermediaries from one actor to another.

Suggestion

Based on the conclusion of the study, we hope to be able to analyze with more crawling data and use the results of real-time tweet crawling data, so that the processing of analytical data can get better analysis results.

REFERENCES

Eriyanto. (2020). *Analisis jaringan media sosial*. Kencana.

Farisa, F. C. (2019, August 31). Hasil lengkap perolehan kursi DPR 2019-2024. *Kompas.com*. Retrieved from https://nasional.kompas.com/read/2019/08/31/11152361/hasil-lengkap-perolehan-kursi-dpr-2019-2024

Fatoni, A., & Anestha, P. (2021). Analisis jaringan komunikasi pada percakapan #TetapDukungPSBB di Twitter pada penerapan ke dua PSBB DKI Jakarta. *Jurnal Spektrum Komunikasi, 8(2), 177–200*. https://doi.org/10.37826/spektrum.v8i2.115

Fitriani, N., Sembiring, I., & Hartomo, K. D. (2020). Evaluasi jaringan dan interaksi tim sukses pileg tahun 2019 melalui social network analysis (SNA). *InfoTekJar: Jurnal Nasional Teknologi dan Informasi, 2(14)*. Retrieved from https://jurnal.uisu.ac.id/index.php/infotekjar/article/view/2348

Hansen, D. L., Shneiderman, B., & Smith, M. A. (2011). Analyzing social media networks with NodeXL. https://doi.org/10.1016/C2009-0-64028-9

Inayah, D., & Purba, F. L. (2020). Implementasi social network analysis dalam penyebaran informasi virus corona (COVID-19) di Twitter. *Seminar Nasional Official Statistics 2020: Statistics in the New Normal: A Challenge of Big Data and Official Statistics*.

Kamil, I. (2022, June 9). Elektabilitas Ganjar Pranowo teratas, unggul signifikan dari Prabowo dan Anies. Kompas.com. Retrieved from https://nasional.kompas.com/read/2022/06/09/15093321/survei-smrc-elektabilitas-ganjar-pranowo-teratas-unggul-signifikan-dari

Kimball, R., & Ross, M. (2010). The Kimball group reader: Relentlessly practical tools for data warehousing and business intelligence.

Kurniawan, D., Iriani, A., & Manongga, D. (2020). Pemanfaatan social network analysis untuk menganalisis kolaborasi karyawan pada PT. Arum Mandiri Group. *Jurnal Transformasi, 17(2), 149*. https://doi.org/10.26623/transformatika.v17i2.1646

Loya, T., & Carden, G. (2018). Business intelligence and analytics. https://doi.org/10.4324/9781315206455-12

Maclean, F., Jones, D., Carin-Levy, G., & Hunter, H. (2013). Understanding Twitter. British Journal of Occupational Therapy, 76(6), 295–298. https://doi.org/10.4276/030802213X13706169933021

Needham, M., & Amy, H. E. (2003). Graph algorithms. https://doi.org/10.1142/9789812791245_0012

Pappi, F. U., & Scott, J. (1993). Social network analysis: A handbook. *Contemporary Sociology, 22(1)*, 128. https://doi.org/10.2307/2075047

Salem, M., Aljarrah, E., Alqaraleh, M., & Ali, S. (2021). NodeXL tool for social network analysis. Journal of Information Technology, 12(14), 202–216.

Setatama, M. S., & Tricahyono, D. (2017). Implementasi social network analysis pada penyebaran country branding 'Wonderful Indonesia.' *Indonesian Journal of Computing, 2(2), 91*. https://doi.org/10.21108/indojc.2017.2.2.183

Susanto, B., Lina, H., & Chrismanto, A. R. (2012). Penerapan social network analysis dalam penentuan centrality studi kasus social network Twitter. *Jurnal Informatika, 8(1)*. https://doi.org/10.21460/inf.2012.81.111

Tahalea, S. P., & SN, A. (2019). Central actor identification of crime group using semantic social network analysis. *Indonesian Journal of Information Systems, 2(1), 24–32*. https://doi.org/10.24002/ijis.v2i1.2354

Tuhuteru, H., & Iriani, A. (2018). Analisis kolaborasi penelitian ilmiah dosen Fakultas X dengan social network analysis (SNA). *Jurnal Teknik Informatika dan Sistem Informasi, 4(1), 149–158*. https://doi.org/10.28932/jutisi.v4i1.758

Vercellis, C. (2009). Business intelligence, data mining and optimization for decision making. John Wiley & Sons. https://doi.org/10.1017/CBO9781107415324.004

Wasserman, S., & Faust, K. (1994). Social network analysis: Methods and applications. *Cambridge University Press*. Retrieved from http://books.google.com

We Are Social. (2021). Digital 2021. Global Digital Insights, p. 103.

Yanuarti, R. (2021). Analisis media sosial Twitter terhadap topik vaksinasi COVID-19. *Jurnal Sistem dan Teknologi Informasi, 6(2)*. Retrieved from http://jurnal.unmuhjember.ac.id /index.php/JUSTINDO

Yuliana, I., Santosa, P. I., & Setiawan, N. A. (2015). Analisis jejaring media sosial untuk pemetaan pada komunitas online.

Yusainy, C., Chawa, A. F., & Kholifah, S. (2017). Social data analytics sebagai metode alternatif dalam riset psikologi. *Buletin Psikologi, 25(2)*, 67–75. https://doi.org/10.22146/buletinpsikologi.27751

Zusrony, E., Purnomo, H. D., & Prasetyo, S. Y. J. (2019). Analisis pemetaan jaringan komunikasi karyawan menggunakan social network analysis pada perusahaan multifinance. *INTENSIF: Jurnal Ilmiah Penelitian dan Penerapan Teknologi Sistem Informasi, 3(2), 145*. https://doi.org/10.29407/intensif.v3i2.12786