

## TOURISM ON INSTAGRAM: A SOCIAL NETWORK ANALYSIS

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**Abstract.** This research aims to analyze and describe the development of tourism in Maluku Province, Indonesia on Instagram. The data used in this study are hashtags from several excellent tourist attractions or tourist priorities set by the maluku province tourism office. The data is then processed using social network analysis to find the level of importance and connectedness of tourism hashtags with other hashtags used in image captions on Instagram posts. The results showed that there are nine hashtags that have an important role in the network because they have high values in the measurement of degree centrality, betweenness centrality, closeness centrality, and eigenvector centrality. The hashtags are #maluku, #ambon, #natsepa, #pulauosi, #pulaubair, #beach, #repost, #indonesia, and #namalatu. Two of nine hashtags have a high betweenness centrality value, namely #natsepa that represent natsepa beach tourism and #namalatu that represents Namalatu beach tourism. Both of these tours have a high value betweenness centrality with a different form of hashtags, namely #natsepa.id and #namalatu02. This research conducted using social network analysis degree measurements such as degree, betweenness, closeness, and eigenvector to analyse insight of tourism topics in Instagram. The result of this research can give insights to the tourism actors, especially in Maluku Province, of how the hashtags are connected and related. The relation of the hashtags can be used as social media marketing strategy.

**Keywords:** centrality, SNA, tourism, hashtags.

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## 1. INTRODUCTION

The tourism industry in the world continues to grow rapidly and has become a very potential sector [1], [2]. Although in the last two years there has been a downward trend in world tourism due to the Covid-19 pandemic [2], [3], the Government of Indonesia, through the ministry of tourism, continues to make various policies to revive Indonesian tourism [4]. As part of the Indonesian state, Maluku Province has an important role in Indonesian tourism because of the potential for natural tourist attractions and the island's tourist attractions [5]. Maluku Province tourism is known for its archipelagic tourism potential [5], which is unique due to its isolation and limitations [6]. The phenomenal growth of the tourism industry parallels the current development of the internet and social media [7], [8]. 63% of internet users spend 2 hours on social media [9]. Social media has an important role in tourism, both for tourists and service providers [10]. Tourists usually use social media to find information [11], as well as generate content [12]. Along with photography trends, Lyu's research [13] illustrates an increase in the number of photos taken by each tourist on every tourist trip. In interacting with images, Instagram is the most widely used social media in everyday life [14]. In interacting on Instagram, each individual can influence others [15] and can change one's behavior [16].

Instagram and other social media already become a new environment for people to have social interaction [17], but Instagram itself has amazing growth comparing to others [18]. The interactions in social media adapted from real life interactions such following, friending, sharing, mentioning, and many others shows how information flows in social media [19], [20]. The importance of information flow makes Social Network Analysis (SNA) paved its way to become a popular tool to analyze structure of social media network in the past years [17], [21]–[25]. In the other hand, tourism nowadays relies on social media promotion [26] and its important to understand information flow and connectivity about tourism or tourist in social media [25]–[28]. This article aims to analyze tourism development in Maluku Province through the Instagram hashtag. The results of this study can be used as a reference in the development of tourism in Maluku Province.

## 2. RESEARCH METHODS

### 2.1 Methods

This research is carried out by conducting several stages, namely data collection and processing, data analysis, and conclusion making.

### 2.2 Data

The study used hashtags data collected from Instagram in mid-2021. The hashtags used in the study were #danaurana, #gunungkerbau, #kepulauanbanda, #namalatu, #natsepa, #ngurbloat, #pantaiora, #pantaiwamsoba, #pulaubair, #pulaumatakus, and #pulaوسي. The hashtags are the priority tourist attractions set by the Maluku Provincial Tourism Office. The data collected and used in this study as many as 4585 image captions containing the hashtags above.

The data collected is then processed to separate the text of the image caption with hashtags. Hashtags that are in the same caption will be created into the constancy matrix to show the relationship between hashtags.

### 2.3 Network Model

A network formed from data is a network between hashtags that appears if it is in the same caption. Nodes represent hashtags and edges indicate the relationship between hashtags. The relationships that are owned between hashtags are given weight according to the number of captions that contain two hashtags. Weighting is only given to edges, while all nodes are given the same weight of 1. The graph formed is an undirected graph because the relationship formed between hashtags is equal.

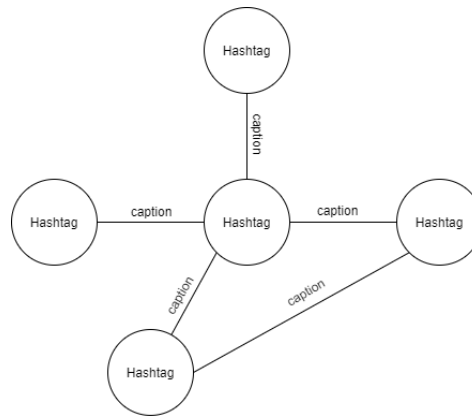


Figure 1. Network Model

## 2.4 Centrality Measures

There are four centrality measures used in this research, such as degree centrality, betweenness centrality, closeness centrality, and eigenvector centrality. These centrality measures are widely used to analyze network's structure in many fields namely criminality [29], psychology [30], social media [17], [22], [31], and tourism [26]–[28], [32].

## 2.5 Degree Centrality

Degree centrality is the number of edges it has [33] and the nodes with higher degree is more central [34]. In this research the edges represent the relationship between two hashtags in a caption measured using equation (1).

$$C_D(i) = \sum \frac{d_i}{n-1} \quad (1)$$

Hashtags represented by  $i$ ,  $n$  is total hashtags in the network, and  $d_i$  is total edges connected to hashtag  $i$

## 2.6 Closeness Centrality

A node with high closeness centrality value indicates that node is close to other nodes in the network [29], [34]. In this research, it shows the ability of a hashtag to reach another hashtags in the network. Closeness centrality can measure using equation (2).

$$C_c(i) = \frac{n-1}{\sum d_{i,j}} \quad (2)$$

Hashtags represented by  $i$ ,  $n$  is total hashtags in the network, and  $d_{i,j}$  is shortest path from hashtag  $i$  to hashtag  $j$ .

## 2.6 Betweenness Centrality

The ability to become a bridge in the network can be measured using shortest path through the network [34]. This measurement can be used to measure hashtags ability to become a bridge in a network by using equation (3).

$$C_b(i) = \sum \frac{g_{j,k}(i)}{g_{j,k}} \quad (3)$$

Hashtags represented by  $i$ , the shortest path from hashtags from hashtag  $j$  to hashtag  $k$  is represented by  $g_{j,k}$

## 2.7 Eigenvector Centrality

Eigenvector centrality is a measure to show importance of a node based on the importance of its neighbor [34]. Links or edges connected with important hashtags worth more than unimportant ones. It can be measured using equation (4).

$$C_e(i) = \frac{1}{\lambda} \sum_{j \in G} a_{i,j} \quad (4)$$

Hashtags represented by  $i$ ,  $\lambda$  is a constant, and  $a_{i,j}$  is adjacency matrix of hashtag  $i$  in network  $G$ .

### 3. RESULTS AND DISCUSSION

From the initial data containing 4585 image captions uploaded to Instagram, there are 7698 nodes or unique hashtags with a total relation of 17263 relationships formed on the graph. The following will be shown the results of measurements of degree centrality, betweenness centrality, closeness centrality, and eigenvector centrality. The network formed is shown in Figure 2.

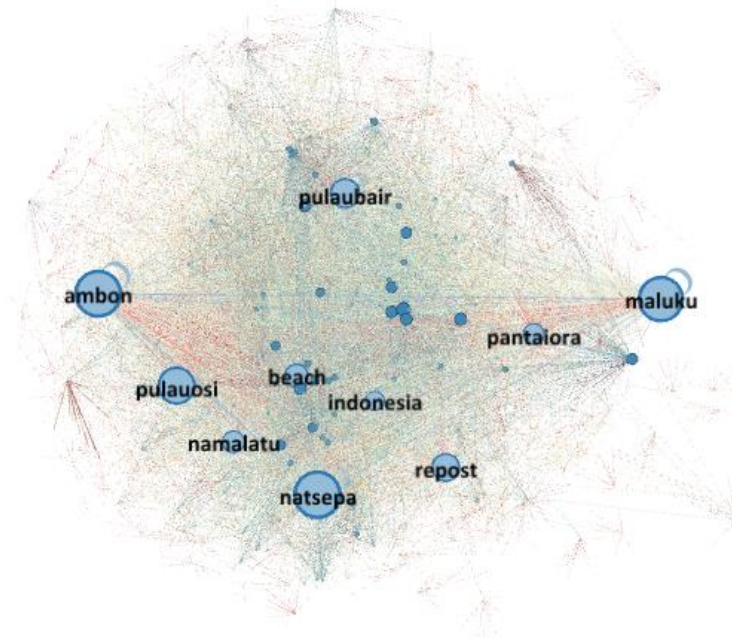


Figure 2. Maluku Province Tourism Hashtags Network

#### 3.1. Degree Centrality

Degree centrality shows the number of connections a hashtag has to other hashtags. Table 1 displays the 10 hashtags with the greatest number of connections. The number of connections does not indicate the number of captions that contain the hashtag. In Table 1 can be seen there are several types of hashtags that enter the top 10 highest centrality degrees, namely, tourist attractions (*#natsepa*, *#pulaوسي*, *#pulaubair*, *#namalatu*), regional names (*#ambon*, *#maluku*), types of tourism (*#beach*), and *#repost*.

The existence of *#natsepa*, *#pulaوسي*, *#pulaubair*, and *#namalatu* in the top 10-degree centrality is normal because the four hashtags are the focus of the data collected. Hashtags can also be used to indicate the location of a post, so *#ambon* and *#maluku* indicate the existence of the tourist location. The type of tourist hashtag that has many connections is *#beach*, this strengthens the type of tourism that famous in Maluku is beach tourism. Meanwhile, there is a *#repost* that is usually used to indicate that the post is a repost. But *#repost* can also have the meaning of the desire of the owner of the post for the post to be reposted.

Table 1. Degree Centrality

Hashtags	Degree
<i>#natsepa</i>	697
<i>#ambon</i>	690
<i>#maluku</i>	669
<i>#pulaوسي</i>	549
<i>#pulaubair</i>	438
<i>#repost</i>	418
<i>#beach</i>	346
<i>#namalatu</i>	335
<i>#pantaiora</i>	319
<i>#indonesia</i>	291

### 3.2. Closeness Centrality

The higher the closeness of the centrality of a hashtag, the closer it is to all hashtags in the network. Table 2 shows the 10 hashtags with the highest closeness centrality values and it appears that they all have the highest value a hashtag can have from the 0-1 range. There are different hashtags with the highest degree centrality in Table 1 and there are only #natsepa.id and #namalatu02 which are different versions of #natsepa and #namalatu. Some hashtags are markers for people who like holidays and landscapes like #pemburusunrise, #pemburusunset, #liburanvirtual, and #liburanonline. The emergence of #liburanvirtual and #liburanonline resulted from data used for research taken at the time of the covid-19 pandemic which resulted in almost all regions in Indonesia, especially in Maluku Province to restrict community activities including closing tourist attractions.

**Table 2. Closeness Centrality**

Hashtags	Closeness Centrality
#pemburusunrise	1
#greentea:	1
#decorbaptis	1
#pemburusunset	1
#liburanvirtual	1
#namalatu02	1
#natsepa.id	1
#piru-bukittele tubis-salawakumovie	1
#tan_rastafara	1
#liburanonline	1

### 3.3. Betweenness Centrality

Betweenness centrality indicates the role of a hashtag in a network as a bridge used to connect one hashtag with another hashtag on the network. Table 3 displays the top 10 hashtags with the highest Betweenness centrality values. All the hashtags in Table 3 are part of the top 10-degree centrality but in different order. In Table 3 it appears that #maluku is the highest-rated hashtag, this shows that instagram users who upload tourist photos on Instagram consciously tell where the tourist location is located. Meanwhile, one of the other hashtag causes such as #natsepa, #pulaوسي, #pulaubair, #pantaiora, and #namalatu can be in the top 10 because the hashtag is a reference hashtag used in this study.

**Table 3. Betweenness Centrality**

Hashtags	Betweenness centrality
#maluku	0.183703
#natsepa	0.139291
#ambon	0.135258
#pulaوسي	0.095109
#pulaubair	0.073169
#repost	0.072219
#pantaiora	0.070179
#indonesia	0.055224
#beach	0.052974
#namalatu	0.048819

### 3.4. Eigenvector Centrality

Eigenvector centrality is an alternate version of degree centrality. In contrast to degree centrality, eigenvector centrality indicates the level of importance of a hashtag based on other hashtags connected to it. Table 4 shows the top 10 hashtags with the highest eigenvector centrality values with #maluku in the first position with a value of 1 in the range of 0-1. This shows that #maluku is a very important hashtag in the

maluku province's tourism hashtag network on Instagram social media. In Table 4 there is one hashtag that never appeared on the previous measurement and occupies the ninth position, namely #travel. This shows that #travel has a fairly high level of importance in the tourism hashtag network of Maluku Province.

**Table 4. Eigenvector Centrality**

<b>Id</b>	<b>Eigenvector centrality</b>
#maluku	1
#ambon	0.919605
#natsepa	0.815083
#pulaوسي	0.64652
#beach	0.642514
#repost	0.586644
#indonesia	0.575531
#pulaubair	0.545242
#travel	0.434401
#namalatu	0.430454

### 3.5. Discussion

Based on the results obtained from research that has been done, there are several hashtags that consistently are in the top 10 measurements of centrality. These hashtags are hashtags that are directly related to tourism, be it tourist locations, types of tourism, or tourist areas. Of the four measurements of centrality there are #maluku that look dominant both as bridges and as hashtags with the highest level of importance on the network. The thing to note here is that out of a total of 11 hashtags, there are only five tourist location hashtags that appear in the list of top 10 measurements of centrality, namely #natsepa, #namalatu, #pulaوسي, #pulaubair, and #pulaورا. Hashtags that don't appear in the top 10 centrality calculations are #danaurana, #kepuluanbanda, #gunungkerbau, #pulaumatakus, #pantaiwamsoba, and #ngurbloat.

Based on the results of centrality measurements, it is seen that the type of tourism that many connections are types of beach tourism with #beach as a reference and supported by #natsepa, #namalatu, #pulaورا, #pulaubair, and #pulaوسي that prioritize beaches as the types of tours offered. But other attractions such as #ngurbloat, #pantaiwamsoba, #kepuluanbanda, and #pulaumatakus do not appear in the top 10 on all measurements of centrality. This is a thing that is quite crucial for a tourism in promoting social media, especially on Instagram which presents a visual display for users. Low centrality value can be caused by several things such as lack of tourist posts used as references or the use of hashtags that do not match the reference hashtag.

Unlike the type of beach tourism, the type of mountain and lake tourism has a fairly low degree centrality value. There are several things that cause this condition, among others; 1) Maluku Province as an island province has more beach tourism than lake and mountain tourism; 2) The number of posts and captions that contain #gunungkerbau and #danaurana is also not as much as posts that contain beach tourism hashtags.

## 4. CONCLUSIONS

This research aims to conduct an analysis of Maluku Province's tourism network based on the hashtag (#) used on Instagram posts. There are 4585 caption data collected, then processed into 7698 nodes and 17263 relationships based on relationships between hashtags that are in the same caption. Centrality measurement is then done to measure the level of importance of a hashtag on the Maluku Province's tourism hashtag network. The results showed that there are nine hashtags that have an important role in the network because they have high values in the measurement of degree centrality, betweenness centrality, and eigenvector centrality. The hashtags are #maluku, #ambon, #natsepa, #pulaوسي, #pulaubair, #beach, #repost, #indonesia, and #namalatu. The #natsepa which is a hashtag of natsepa beach tourism and #namalatu which is a hashtag of namalatu beach tourism also appears on the top 10 closeness centrality in different forms, namely #natsepa.id and #namalatu02 this shows that Natsepa beach tourism and Namalatu beach have a high level of closeness and influence on the maluku province tourism network. In addition, the results of the study also



showed that this type of beach tourism has a higher level of popularity and influence compared to mountain and lake tourism. This could be because the tourism used in the research refers to the priority tourism of the Maluku Provincial Tourism Office which is dominated by beach or sea tourism.

Research conducted is only a small part of the many analytical methods that can be used to analyze tourism in an area. Further research can be done from network analysis using different hashtag references, topic modeling, to sentiment analysis from a tourist location on social media such as Instagram, Facebook, Twitter, and others.

## REFERENCES

- [1] UNWTO, "2018 Edition UNWTO Tourism Highlights," pp. 1–20, 2018.
- [2] WTTC, "Travel and Tourism Economic Impact 2021," 2021.
- [3] UNWTO, "World Tourism Barometer," 2021.
- [4] Kemenparekraf, "Buku Tren Pariwisata Indonesia 2021," Jakarta, 2021.
- [5] E. Salouw, "IMPLEMENTASI PERAN STAKEHOLDERS DALAM PENGEMBANGAN PARIWISATA (Studi Kasus pada Kepulauan Banda)," *Pariwisata Pesona*, vol. 06, no. 1, pp. 1–10, 2021.
- [6] C. Kueffer and K. Kinney, "What is the importance of islands to environmental conservation?," *Environ. Conserv.*, vol. 44, no. 4, pp. 311–322, 2017.
- [7] O. S. Itani, A. N. Kassar, and S. M. C. Loureiro, "Value get, value give: The relationships among perceived value, relationship quality, customer engagement, and value consciousness," *Int. J. Hosp. Manag.*, vol. 80, no. March 2018, pp. 78–90, 2019.
- [8] S. M. C. Loureiro and J. Lopes, "How Corporate Social Responsibility Initiatives in Social Media Affect Awareness and Customer Engagement," *J. Promot. Manag.*, vol. 25, no. 3, pp. 419–438, 2019.
- [9] GlobalWebIndex, "GlobalWebIndex's flagship report on the latest trends in social media," 2020.
- [10] J. K. S. Jacobsen and A. M. Munar, "Tourist information search and destination choice in a digital age," *Tour. Manag. Perspect.*, vol. 1, no. 1, pp. 39–47, 2012.
- [11] H. Nezakati, A. Amidi, Y. Y. Jusoh, S. Moghadas, Y. A. Aziz, and R. Sohrabinezhadalemi, "Review of Social Media Potential on Knowledge Sharing and Collaboration in Tourism Industry," *Procedia - Soc. Behav. Sci.*, vol. 172, pp. 120–125, 2015.
- [12] P. R. Berthon, L. F. Pitt, K. Plangger, and D. Shapiro, "Marketing meets Web 2.0, social media, and creative consumers: Implications for international marketing strategy," *Bus. Horiz.*, vol. 55, no. 3, pp. 261–271, 2012.
- [13] S. O. Lyu, "Travel selfies on social media as objectified self-presentation," *Tour. Manag.*, vol. 54, pp. 185–195, 2016.
- [14] Izzal Asnira Zolkepli, H. H. Mukhiar, and S. N. Syed, "Online Social Network Citizen Engagement on Instagram Crowdsourcing: A Conceptual Framework by Academic Conferences International - issue," *Electron. J. Knowl. Manag.*, vol. 13, no. 4, pp. 283–292, 2015.
- [15] L. V. Casalo, C. Flavián, and S. Ibáñez-Sánchez, "Influencers on Instagram: Antecedents and consequences of opinion leadership," *J. Bus. Res.*, vol. 117, no. July, pp. 510–519, 2020.
- [16] M. Palazzo, A. Vollero, P. Vitale, and A. Siano, "Urban and rural destinations on Instagram: Exploring the influencers' role in #sustainabletourism," *Land use policy*, vol. 100, no. April 2020, p. 104915, 2021.
- [17] M. Habibi, A. Priadana, and M. R. Ma'arif, "Hashtag Analysis of Indonesian COVID-19 Tweets Using Social Network Analysis," *IJCCS (Indonesian J. Comput. Cybern. Syst.)*, vol. 15, no. 3, Jul. 2021.
- [18] S. Jiang and A. Ngien, "The Effects of Instagram Use, Social Comparison, and Self-Esteem on Social Anxiety: A Survey Study in Singapore.," <https://doi.org/10.1177/2056305120912488>, vol. 6, no. 2, May 2020.
- [19] I. Himelboim, M. A. Smith, L. Rainie, B. Shneiderman, and C. Espina, "Classifying Twitter Topic-Networks Using Social Network Analysis.," <http://dx.doi.org/10.1177/2056305117691545>, vol. 3, no. 1, Feb. 2017.
- [20] G. Giordano, I. Primerano, and P. Vitale, "A Network-Based Indicator of Travelers Performativity on Instagram," *Soc. Indic. Res. 2020 1562*, vol. 156, no. 2, pp. 631–649, Mar. 2020.
- [21] M. Grandjean, "A social network analysis of Twitter: Mapping the digital humanities community," *Cogent Arts Humanit.*, vol. 3, no. 1, 2016.
- [22] A. Priadana and S. P. Tahalea, "Hashtag activism and message frames: social network analysis of Instagram during the COVID-19 pandemic outbreak in Indonesia," *J. Phys. Conf. Ser.*, vol. 1836, no. 1, p. 012031, Mar. 2021.
- [23] M. Tremayne, "Anatomy of Protest in the Digital Era: A Network Analysis of Twitter and Occupy Wall Street," <https://doi.org/10.1080/14742837.2013.830969>, vol. 13, no. 1, pp. 110–126, 2013.
- [24] R. Recuero, G. Zago, and F. Soares, "Using Social Network Analysis and Social Capital to Identify User Roles on Polarized Political Conversations on Twitter.," <https://doi.org/10.1177/2056305119848745>, vol. 5, no. 2, p. 205630511984874, May 2019.
- [25] V. Vrana, D. Kydros, E. Kehris, A.-I. Theocharidis, and G. Karavasilis, "A Network Analysis of Museums on Instagram," pp. 1–10, 2019.
- [26] I. Brdar, "The Impact of Social Media on Tourism," *Sint. 2014 - Impact Internet Bus. Act. Serbia Worldw.*, pp. 758–761, Jun. 2014.
- [27] E. Van der Zee and D. Bertocchi, "Finding patterns in urban tourist behaviour: a social network analysis approach based on TripAdvisor reviews," *Inf. Technol. Tour. 2018 201*, vol. 20, no. 1, pp. 153–180, Dec. 2018.
- [28] M. Chang, T. Yi, S. Hong, P. Y. Lai, and J.-H. Lee, "Type and Behavior Pattern Analysis of Art Museum Visitors Based on Social Network Analysis," pp. 43–54, 2021.
- [29] S. P. Tahalea and A. SN, "Central Actor Identification of Crime Group using Semantic Social Network Analysis," *Indones. J. Inf. Syst.*, vol. 2, no. 1, pp. 24–32, Aug. 2019.
- [30] B. LF et al., "What do centrality measures measure in psychological networks?," *J. Abnorm. Psychol.*, vol. 128, no. 8, 2019.

- [31] S. N. M. Rum, S. N. M. Rum, R. Yaakob, and L. S. Affendey, "Detecting Influencers in Social Media Using Social Network Analysis (SNA)," *Int. J. Eng. Technol.*, vol. 7, no. 4.38, pp. 950–954, Dec. 2018.
- [32] N. Iswandhani and M. Muhajir, "K-means cluster analysis of tourist destination in special region of Yogyakarta using spatial approach and social network analysis (a case study: post of @explorejogja instagram account in 2016)," *J. Phys. Conf. Ser.*, vol. 974, no. 1, p. 012033, Mar. 2018.
- [33] J. Zhang and Y. Luo, "Degree Centrality, Betweenness Centrality, and Closeness Centrality in Social Network," pp. 300–303, Mar. 2017.
- [34] J. Golbeck, "Analyzing the social web," 2013.