COVID-19 Cases and Deaths in Southeast Asia Clustering using K-Means Algorithm

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Abstract. Covid-19 is an infectious illness caused by a newly identified form of coronavirus. This is a new virus and illness that was previously unknown before the December 2019 outbreak in Wuhan, China. The number of confirmed cases of Covid-19 and the number of deaths due to this virus in Southeast Asia are increasing and quite alarming. Therefore this study will discuss the grouping of Cases and Deaths of COVID-19 in Southeast Asia. The method used is the K-Means Clustering Data Mining. By using this method the data that has been obtained can be grouped into several clusters, where K-Means Clustering Process is applied using RapidMiner tools. Data used are Country statistics, Area of recorded laboratory-confirmed cases of COVID-19, and April 2020 deaths from WHO (World Health Organization). Data is divided into 3 clusters: high (C1), medium (C2) and low (C3). The results obtained are that there are four countries with a high level cluster (C1), one country with a moderate level cluster (C2), and 6 countries with a low level cluster (C3). This can be an input for each country to increase awareness of the transmission of Covid-19.

1. Introducing

Almost the entire world today is shocked by the phenomenon of the emergence of a deadly virus that is quite dangerous and very quickly transmitted to humans called Coronavirus disease (COVID-2019). Coronaviruses (CoV) is a virus that causes more severe diseases like common cold such as MERS-CoV and SARS-CoV [1]–[4]. Coronavirus (COVID-2019) is a new type of disease discovered in 2019 and not previously identified in humans. It is spread between animals and humans through the coronavirus (zoonosis). The inquiry found that dromedary camels were transferred to human beings by MERS-CoV, while mongoose cats transmitted SARS-CoV to humans. Many coronaviruses are known to circulate and exist in animals not yet infected by humans [5]. Typical signs of infection include respiratory distress, fever, coughing, shortness of breath and difficulty breathing. In more extreme cases, the infection can cause pneumonia, acute respiratory syndrome, renal failure and even death. [6]. Since the end of December 2019, a new coronavirus outbreak (COVID-2019; ormerly For 2019-nCoV) [7] Chinese reported in Wuhan [8] which then affected countries in almost the entire world, including Southeast Asia. COVID-19 is generally a disease that can be cured but can also be deadly [9][10]. Based on WHO data on April 30, 2020, there were around 3,090,445 confirmed cases and more than 217769 people died from the COVID-19 virus. [11]. Whereas in Southeast Asia alone, the
transmission of the COVID-19 virus in just one week has increased and is becoming increasingly worrying. For the number of Covid-19 cases and the number of people who died in Southeast Asia due to this virus could be seen in the table below.

Table 1. Cases and Deaths in Southeast Asia Due to Covid-19 Virus (April 2020)

| Reporting Country | 4/1/2020   | 4/2/2020   | 4/3/2020   | ... | 4/28/2020 | 4/29/2020 | 4/30/2020 |
|-------------------|------------|------------|------------|-----|-----------|-----------|-----------|
|                   | TCC        | TD         | TCC        | TD  | ...       | TCC       | TD        |
| Brunei Darussalam | 129        | 1          | 131        | 1   | ...       | 138       | 1         |
| Cambodia          | 109        | 0          | 109        | 0   | ...       | 122       | 0         |
| Indonesia         | 1528       | 136        | 1677       | 157 | ...       | 9096      | 765       |
| Laos              | 9          | 0          | 10         | 0   | ...       | 19        | 0         |
| Malaysia          | 2766       | 43         | 2908       | 45  | ...       | 5820      | 99        |
| Philippines       | 2084       | 88         | 2311       | 96  | ...       | 7777      | 511       |
| Singapore         | 926        | 3          | 1000       | 4   | ...       | 14423     | 14        |
| Thailand          | 1771       | 12         | 1771       | 12  | ...       | 2938      | 54        |
| Timor Leste       | 1          | 0          | 1          | 0   | ...       | 24        | 0         |
| Vietnamese        | 207        | 0          | 218        | 0   | ...       | 270       | 0         |

Source: World Health Organization [12]

Figure 1. Case Chart and Death in Southeast Asia Due to Covid-19 Virus

Explanation:
TCC: Total Confirmed Cases
TD: Total Deaths

Based on the data presented in table 1 and figure 1, it is seen that the number of confirmed Covid-19 cases and the number of deaths in Southeast Asia due to this virus are increasing and quite alarming. Therefore, each country needs to take concrete steps to get more leverage to tackle the problem and increase awareness of the transmission of Covid-19.

2. Methodology

2.1. Research Data
Data used are Country statistics, Area of recorded laboratory-confirmed cases of COVID-19, and April 2020 deaths from WHO (World Health Organization) [12].
2.2. Research Methods
This study uses the K-Means Clustering method. K-Means is one of the clustering algorithms used in the Unsupervised learning group that is used to classify data into several classes with a partition of the system. This algorithm accepts data entries in the form of class labels [13].

2.3. Research Flowchart
The K-Means Flowchart Algorithm follows [14].

![K-Means Flowchart](image)

**Figure 2.** Research Flowchart of K-Means

Steps to perform clustering using k-means algorithm [15]:
- a. Determine cluster counts (k) in the data set.
- b. Determine the center value (Centroid).
- c. On each record, calculate the closest distance to Centroid
- d. Distance Group objects to nearest Centroid
- e. Repeat step a to step b, iterating until Centroid is optimal

3. Results and Discussion
3.1. Centroid
A midpoint value, or centroid data, is generated when implementing the K-means algorithm. The method of determining a midpoint value is achieved by following the largest (maximum) for high cluster value (C1), the mean value for a medium cluster (C2), and the lowest Cluster value (C3).

| Data Cluster         | Total Confirmed Cases | Total Deaths |
|----------------------|-----------------------|--------------|
| (C1) High Cluster    | 15641                 | 784          |
| (C2) Normal Cluster  | 2424,653333           | 89,90666667  |
| (C3) Low Cluster     | 1                     | 0            |

**Table 2.** Initial Centroid Data
3.2. Implementation RapidMiner

Based on the data in table 1, the COVID-19 Case and Death data grouping in Southeast Asia will be carried out with RapidMiner. Grouping method The following figure illustrates the use of RapidMiner for the K-Means.

![Figure 3. The Process of Grouping the K-Means Algorithm with Value K = 3](image)

Figure 3 is the process of connecting read excel with K-Means and the output to be executed with a value of K = 3. All necessary parameters are stored in the object model. In this case the researchers used a data sample of 11 countries in Southeast Asia (Based on Table 1) with 2 attributes, namely: Total Confirmed Cases (TCC) and Total Deaths (TD). The Final Results data grouping Could be seen in the figure below.

![Figure 4. Results Clustering uses K-Means](image)

It can be clarified in the light of figure 4 there are 3 clusters starting from cluster 0, then cluster 1, and cluster 2. Cluster 0 is a low, cluster 1 is a normal, and cluster 2 is high. So we get a plot view graph from testing with RapidMiner as follows:

![Figure 5. Clustering Graph in Plot View](image)
While the results of grouping countries in Southeast Asia based on data on Cases and Deaths due to COVID-19 could be seen in figure 6 below.

![Figure 6. Clustering of Countries Based on Case Data and Deaths Due to COVID-19](image)

It can be clarified that according to figure 6 countries in Southeast Asia included in cluster 0 (Low Cluster / Green Zone) includes: Darussalam Brunei, Cambodia, Laos, Myanmar, Timor-Leste and Vietnam. Countries included in cluster 2 (Normal Cluster / Yellow Zone) is Singapore. While the State included in cluster 1 (High Cluster / Red Zone) is Indonesia, Malaysia, Philippines, and Thailand.

4. Conclusion

Clustering for Cases and Deaths caused by COVID-19 in Southeast Asia can be done with data mining. The data mining method used is K-means by utilizing the RapidMiner tool. Based on 2 assessment attributes (Total Confirmed Cases and Total Deaths), clustering uses 3 clusters, that is: (C1) high, (C2) regular cluster, and (C3) low cluster. From the results of clustering, four countries is in (C1) High Cluster and is a country in Southeast Asia that is included in the red zone category. The country is Indonesia, Malaysia, Philippines, and Thailand. The findings of this study may provide feedback to countries in Southeast Asia to take concrete steps even more optimally to tackle the problem of transmission and death caused by Covid-19. In addition to that the population of each country in Southeast Asia is increasingly raising awareness of the transmission of Covid-19, and for the time being do not visit countries such as Indonesia, Malaysia, Philippines, and Thailand because these countries are at the level of cases of spread and deaths due to Covid-19 high enough.

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