



## Android & Ios Covid19 Data Clustering Application Using Flutter with K-Means Algorithm

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### ARTICLEINFO

### ABSTRACT

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In the current pandemic, Covid19 has a tremendous impact on the survival of mankind. The government has made efforts to spread Covid19 so that it does not spread much in Indonesia, and now it is in the process of being called PSBB (Large-Scale Social Restrictions) but many Indonesians still violate and ignore the program. There are still many who travel to the Mall, Coffe shop, and even abroad. In this 2020 Era, mobile technology is now an important component of human life, so it is possible to harness the power of mobile technology to make the Indonesian people who still want to violate the program of this government aimed at reducing the spread of COVID-19. So the author aims to create an application that can be accessed through Android & Ios

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## 1. Introduction

Since the beginning of the year, the world has been dealing with a new respiratory disease similar to the flu and highly contagious COVID-19 caused by the SARS-Cov-2 virus (often referred to as coronavirus). tuberculosis, fatigue, loss of taste and smell, are transmitted both directly through respiratory and indirect droplets. Even people without symptoms can spread the disease, while the death toll is quite high in older populations and people with chronic diseases, which makes the situation almost impossible to deal with. The application of face masks and hand sanitizers has shown promising results in cases of reduced disease transmission.

However, the main problem is the lack of approved vaccines and treatments. Based on all these facts, many protection and security efforts are made by the government to reduce the spread of disease, such as compulsory use of indoor masks, social distancing, quarantine, isolation, work from home, restricting movement of citizens and tourism, banning and cancellation of events and public meetings . Despite the loss of lives, the pandemic has also led to devastating financial losses and economic stagnation, leading to an overall global crisis.

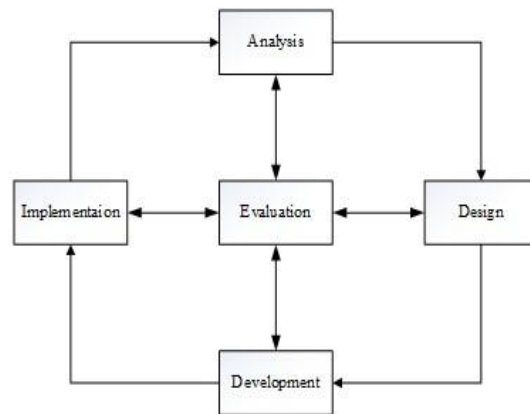
But people in Indonesia is very difficult in the warning not to go out full, but there are still many who are desperate to go out of state and out of the city, seen from the number of smartphone users in Indonesia's Android and Ios will facilitate the government in implementing programs such as this. So in this study the author gives the title "Covid19 Data Clustering Application Based on Android & IOS Using Flutter With K-Means Algorithm"

## 2. Research Methods

The type of research used is developmental research. In this development research, general service information application development products use the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The ADDIE model consists of 5 stages of development, namely:

- a) *Analyze* (Analysis)
- b) *Design* (Planning)
- c) *Development* (Development)
- d) *Implement* (Implementation)
- e) *Evaluate* (Evaluation)





**Fig. 2** Development Methodology

**2.1 Analysis**

In this stage, the researcher analyzes the number of victims of covid disease from various countries and sources that display numbers and statistical graphs. This stage is the most important stage where the application that will be created by the author really needs accurate numbers and graphics and updated in realtime.

**2.2 Planning**

At the design stage, it is done systematically and specifically. This stage is done after the stage of analysis and definition of system needs. At this stage is the stage of application design so that the software used is in accordance with the needs of the application that has been done at the analysis stage.

This application is built with a clear picture and design so that the application developer, can be more structured in developing it so that it can translate the software needs from the analysis stage to the design representative to be implemented into the program at the next stage.

a) **K-Means Clustering Algorithm**

K-Means Clustering K which represents the number of Clusters, Means means the average of each cluster. Means is also commonly called centroid, K-Means is used to group data into several groups with some

Cluster. Data - data is selected into several groups with predetermined criteria and then grouped into one in a Cluster. Where each Cluster has a central point called Centroid. Here are the steps to optimize using the K-Means algorithm:

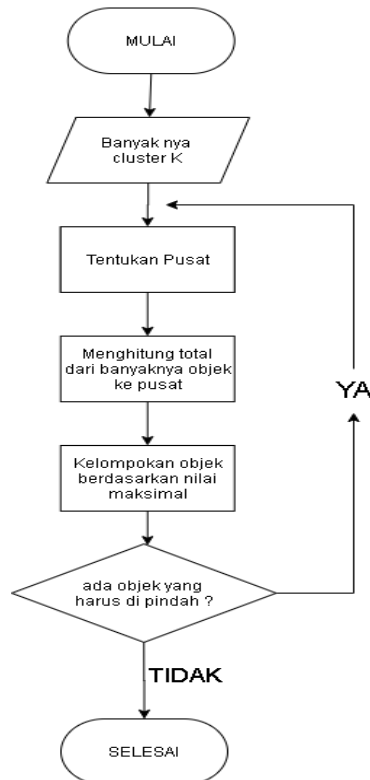


Fig. 3. K-Means Clustering Algorithm

- b) Selects the Cluster on the dataset
- c) Calculates Centroid from the selected Cluster
- d) Calculating the closest distance each data to Centroid to calculate the centroid distance is Euclidean distance (d) using the formula below:

$$de = \sqrt{(xi - si)^2 + (yi - ti)^2} .$$

Description:

(x, y) = Object coordinates

(s, t) = Centroid coordinates

i = Number of objects

- e) Recalculate the center of the Cluster with the current Cluster. Cluster Average is the average of all the data in a Cluster.

How to calculate it using a formula:

$$V_{ij} = \frac{1}{N_i} \sum_{k=0}^{N_i} X_{kj}$$

Description:

V<sub>ij</sub> = Average Centroid on Cluster - i

for variables -j

N<sub>i</sub> = Number of members of the i-Cluster

i, k = Index of Cluster

j = Variable index

X<sub>kj</sub> = Data value to -k variable j - for the Cluster

- f) Recalculate the object using the new Cluster center (New Centroid), If the Cluster member does not experience Cluster transfer again, then the Clustering process is declared complete. But, if the Cluster experiences a transfer, then it goes back to step c until the Cluster does not experience a transfer again.

### 2.3 Development

The development stage is the development stage of the design that has been made which is implemented in the programming language to develop this application in real time. In the development

process, of course, researchers need some tools that will be used in implementing it. The needs of these devices can be categorized into 2, namely hardware and software.

**2.4 Implementation**

Implementation is the stage of implementation as well as testing for new systems and is the stage where the application is ready to be operated in the real situation, the effectiveness of the new system will be known for sure, also for all the advantages and disadvantages of system and program applications.

**2.5 EVALUATION**

The evaluation stage is the concluding stage of application development and testing. If there is an imperfection or the application displays different results than expected, then a revision or modification action is required which will be implemented to the next level.

**3. Discussion**

**3.1 Calculation with K-Means Algorithm**

performed by manual calculation using sample data of 216 countries affected by the spread of COVID-19 in the world. The following is a sample of COVID-19 distribution data in the World as of October 16, 2020:

**Table 1.**  
Sample dissemination data

No	Nama Negara	Total Kasus	Total Meninggal				
1	USA	8197464	222455	51	China	85622	4634
2	India	7360345	112144	52	Honduras	85458	2533
3	Brazil	5148345	151971	53	Venezuela	85005	714
4	Russia	1354163	23491	54	Bahrain	76021	289
5	Spain	972958	33553	55	Switzerland	71317	2115
6	Argentina	931967	24921	56	Moldova	65076	153
7	Colombia	930159	28306	57	Uzbekistan	62278	518
8	Peru	856951	33512	58	Nigeria	60834	1116
9	Mexico	823986	84898	59	Austria	60224	877
10	France	809684	33125	60	Armenia	59995	1046
11	South Africa	696414	18151	61	Lebanon	58745	501
12	UK	673622	43293	62	Singapore	57892	28
13	Iran	517835	29605	63	Algeria	53777	1827
14	Chile	486496	13444	64	Paraguay	51845	1131
15	Iraq	416802	10086	65	Kyrgyzstan	50589	1099
16	Bangladesh	384559	5608	66	Ghana	47151	310
17	Italy	381602	36372	67	Libya	46676	681
18	Indonesia	34916	12268	68	Ireland	46429	1818
19	Germany	348707	981	69	Palestine	461	401
20	Philippines	348099	6497	70	Kenya	43143	805
21	Turkey	342143	908	71	Azerbaijan	4275	616
22	Saudi Arabia	341062	5127	72	Hungary	41732	1052
23	Pakistan	321218	6614	73	Afghanistan	40026	1481
24	Israel	300011	2121	74	Serbia	34544	770
25	Ukraine	281239	5302	75	Tunisia	3479	512
26	Netherlands	202954	6992	76	Denmark	34023	677
27	Canada	19131	9698	77	Jordan	33009	282
28	Belgium	181511	10278	78	Myanmar	32351	765
29	Romania	16849	5674	79	Bosnia and Herzeg	32224	972
30	Morocco	16385	2772	80	El Salvador	31061	968
31	Poland	149903	3308	81	Australia	27337	904
32	Ecuador	149083	12264	82	Bulgaria	26593	529
33	Czechia	144849	1218	83	S. Korea	24988	439
34	Bolivia	139141	8377	84	Slovakia	24225	71
35	Qatar	128803	222	85	Greece	23947	482
36	Panama	122128	2519	86	Croatia	22534	344
37	Nepal	121745	694	87	North Macedonia	2217	815
38	Dominican Republic	119662	2186	88	Cameroon	21441	423
39	Kuwait	114015	684	89	Ivory Coast	20217	120
40	UAE	111437	452	90	Malaysia	18129	170
41	Kazakhstan	109094	1768	91	Madagascar	16754	237
42	Oman	108296	1071	92	Albania	16212	439
43	Egypt	104915	6077	93	Norway	1605	278
44	Sweden	102407	591	94	Zambia	15616	345
45	Guatemala	99765	3453	95	Senegal	15348	316
46	Portugal	93294	2128	96	Montenegro	14672	221
47	Costa Rica	9178	1134	97	Georgia	1444	113
48	Japan	9071	1646	98	Sudan	13691	836
49	Ethiopia	87169	1325	99	Finland	12944	350
50	Belarus	85734	916	100	Namibia	12069	130



101	Guinea	11255	70	151	Benin	2478	41
102	Maldives	11062	35	152	Guinea-Bissau	2389	41
103	DRC	10935	281	153	Uruguay	2388	51
104	Slovenia	10683	176	154	Sierra Leone	2315	73
105	Mozambique	10392	73	155	Burkina Faso	2305	63
106	Tajikistan	10374	80	156	Cyprus	2274	25
107	Luxembourg	10244	133	157	Martinique	2257	24
108	French Guiana	10233	69	158	Yemen	2053	596
109	Uganda	10117	96	159	Togo	1983	51
110	Haiti	8908	231	160	New Zealand	1876	25
111	Gabon	8869	54	161	Lesotho	1833	42
112	Jamaica	8067	160	162	Liberia	1372	82
113	Zimbabwe	8055	231	163	Chad	1329	92
114	Mauritania	7572	163	164	Niger	1205	69
115	Cabo Verde	7371	79	165	Vietnam	1124	35
116	Guadeloupe	6908	96	166	Sao Tome and Prin	929	15
117	Angola	6846	227	167	Sao Marino	759	42
118	Lithuania	676	110	168	Channel Islands	748	48
119	Cuba	6062	123	169	Sint Maarten	729	22
120	Malawi	5836	181	170	Diamond Princess	712	13
121	Eswatini	5715	114	171	Turks and Caicos	696	6
122	Djibouti	544	61	172	Curaçao	645	1
123	Bahamas	5385	112	173	Papua New Guinea	578	7
124	Nicaragua	5353	154	174	Taiwan	531	7
125	Sri Lanka	5344	13	175	Gibraltar	531	
126	Hong Kong	5214	105	176	Burundi	529	1
127	Congo	5156	92	177	Tanzania	509	21
128	Trinidad and Tobago	5154	93	178	Saint Martin	501	8
129	Suriname	5083	108	179	Comoros	496	7
130	Equatorial Guinea	5068	83	180	Faeroe Islands	480	
131	Rwanda	494	33	181	Eritrea	414	
132	Syria	4883	234	182	Mauritius	407	10
133	CAR	4855	62	183	Isle of Man	348	24
134	Réunion	4678	17	184	Mongolia	320	
135	Aruba	4285	32	185	Bhutan	316	
136	Malta	416	45	186	Cambodia	283	
137	Mayotte	403	43	187	Monaco	253	2
138	Estonia	398	68	188	Cayman Islands	225	1
139	Botswana	3914	20	189	Barbados	215	7
140	Somalia	3864	99	190	Bermuda	183	9
141	Iceland	3817	10	191	Liechtenstein	183	1
142	Thailand	3665	59	192	Caribbean Netherl	150	2
143	Gambia	3642	118	193	Seychelles	148	
144	Guyana	3589	106	194	Brunei	147	3
145	French Polynesia	3573	13	195	Antigua and Barbu	112	3
146	Mali	3368	132	196	British Virgin Islan	71	1
147	Andorra	319	39	197	St. Barth	67	
148	Latvia	3056	41	198	St. Vincent Grenad	64	
149	South Sudan	2907	55	199	Macao	46	
150	Belize	2619	40	200	Dominica	33	
201	Fiji	32	2				
202	Saint Lucia	31					
203	Timor-Leste	29					
204	New Caledonia	27					
205	Grenada	25					
206	Laos	23					
207	Vatican City	19					
208	Saint Kitts and New 13						
209	Greenland	16					
210	Saint Pierre Mique 16						
211	Montserrat	13	1				
212	Falkland Islands	13					
213	Western Sahara	10	1				
214	MS Zaandam	9	2				
215	Anguilla	3					
216	Solomon Islands	3					

At this stage it can be seen that:

Number of Clusters: 3

Total Data: 216

Number of Attributes: 2 (Positive Cases and Cases Died)

1st iteration

**A. Determine the initial centroid at random.**

C1 (USA) = (8197464,222455),

C2 (Angola) = (6846,227)

C3 (Laos) = (23.0)

In the COVID-19 distribution cluster which is the large-scale distribution is taken on the 1st data i.e. USA, then for the Cluster with medium-term distribution is the 117th data that is Angola, and for the Cluster with the short-term distribution is the 206th data namely Laos.

**B. Count the nearest centroids.**

The next step is to calculate the distance of each data with Centroid with the Euclidean Distance equation. At this stage the closest distance between the data and the Cluster will determine which data goes into which Cluster.

The following is the result of the calculation of the distance in the 1st Iteration



**Table 2**  
**Results of Interaction calculation 1**

Cluster 1	Cluster 2	Cluster 3	China
Nepal	8114765,962	7889,17509	85724,34168
USA	8114986,57	78645,81476	85472,54129
India	8115486,901	78160,51271	84964,99998
Brazil	8123811,385	4775,02755	76598,54519
Russia	8129133,704	64498,63863	71235,36478
Spain	8115425,789	58230,04762	60031,17992
Argentina	8138212,782	55432,76382	62037,1555
Colombia	8139639,962	53995,31692	60821,23952
Peru	8140256,238	51881,93748	60607,28767
Mexico	8140480,505	51355,30962	59991,1212
France	8141744,932	51899,72328	58724,13758
South Africa	8142610,522	51046,30789	57869,00677
UK	8148625,668	46668,26616	53786,69923
Chile	8148625,234	45008,07946	51834,3404
Costa Rica	8149881,04	43731,69663	50577,94143
Italy	8151319,611	40305,08346	47129,61905
Germany	8153804,555	39832,58736	46657,97006
Japan	8154020,078	39615,76971	46442,38452
Indonesia	8200010,182	6387,370429	3911,839108
Turkey	815732,879	36301,6018	41127,51355
Philippines	8158191,709	26030,26191	4296,389182
Canada	8158716,051	14695,75362	4172,24466
Belgium	8164452,99	27180,7271	34006,73946
Romania	8164777,352	26145,0791	32997,2054
Morocco	8168121,985	25510,4783	32117,0501
Poland	8168283,223	25388,9221	32225,66678
Czechia	8169407,629	24234,57491	31051,27889
Bolivia	8173116,877	20522,16972	27348,84662
Qatar	8173874,419	19759,47401	26586,23593
Ukraine	8175491,121	18143,23963	24968,80958
UAE	8176263,641	17179,70014	24622,10424
Denmark	8178305,57	17702,9011	23928,85497
Sweden	8177946,796	15688,43628	22513,62825
South Korea	8180643,873	4666,19588	2140,46997
Iran	8179037,248	14096,31601	21422,17666
Iran	8180209,027	13371,42812	20194,30564
Iran	818214,887	11381,14318	18126,78063
Iran	8183727,57	9908,00649	16732,67851
Iran	8184263,888	9908,39909	16194,95113
Iran	8188868,864	5241,248134	1056,260313
Iran	8184062,219	8770,79387	15596,81613
Iran	8183130,907	8502,663819	15328,29276
Iran	8185809,217	7826,023	14650,66695
Iran	8199035,297	5403,202754	1425,458882
Iran	8180773,204	6872,03798	13693,543
Iran	8187813	6099,240183	12825,73848
Iran	8188413,748	5223,90065	12046,70146
Iran	8189229,077	4411,7942	11322,23812
Iran	818421,957	620,26051	11039,05546
Iran	818943,232	4089,35051	10915,61746
Iran	818977,989	3817,10922	10661,45281
Iran	818498,478	3443,34243	10369,29869
Iran	819109,481	3511,06172	10351,30914
Iran	819037,994	3399,29928	10221,88529
Iran	8190290,728	3190,40264	10100,21913
Iran	8190465,052	3176,62251	10044,4064
Iran	8191570,843	2962,00388	9888,00284
Iran	8191614,632	2930,80170	9846,14883
Iran	8192411,459	2722,86866	9505,91919
Iran	819243,529	1209,06617	8035,21988
Iran	8192406,136	728,8124771	7500,39346
Iran	819111,401	545,661091	7246,23669
Iran	8191373,769	144,911081	6885,66624
Iran	8193632,192	0	6626,77588
Iran	819381,096	617,10922	642,200104
Iran	8194418,725	795,8076777	6040,25247
Iran	8194641,069	1811,040862	5815,817225
Iran	8194641,069	1811,040862	5815,817225
Iran	8199396,376	6304,189511	534,558852
Iran	8195095,734	1465,518021	5363,189893
Iran	8195126,623	1494,761096	5352,24092
Iran	819539,409	1616,20101	5221,61818
Iran	8195286,901	1638,553696	5192,61828
Iran	8195325,233	1695,383437	5133,824883
Iran	8195127,205	1897,287051	5111,84278
Iran	819587,772	1767,611602	5061,152438
Iran	8195411,445	1763,82174	5045,46279
Iran	8195897,117	624,862461	4711,648103
Iran	819594,281	1963,61481	4865,83077
Iran	8195628,936	1997,82318	4832,39749
Iran	819581,092	2176,349174	4655,03106
Iran	8195197,54	2548,411129	4262,12013
Iran	820004,763	6432,575223	395,567941
Iran	820077,813	6443,60881	364,241516
Iran	8200062,133	6449,90077	361,115465
Iran	819058,729	2939,28045	3891,0514
Iran	819616,567	2954,10280	3842,27628
Iran	819645,972	31616,4545	3824,81311
Iran	819616,579	3185,433252	3642,47985
Iran	819687,97	3205,80355	3620,52325
Iran	819691,796	3219,34046	3547,71967
Iran	819699,794	3279,588657	3500,023883
Iran	8197111,49	3479,297199	3447,603471
Iran	820043,148	629,38178	311,637967
Iran	8197425,843	3794,561371	3033,277106
Iran	8197874,372	4042,600634	2786,54323
Iran	8197861,71	4211,134363	2596,302448
Iran	8114765,962	7889,17509	85724,34168
Iran	8114986,57	78645,81476	85472,54129
Iran	8115486,901	78160,51271	84964,99998
Iran	8123811,385	4775,02755	76598,54519
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Iran	8140480,505	51355,30962	59991,1212
Iran	8141744,932	51899,72328	58724,13758
Iran	8142610,522	51046,30789	57869,00677
Iran	8148625,668	46668,26616	53786,69923
Iran	8148625,234	45008,07946	51834,3404
Iran	8149881,04	43731,69663	50577,94143
Iran	8151319,611	40305,08346	47129,61905
Iran	8153804,555	39832,58736	46657,97006
Iran	8154020,078	39615,76971	46442,38452
Iran	8200010,182	6387,370429	3911,839108
Iran	815732,879	36301,6018	41127,51355
Iran	8158191,709	26030,26191	4296,389182
Iran	8158716,051	14695,75362	4172,24466
Iran	8164452,99	27180,7271	34006,73946
Iran	8164777,352	26145,0791	32997,2054
Iran	8168121,985	25510,4783	32117,0501
Iran	8168283,223	25388,9221	32225,66678
Iran	8169407,629	24234,57491	31051,27889
Iran	8173116,877	20522,16972	27348,84662
Iran	8173874,419	19759,47401	26586,23593
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Iran	8176263,641	17179,70014	24622,10424
Iran	8178305,57	17702,9011	23928,85497
Iran	8177946,796	15688,43628	22513,62825
Iran	8180643,873	4666,19588	2140,46997
Iran	8179037,248	14096,31601	21422,17666
Iran	8180209,027	13371,42812	20194,30564
Iran	818214,887	11381,14318	18126,78063
Iran	8183727,57	9908,00649	16732,67851
Iran	8184263,888	9908,39909	16194,95113
Iran	8188868,864	5241,248134	1056,260313
Iran	8184062,219	8770,79387	15596,81613
Iran	8183130,907	8502,663819	15328,29276
Iran	8185809,217	7826,023	14650,66695
Iran	8199035,297	5403,202754	1425,458882
Iran	8180773,204	6872,03798	13693,543
Iran	8187813	6099,240183	12825,73848
Iran	8188413,748	5223,90065	12046,70146
Iran	8189229,077	4411,7942	11322,23812
Iran	818421,957	620,26051	11039,05546
Iran	818943,232	4089,35051	10915,61746
Iran	818977,989	3817,10922	10661,45281
Iran	818498,478	3443,34243	10369,29869
Iran	819109,481	3511,06172	10351,30914
Iran	819037,994	3399,29928	10221,88529
Iran	8190290,728	3190,40264	10100,21913
Iran	8190465,052	3176,62251	10044,4064
Iran	8191570,843	2962,00388	9888,00284
Iran	8191614,632	2930,80170	9846,14883
Iran	8192411,459	2722,86866	9505,91919
Iran	819243,529	1209,06617	8035,21988
Iran	8192406,136	728,8124771	7500,39346
Iran	819111,401	545,661091	7246,23669
Iran	8191373,769	144,911081	6885,66624
Iran	8193632,192	0	6626,77588
Iran	819381,096	617,10922	642,200104
Iran	8194418,725	795,8076777	6040,25247
Iran	8194641,069	1811,040862	5815,817225
Iran	8194641,069	1811,040862	5815,817225
Iran	8199396,376	6304,189511	534,558852
Iran	8195095,734	1465,518021	5363,189893
Iran	8195126,623	1494,761096	5352,24092
Iran	819539,409	1616,20101	5221,61818
Iran	8195286,901	1638,553696	5192,61828
Iran	8195325,233	1695,383437	5133,824883
Iran	8195127,205	1897,287051	5111,84278
Iran	819587,772	1767,611602	5061,152438
Iran	8195411,445	1763,82174	5045,46279
Iran	8195897,117	624,862461	4711,648103
Iran	819594,281	1963,61481	4865,83077
Iran	8195628,936	1997,82318	4832,39749
Iran	819581,092	2176,349174	4655,03106
Iran	8195197,54	2548,411129	4262,12013
Iran	820004,763	6432,575223	395,567941
Iran	820077,813	6443,60881	364,241516
Iran	8200062,133	6449,90077	361,115465
Iran	819058,729	2939,28045	3891,0514
Iran	819616,567	2954,10280	3842,27628
Iran	819645,972	31616,4545	3824,81311
Iran	819616,579	3185,433252	3642,47985
Iran	819687,97	3205,80355	3620,52325
Iran	819691,796	3219,34046	3547,71967
Iran	819699,794	3279,588657	3500,023883
Iran	8197111,49	3479,297199	3447,603471
Iran	820043,148		

**Table 3.**  
Interaction Cluster Grouping 1

Nama Negara	Jarak Terdekat		
		China	C2
USA	C1	Honduras	C2
India	C1	Venezuela	C2
Brazil	C1	Bahrain	C2
Russia	C2	Switzerland	C2
Spain	C2	Moldova	C2
Argentina	C2	Uzbekistan	C2
Colombia	C2	Nigeria	C2
Peru	C2	Austria	C2
Mexico	C2	Armenia	C2
France	C2	Lebanon	C2
South Africa	C2	Singapore	C2
UK	C2	Algeria	C2
Iran	C2	Paraguay	C2
Chile	C2	Kyrgyzstan	C2
Iraq	C2	Ghana	C2
Bangladesh	C2	Libya	C2
Italy	C2	Ireland	C2
Indonesia	C2	Palestine	C3
Germany	C2	Kenya	C2
Philippines	C2	Azerbaijan	C2
Turkey	C2	Hungary	C2
Saudi Arabia	C2	Afghanistan	C2
Pakistan	C2	Serbia	C2
Israel	C2	Tunisia	C2
Ukraine	C2	Denmark	C2
Netherlands	C2	Jordan	C2
Canada	C2	Myanmar	C2
Belgium	C2	Bosnia and Herzegovina	C2
Romania	C2	El Salvador	C2
Morocco	C2	Australia	C2
Poland	C2	Bulgaria	C2
Ecuador	C2	S. Korea	C2
Czechia	C2	Slovakia	C2
Bolivia	C2	Greece	C2
Qatar	C2	Croatia	C2
Panama	C2	North Macedonia	C3
Nepal	C2	Cameroon	C2
Dominican Republic	C2	Ivory Coast	C2
Kuwait	C2	Malaysia	C2
UAE	C2	Madagascar	C2
Kazakhstan	C2	Albania	C2
Oman	C2	Norway	C3
Egypt	C2	Zambia	C2
Sweden	C2	Senegal	C2
Guatemala	C2	Montenegro	C2
Portugal	C2	Georgia	C3
Costa Rica	C2	Sudan	C2
Japan	C2	Finland	C2
Ethiopia	C2	Namibia	C2
Belarus	C2		



Guinea	C2	Benin	C3		
Maldives	C2	Guinea-Bissau	C3		
DRC	C2	Uruguay	C3		
Slovenia	C2	Sierra Leone	C3		
Mozambique	C2	Burkina Faso	C3		
Tajikistan	C2	Cyprus	C3		
Luxembourg	C2	Martinique	C3		
French Guiana	C2	Yemen	C3		
Uganda	C2	Togo	C3		
Haiti	C2	New Zealand	C3		
Gabon	C2	Lesotho	C3		
Jamaica	C2	Liberia	C3		
Zimbabwe	C2	Chad	C3		
Mauritania	C2	Niger	C3		
Cabo Verde	C2	Vietnam	C3		
Guadeloupe	C2	Sao Tome and Principe	C3		
Angola	C2	San Marino	C3		
Lithuania	C3	Channel Islands	C3		
Cuba	C2	Sint Maarten	C3		
Malawi	C2	Diamond Princess	C3		
Eswatini	C2	Turks and Caicos	C3		
Djibouti	C3	Curaçao	C3		
Bahamas	C2	Papua New Guinea	C3		
Nicaragua	C2	Taiwan	C3		
Sri Lanka	C2	Gibraltar	C3		
Hong Kong	C2	Burundi	C3		
Congo	C2	Tanzania	C3		
Trinidad and Tobago	C2	Saint Martin	C3		
Suriname	C2	Comoros	C3		
Equatorial Guinea	C2	Faeroe Islands	C3		
Rwanda	C3	Eritrea	C3		
Syria	C2	Mauritius	C3		
CAR	C2	Isle of Man	C3		
Réunion	C2	Mongolia	C3		
Aruba	C2	Bhutan	C3	Fiji	C3
Malta	C3	Cambodia	C3	Saint Lucia	C3
Mayotte	C3	Monaco	C3	Timor-Leste	C3
Estonia	C3	Cayman Islands	C3	New Caledonia	C3
Botswana	C2	Barbados	C3	Grenada	C3
Somalia	C2	Bermuda	C3	Laos	C3
Iceland	C2	Liechtenstein	C3	Vatican City	C3
Thailand	C2	Caribbean Netherland	C3	Saint Kitts and Nevis	C3
Gambia	C2	Seychelles	C3	Greenland	C3
Guyana	C2	Brunei	C3	Saint Pierre Miquelon	C3
French Polynesia	C2	Antigua and Barbuda	C3	Montserrat	C3
Mali	C3	British Virgin Islands	C3	Falkland Islands	C3
Andorra	C3	St. Barth	C3	Western Sahara	C3
Latvia	C3	St. Vincent Grenadine	C3	MS Zaandam	C3
South Sudan	C3	Macao	C3	Anguilla	C3
Belize	C3	Dominica	C3	Solomon Islands	C3

**D. Determine the new Centroid for the next iteration by finding the average value of each cluster.**  
Here is the interaction done using the K-means algorithm

Iteration.1

C1	6903748	162190
C2	129947,689	4443,393939
C3	785,876543	47,79012346

Iteration.2

C1	6903748	162190
C2	334926,391	11356,80435
C3	10839,1437	407,1017964

Iteration.3

C1	6903748	162190
C2	561354,391	20125
C3	22661,0526	671,1789474



Iteration.4

C1	6903748	162190
C2	612222,35	22030,15
C3	25763,2332	776,1450777

Iteration.5

C1	6903748	162190
C2	628654,526	23078
C3	27176,8814	783,0773196

Iteration.6

C1	6903748	162190
C2	645734,333	23992,66667
C3	28684,7846	812,9794872

Iteration.7

C1	6903748	162190
C2	645734,333	23992,66667
C3	28684,7846	812,9794872

If the iteration phase has achieved the same result without any further transfer, then the calculation is stopped.

In this study iterations are done until the 7th iteration. Because in the picture above in the 6th and 7th iterations the same iteration results are found. Therefore the final result of the interaction above the Cluster position of the 7th iteration Centroid can be shown in the table below:

**Table 4.**  
Cluster Division in the 7th Iteration

Nama Negara	Letak Cluster	Nama Negara	Letak Cluster
China	C3	USA	C1
Honduras	C3	India	C1
Venezuela	C3	Brazil	C1
Bahrain	C3	Russia	C2
Switzerland	C3	Spain	C2
Moldova	C3	Argentina	C2
Uzbekistan	C3	Colombia	C2
Nigeria	C3	Peru	C2
Austria	C3	Mexico	C2
Armenia	C3	France	C2
Lebanon	C3	South Africa	C2
Singapore	C3	UK	C2
Algeria	C3	Iran	C2
Paraguay	C3	Chile	C2
Kyrgyzstan	C3	Iran	C2
Ghana	C3	Bangladesh	C2
Libya	C3	Italy	C2
Ireland	C3	Indonesia	C3
Palestine	C3	Germany	C2
Kenya	C3	Philippines	C2
Azerbaijan	C3	Turkey	C2
Hungary	C3	Saudi Arabia	C2
Afghanistan	C3	Pakistan	C3
Serbia	C3	Israel	C3
Tunisia	C3	Ukraine	C3
Denmark	C3	Netherlands	C3
Jordan	C3	Canada	C3
Myanmar	C3	Belgium	C3
Bosnia and Herzegovina	C3	Romania	C3
El Salvador	C3	Morocco	C3
Australia	C3	Poland	C3
Bulgaria	C3	Ecuador	C3
S. Korea	C3	Czechia	C3
Slovakia	C3	Bolivia	C3
Greece	C3	Qatar	C3
Croatia	C3	Panama	C3
North Macedonia	C3	Nepal	C3
Cameroon	C3	Dominican Republic	C3
Ivory Coast	C3	Kuwait	C3
Malaysia	C3	UAE	C3
Madagascar	C3	Kazakhstan	C3
Albania	C3	Oman	C3
Norway	C3	Egypt	C3
Zambia	C3	Sweden	C3
Senegal	C3	Guatemala	C3
Montenegro	C3	Portugal	C3
Georgia	C3	Costa Rica	C3
Sudan	C3	Japan	C3
Finland	C3	Ethiopia	C3
Namibia	C3	Belarus	C3



Nama Negara	Letak Cluster	Nama Negara	Letak Cluster
Benin	C3	Guinea	C3
Guinea-Bissau	C3	Guinea	C3
Uruguay	C3	Maldives	C3
Sierra Leone	C3	DRC	C3
Burkina Faso	C3	Slovenia	C3
Cyprus	C3	Mozambique	C3
Martinique	C3	Tajikistan	C3
Yemen	C3	Luxembourg	C3
Togo	C3	French Guiana	C3
New Zealand	C3	Uganda	C3
Lesotho	C3	Haiti	C3
Liberia	C3	Gabon	C3
Chad	C3	Jamaica	C3
Niger	C3	Zimbabwe	C3
Vietnam	C3	Mauritania	C3
Sao Tome and Principe	C3	Cabo Verde	C3
San Marino	C3	Guadeloupe	C3
Channel Islands	C3	Angola	C3
Sint Maarten	C3	Lithuania	C3
Diamond Princess	C3	Cuba	C3
Turks and Caicos	C3	Malawi	C3
Curacao	C3	Eswatini	C3
Papua New Guinea	C3	Djibouti	C3
Taiwan	C3	Bahamas	C3
Gibraltar	C3	Nicaragua	C3
Burundi	C3	Sri Lanka	C3
Tanzania	C3	Hong Kong	C3
Saint Martin	C3	Congo	C3
Comoros	C3	Trinidad and Tobago	C3
Faeroe Islands	C3	Suriname	C3
Eritrea	C3	Equatorial Guinea	C3
Mauritius	C3	Rwanda	C3
Isle of Man	C3	Syria	C3
Mongolia	C3	CAR	C3
Bhutan	C3	Reunion	C3
Cambodia	C3	Aruba	C3
Monaco	C3	Malta	C3
Cayman Islands	C3	Mayotte	C3
Barbados	C3	Estonia	C3
Bermuda	C3	Botswana	C3
Liechtenstein	C3	Somalia	C3
Caribbean Netherlands	C3	Iceland	C3
Seychelles	C3	Thailand	C3
Brunei	C3	Gambia	C3
Antigua and Barbuda	C3	Guyana	C3
British Virgin Islands	C3	French Polynesia	C3
St. Barth	C3	Mali	C3
St. Vincent Grenadines	C3	Andorra	C3
Macao	C3	Latvia	C3
Dominica	C3	South Sudan	C3
		Belize	C3
		Solomon Islands	C3
		Fiji	C3
		Saint Lucia	C3
		Timor-Leste	C3
		New Caledonia	C3
		Grenada	C3
		Laos	C3
		Vatican City	C3
		Saint Kitts and Nevis	C3
		Greenland	C3
		Saint Pierre Miquelon	C3
		Montserrat	C3
		Falkland Islands	C3
		Western Sahara	C3
		MS Zaandam	C3
		Anguilla	C3

The simulation results of the K-means algorithm will be applied to the android & ios based applications that have been created by the author the following is an example of the application demo:  
It can be seen for the initial view in Figure 1 containing the "Start" button & the "About" button.



Fig 1. Start button

when we click the button "Start" will immediately drop to the homepage page containing the three clusters, namely total casualties, total healing, total deaths and centroids updated in realtime as shown in Figure 2





Fig 2. Total deaths and centroids

In myhomepage there is an icon button located in the lower right corner that aims to select the target cluster that we want to display if clicked will display a list of countries with the largest number sequence such as figure 3

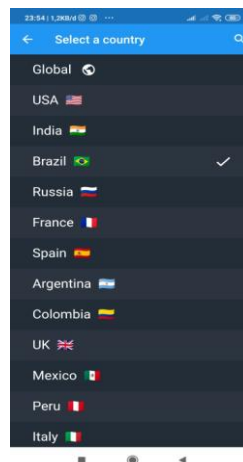


Fig 3. Display countries

Inside myhomepage there is also a calendar button located in the upper left corner which aims to filter the number of centroids from the last date or 7-28 days. If clicked it will display as shown in Figure 4

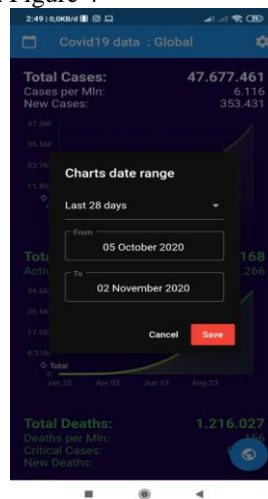


Fig 4 Calendar button

If you have set a date it will return to myomepage view with the same total centroid, because the centroid is the data that is Pulled in realtime.

And to see the centroid that we have filtered earlier can be seen in the diagram that has been divided, In the area there is a refresh button icon that aims to change from which side the user wants to see the total development of centroid, if clicked it will change to daily as in figure 5



Fig 5. Refresh button

In Figure 5 we can see the difference when we click the refresh button which changes the total to a diary will change the appearance of the graph.

#### 4. Conclusion

Based on the results of the calculations, it can be concluded that the combination of the clustering method and ADDIE can be applied to cases of the spread of covid-19 in the world by utilizing Microsoft Excel software and Visual studio code with the Flutter framework. This combination produces 3 countries that are in the highest cluster. The top countries on October 16 were ranked by the USA, Angola second to the middle tier, and Laos to the lowest three.

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