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The Impact of COVID-19 in Depression in Arab Twitter Users

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Abstract: Background: The COVID-19 pandemic is the greatest pandemic the world has witnessed in the modern era this has caused suffering, disruption in the lives of millions of people. Method: we got 16581 Arab tweets, whether they express depression or not, and what symptoms they contain while keeping the Time Series of the tweets to monitor the 1439 Arab Twitter Users during the two years 2019 and 2020. We determined whether the user was depressed or not, once in 2019 and again in 2020 during the COVID-19 pandemic period; to determine the impact of COVID-19 on depression for each user. Result: We have found that approximately 1.18% of users were classified with depression during the year 2019, compared to 36.69% of users who were classified with depression during the 2020 "during the COVID-19 pandemic," from a database of 1439 Arab users. Conclusion: Taking care of people's mental health during this difficult period is very important, as some measures must be taken to preserve people's mental health in countries affected by COVID-19. Feelings of fear related to the COVID-19 can affect and harm mental health, causing depression.

Keywords: COVID-19; Coronavirus; Twitter; Depression.

1. Introduction

Coronavirus is a large, widespread family that is known to cause diseases ranging from the common cold to more serious diseases such as Middle East Respiratory Syndrome (MERS) and SARS. COVID-19 is a disease caused by the emerging coronavirus called SARS-CoV-2. The new coronavirus is a new strain of coronavirus that has not been previously detected in humans. The first infection with this emerging virus was recorded on December 31, 2019, in Wuhan, China.

The COVID-19 pandemic is posing very serious public health challenges worldwide [1], with the COVID-19 pandemic having an impact the world has never seen before. The COVID-19 pandemic

has had a significant impact on the world as a whole in all areas of life, such as health and education, as the COVID-19 pandemic has had a clear and significant impact on millions of people around the world [2]. During the COVID-19 pandemic, some vulnerabilities in countries around the world that were not previously exposed, these effects have caused heavy and costly burdens on everyone and caused feelings of fear, anxiety and depression, so there is an urgent need to increase attention to providing effective support to the population [3].

The governments of countries have taken some measures and measures to confront and combat the COVID-19 pandemic, such as social distancing and closures in societies around the world. As social distancing during COVID-19 and not mingling with others and friends is very similar to the introversion that causes loneliness, anxiety, and depression, this came from the results of research that says that there is a possibility that mixing has a protective effect against mental health diseases [4], and this is what we lost during the pandemic COVID-19, in addition to the fear-inducing news that a vaccine against the virus will need months or possibly years [5].

Millions of people who have contracted COVID-19 now suffer from mental illnesses, such as depression and anxiety. The COVID-19 pandemic has raised anxiety and fear of infection and death, so early detection of mental health is essential to provide support and assistance to the population [6]. Depression is one of the most common mental health problems during the COVID-19 pandemic, according to findings from the World Health Organization (WHO).

The COVID-19 pandemic has caused disruptions in the political, social, economic, and health aspects of all countries of the world [7]. Mental health diseases have become a major problem during the COVID-19 pandemic [8], as the policies, events and measures that accompanied the COVID-19 pandemic -19 had a significant impact on people's feelings and led to various mental illnesses such as depression, anxiety and sadness [9], the COVID-19 pandemic has been associated with significant challenges, including mental health challenges. It is worth noting that the emergence of mental health diseases such as depression is linked to measures to combat the Covid-19 pandemic, such as social distancing [10]. Depression can cause serious physical, emotional, and behavioral health problems with dire consequences, including personal and social costs [11], and this is compounded by the COVID-19 pandemic, at a time when the world is striving to reduce the damage and impact of the COVID-19 pandemic.

The American Psychiatric Association (APA) outlines the criterion of a diagnosis of depression as is a common and serious medical illness that negatively affects how an individual feel, the way his think, and how to act. This causes feelings of sadness and a loss of interest in activities once enjoyed. It can lead to a variety of emotional and physical problems and can decrease the ability to function at work and study. The Depression Symptoms according to APA are:

a. Depressed mood.
b. Lack of interest or enjoyment of everything.
c. Appetite and weight disorder.
d. Slowed thinking and decreased physical movement.
e. Loss of energy.
f. Self-contempt.
g. Impaired ability to think.

h. Repeated thoughts of death and suicide.

i. Sleep disorder.

If a person suffers three of these symptoms for at least two consecutive weeks within three months, he is depressed.

Depression is one of the leading causes of disability among the world's population [12]. The rate of depression in the world is approximately 7%, as approximately 350 million people worldwide are affected by depression, according to World Health Organization WHO, with significant financial costs to governments and health institutions [25]. According to the WHO, depression is responsible for the loss of more than 4% of a person's life in disability during the year 2020 if this trend continues.

The Arab world is living in the last period, the worst period ever. This is due to the spread of violence and wars and the high rates of poverty and unemployment among young people. All of this creates a good environment for mental illnesses such as depression, anxiety, mania, and schizophrenia, as health statistics of the World Bank indicate that 7 out of 10 countries that topping the list of countries in the world in depression are countries in the Arab world. According to a survey conducted by the Arab Barometer network for research, approximately 30% of Arabs have suffered from depression. Depression tops the list of mental illnesses in the Arab world, as it is the main cause, according to psychologists, in 90% of suicide cases that have spread widely in the Arab world.

Depression negatively affects thoughts and feelings, as it has negative effects on the person's body and behaviors, and in advanced stages of infection, it is one of the fundamental reasons that lead an individual to think about suicide [14]

Social media platforms have emerged as an effective way to express feelings of fear, anxiety, depression, and opinions [15]. There is an importance for social media platforms, and in particular Twitter, in expressing the feelings, opinions, and needs of people [16]. The Twitter platform helps to discover important things, people's interests and thinking trends, and a lot of information [17]. Social media has become the most popular way to communicate between people during the COVID-19 pandemic. The use of different social media platforms during the COVID-19 pandemic was different from how they were used before the pandemic [18]. Therefore, Twitter was a source for collecting our data to analyze people's feelings during the COVID-19 pandemic and to reveal the impact of the pandemic on depression among Arab Twitter users.

2. Related Work

The authors in [3] aimed in this study was to reveal emotions in the population during the COVID-19 pandemic by conducting a cross-sectional study to analyze data on Twitter. A total of 1,015,655 English tweets were posted during the pandemic period from August 7 to 12, 2020. The tweets were analyzed to find out about sentiment in the population during the COVID-19 pandemic. The results showed that organizations are more afraid of COVID-19 and show more anxiety and depression than people, and women are less afraid and depressed because of COVID-19 than men. He finds that depression and anxiety from COVID-19 have a direct relationship with age.

The authors [19] conducted a systematic review of collecting, analyzing, and synthesizing research to explore the impact of the COVID-19 pandemic on people's mental health. 19 studies were collected in this systematic review. The results showed that the COVID-19 pandemic had a clear

impact on search engine searches about mental health, which is an indication of an increase in the number of depressed search engine users who have feelings of anxiety and stress. These results give public health and policy officials an important indicator in order to work on reducing and treating mental health symptoms.

The authors [6] designed a general survey targeting the population of Saudi Arabia whose objective was to determine the psychological impact on the population during the COVID-19 pandemic. This survey was conducted online, to collect data on the psychological effects of 1160 Saudi participants. The psychological impact was assessed by the revised Event Scale Impact Scale (IES-R) and Depression, Anxiety, and Stress Scale (DASS-21). The results showed that approximately 23.6% of the participants reported moderate or severe psychological distress due to the COVID-19 pandemic, and approximately 28.3% of the participants reported symptoms of depression, 24% of the participants reported having anxiety, and 22.3% of the participants Report stress.

The authors [20] chose Twitter to collect data for the English language depression study. A database of 2,575 users and their tweets was created. To study the impact of the COVID-19 pandemic on depression through Twitter, three models were trained that classify tweets as depressed or not, and at the user level. In addition, a classification model was created that combines deep learning and psychological script features. We demonstrate the ability of our model to monitor depression trends at the group level and at the population level by presenting two of its applications during the COVID-19 pandemic. From the SVM model, we got the best accuracy of 78.9% and the best F1 of 79.2%.

The authors [11] studied the dynamics of the prevalence of depression in society due to the COVID-19 pandemic by analyzing users' tweets. The authors suggested a TF-IDF- based approach for the detection of depression. The tweets recently deleted by Twitter users are collected from users in Australia. The presented model has the potential to detect depression caused by COVID-19 and the conditions that accompanied COVID-19. It was found through the results that people suffered from depression during COVID-19; in addition to that the measures taken by governments such as closures were the cause of depression as well. It is possible that the COVID-19 health emergency is causing depression.

The authors [8] aimed to expose mental health issues on Twitter during the COVID- 19 pandemic in the United States. User Tweets posted during COVID-19 were collected from March 5, 2020, to January 31, 2021. After analyzing the Tweets, Tweets expressing mental health issues were obtained from US users. Latent Dirichlet Allocation has been used to detect fear of mental health problems. The results showed that there is a positive correlation between mental health problems and the COVID-19 pandemic in the United States. Males are also more affected by health problems among Twitter users during the COVID-19 pandemic.

The authors [10] aimed to analyze the temporal evolution of depressive symptoms during COVID-19. Approximately 9,011 cross-sectional German population surveys and a total of 88,900 tweets, examined using depressive symptoms, were collected from the components of the Patient Health Questionnaire (PHQ-8) during the period from January to July 2020. Self- contempt symptoms were the least surveyed: 13.9%; Twitter: 5.7%, while feeling tired and losing energy was the most frequent Survey: 51.6%; Twitter: 34.9%. The results of the survey and Twitter comparison showed

that there is an indication of a decrease in fatigue and energy loss with time. There is a difference in the incidence of depressive symptoms related to the COVID-19 pandemic.

The authors [21] reveal the psychological impact of the COVID-19 pandemic on 3,055 residents of Spain, and the anxiety, stress, and depression caused by the COVID-19 pandemic. The results show that Spanish residents feel that the COVID-19 pandemic is having a clear impact on their lives. Approximately 36% of the participants reported moderate to severe psychological distress, approximately 25% reported mild to severe symptoms of anxiety, approximately 41% reported symptoms of depression, and approximately 41% felt tension.

The authors [22] aimed to study the psychological impact in Algeria during the COVID-19 pandemic. An online cross-sectional survey was conducted in which 678 Algerians responded to the Psychological Effect Study from March 23 to April 12, 2020. The results showed 50.3% of the respondents felt anxious, while 48.2% felt nervous, 46.6% were in a bad mood, and 47.4% of the respondents reported that they All day long were constantly thinking about this pandemic.

3. Methodology

3.1. Building Datasets that Contains Arab Twitter accounts and their Tweets

We collected 1439 Arab user accounts who are posting specific words such as:" أنا كئيب/ة, أنا مكتئب/ة "I am depressed", and أعاني الاكتئاب "I suffer from depression". From the dataset that contains 1439 Arab Twitter Accounts, we collected 22568 Arabic Tweets using the Apify website to solve the problem of collecting limited tweets. We collected Arabic Tweets from Arab Twitter Accounts during the two periods, the first from January 1 to December 31, 2019, and the second from January 1 to October 31, 2020, because we started collecting data in November 2020.

3.2. Data Preprocessing

In the posts of social media platforms, there are no rules that govern the language of users in drafting their posts through which they express their thoughts and feelings, where users of social media platforms use to write their post, punctuation, Word elongation, Arabic diacritics, Non-Arabic characters, and others. Twitter users like other users of social media platforms; use informal language and contain symbols and letters other than Arabic. So we needed to preprocess and cleaned the data to remove additional information that we do not need in the data.

Preprocessing was for two databases, namely My Depression dictionary and My Depression Tweets because we will later use My Depression dictionary to classify My Depression Tweets into depressed tweets or not. To arrive at clean datasets we followed these points:

1. Remove Arabic diacritics, these include Dammah, Fatahah, Kasrah, Maddah, Shaddah, Tanwin, Sukun.
2. Remove Word elongation (kashida), such as الاحزاااااان, المووووت
3. Remove Punctuation, numbers, and emojis
4. Remove Non-Arabic characters
5. Remove Multiple whitespace and empty lines
6. Remove Users names and URLs
7. Convert different forms of characters to the same form:

ا ◎ إ أ آ ا ◎

- ◎ ي ◎ ى ي
- ◎ ء ◎ ئ ؤ ء
- ◎ ك ◎ گ
- ◎ ه ◎ ة ه

8. Remove duplicate tweets

3.3. Determine Depressed Tweets

After preprocessing the datasets and cleaning them, we can classify the tweets as depressed or not. It is not easy to review a large number of tweets manually. To facilitate the task of categorizing tweets, we built a dictionary of words for depression in Arabic similar to the method of [26][27].We used the My Depression dictionary to classify the tweets of Arab Twitter users.

For the tweet to be classified as a depression tweet, it must contain at least one keyword used by an Arab depression patient, as the depression tweet may contain more than one keyword indicating depression. At this stage, to identify the depressed tweets from the regular tweets and to facilitate the process of reviewing the tweets, we used the Python code with the sqlite3 package. This code inquires about the presence of one of the keywords in the tweets, and if the tweet contains one of these words, this tweet is depressive and takes classifier depressed tweet, addition Determine the symptoms indicated by this keyword into this tweet. From 22568 tweets" before removing duplicate tweets" for 1439 Arab users, we have 14735 Arabic Tweets containing words related to depression. In the psychologists 'evaluation phase, the evaluations were undertaken by the psychologists who evaluated the My Depression dictionary. From 14735 tweets we got 12486 Depression Arabic Tweets. We got the data as shown in Table 1 which shows information about our datasets.

Table 1. Dataset Information

Dataset Information	Quantity
Total number of Twitter users Accounts	1439
Total number of Tweets	16581
Depression Tweets	8458
2019 Depression Tweets	373
2020 Depression Tweets	8085
Non- Depression Tweets	8123

3.4. Classification Depressed Arab Twitter Users

In the previous stage, we classified the Tweets of each Twitter user into Depressed Tweets and Non-Depressed Tweets.

The Arabic Tweets for each user were divided into two stages; the first stage is to divide the tweets for each user into two years, which are 2019 and 2020. In the second stage, the tweets were divided for each year into two consecutive weeks. This helps determine the psychological state of the user whether he suffers from depression, as he must suffer from three symptoms of depression, one of these symptoms must be depressed mood, for at least two consecutive weeks in three months, according to the APA.

The tweets for each user in 2019 were divided into approximately 27 intervals, and in 2020 they were divided into approximately 22 intervals, as in 2020 the tweets were not collected in the last two months of the year, each interval equals two consecutive weeks.

Then, using Python code, we determined the psychological state of each user in 2019 and 2020 separately. Where the period to which each tweet belongs was specified, if in the same period there are tweets that express symptoms of depressed mood in addition to at least two symptoms of depression, then this user during this period suffers from depression, according to the APA. Therefore, the user, in this case, takes the classification depressed user, but if the user's tweets do not meet these conditions, then he takes the classification non-depressed user.

3.5. Detecting the Impact of COVID-19 in Arab Twitter Users

To determine the impact of COVID-19 on a user's depression by comparing the user's psychological state between 2019 and 2020, we classified each user twice, the first in 2019, and the second in 2020, during the COVID-19 period, while preserving the time series for each user. We split his Tweets into two-week time intervals throughout the year. Through this segmentation, we define the psychological state (depressed or not) of each user during the years 2019 and 2020 into two-week through three-month time patterns, and thus we will be able to know the effect of COVID-19 on the psychological state of each user by comparing the classification for each pattern during the two years (2019 And 2020) and took a full perspective of this effect of 1439 Arab Twitter users.

Time series analysis can be useful to see how a specific psychological condition changes over time. Time series are records of an event that changes in a way that is difficult to predict and predict over time [23]. They are called time series and time series data are a type of information that is usually of high dimensions and large in the volume of data. In this section, we focus on the time patterns of Twitter users, in 2019 and 2020.

4. Results

The COVID-19 pandemic and its repercussions have caused many negative effects, problems, and crises in all aspects of life, as COVID-19 is a devastating crisis and a challenge to public health in the world at present [24]. Due to the high number of deaths and injuries that are still announced by the countries of the world, this negatively affected mental health and led to anxiety and depression. Arab citizens are not an exception. The countries of the Arab world have been affected by this epidemic like other countries of the world and in all sectors and various aspects of economic, social, educational, and other life. The closure was a measure to confront the epidemic and an attempt to reduce infections, but it caused a feeling of fear about many life matters such as education, employment, and the financial situation of Arab citizens. The main goal of this thesis was to discover depression among Arab Twitter users during the COVID-19 pandemic and to detect the symptoms of depression most common during this pandemic.

We have compiled a database containing 1439 Arab users on Twitter, and we categorized each user as depressed or not. We have maintained the time series for each user and we have done this classification twice, the first for the year 2019 and the second for the year 2020; the year that witnessed the spread and peak of COVID-19. And that is to compare the psychological state of the user during

two periods, before and during the COVID-19 pandemic, this comparison enables us to know the psychological impact of the pandemic and its repercussions on the user, did this user suffer from depression only during the COVID-19 pandemic or was he suffering from it before this pandemic. We use the same data reported in Table 2 to study levels of depression detection among Twitter users, we see that the values for 2020 and "Depressed" for all symptoms of depression are higher than in 2019.

From the table below, we can see that Depression tweets 8458 out of 16581 tweets in the two years. We noticed that the rate of depression is higher in 2020, where the number of depressed tweets was 8085 out of 12123 than in 2019, where in 2019 the number of depressed tweets was 373 out of 4458 tweets. And that we can explain that this period (2020) was characterized by difficult and exceptional circumstances, in addition to loneliness, interruption from work or going to university schools, absence of vitality, lack of movement activity, disconnection from friends, and lack of meeting with them, all of this may be related to the mental health. Next, we'll analyze our database over three months of the year, where we will divide the database for each year into intervals of two-week over three months, according to psychiatry, to diagnose an individual as having depression. To be able to identify cyclical patterns of depression for Twitter users who are experiencing a high rate of depression in 2020 in light of the spread of the COVID-19 pandemic. We observed that depression patterns are highest in 2020, while it was the lowest level during 2019. Also, we note that the problem of depression among Twitter users is linked to the problems and conditions caused by the COVID-19 pandemic more than others. In short, we see a clear and explicit trend in the expression of depression on social media during the outbreak and peak period of the COVID-19 pandemic and the accompanying measures and closures.

Table 2. Time Series Dataset Information.

Time Series Dataset Information		**Number**
Total number of Tweets		16581
Depression Tweets		8458
Non- Depression Tweets		8123
Tweets in 2019	Total	4458
	Depressed	373
	Non-Depressed	4085
Tweets in 2020	Total	12123
	Depressed	8085
	Non-Depressed	4038

We have found that approximately 1.18% of users were classified with depression during the year 2019, i.e. a total of 17 users only from a database of 1439 Arab users. Compared to 36.69% of users who were classified with depression during the 2020 "during the COVID-19 pandemic," that is a total of 528 users from a database of 1439 Arab users.

It is worth noting that 11 (64.71%) of depressed Arab users were monitored during 2019 out of 17 users who were also classified as depressed users during 2020, while 6 (35.29%) users were classified as non-depressed during 2020. Compared with the numbers and percentages in 2020,

during COVID-19, 11 (2.08%) depressed Arab users were monitored in 2020 out of 528 users who were also classified as depressed users during 2019, while 517 (97.92%) users were classified as Depressed only during the year 2020, this indicates that these users became depressed during the spread of COVID-19, and this pandemic affected their mental health negatively. Table.3 shows a summary of these results.

Table 3. Summary of Number Depressed Arab Users

Users Depression	Number	%
Total Number of Users	1439	
Total Users Depressed in 2019	17	1.18%
2019 And 2020	11	64.71%
Just 2019	6	35.29%
Total Users Depressed in 2020	528	36.67%
2020 And 2019	11	2.08%
Just 2020	517	97.92%

We analyzed the periods of time that Arab users experienced depression during 2019 and 2020, during the COVID-19 pandemic, segmenting users' tweets into two-week intervals over the two years, and then determining whether the user during this interval was depressed. Determining the intervals during which users experienced depression during the two years, gives us a clear and logical perception of the impact of COVID-19 on Arab users during the year 2020. We divided these intervals into four intervals of three months, keeping users classified as depressed during the original intervals. The first interval consists of intervals representing the months January, February, and March, the second interval represents the months of April, May, and June, the third interval represents the months of July, August, and September, the fourth interval represents the months of October, November, and December. The number of users who suffer from depression every three months was determined separately, as there are users who suffer from depression during more than one interval.

In 2019, there was a fluctuation in the number of depressed users who suffer from depressive symptoms during the first three intervals, while the last fourth interval was more frequent for users who suffered from depression during which the users were repeatedly classified as depressed 32 times, the interval comprising the last three months of the year. By analyzing this frequency of depressed users during the fourth interval, it was found that a total of 13 times users were classified as depressed during December, the month that witnessed the birth of the COVID-19 pandemic in Wuhan, China. This gives us an important indication that with the onset of this pandemic, feelings of fear and depression began to appear clearly on Arab Twitter users. For these feelings to continue to appear gradually and clearly on users at the beginning of 2020, in the first interval that includes the first three months, users were classified as depressed 24 times compared to this interval in the previous year, when the number was only 8 times, and with the beginning of the spread of the COVID-19 virus in The Arab world and the beginning of the Arab governments taking preventive measures such as closures, social distancing, distance education, and other measures, depressive symptoms increased among users, and they were classified during these second three months of the year, the second interval, approximately 84 times compared to the same interval of In 2019, when the

number was 4 times, this is a big and clear difference and confirms that this pandemic is a cause of feelings of depression among Arab Twitter users.

At the beginning of July, life got worse due to the COVID-19 pandemic; The economic situation began to deteriorate, the financial situation of families and companies alike was bad, and education did not have a clear future, and the period of closures and not leaving homes and social distancing was prolonged, and what made matters worse is successive news about the high numbers of people infected with this virus and The high number of deaths in the Arab world and the world, the collapse of health systems in some countries in the world and the inability of governments to control this pandemic that changed the features of the world, which made the present a feeling of fear, sadness and negativity, and the future is unclear, just expect what is bad and scary. This situation and these feelings were between the month of July and the month of September, which constitutes our third interval, where users were classified as depressed about 518 times compared to the same months during the year 2019 when they were 11 times, the difference is very wide, and this confirms and explains that this pandemic and the situation that threw the world and people into during this interval is the reason for this high number.

In the fourth period, which includes only October of the year 2020 (this was clarified in the fourth chapter), users were classified as depressed 188 times, which gives an indication that feelings of depression are continuing among Arab Twitter users, and if we compare the fourth period From 2019 and 2020, it will be higher in 2020 with a big difference, but it is worth noting that in 2019 this period includes the last three months and the year, and the number of classification times was 32 times. Upon careful analysis, the number of times depressed users were classified in October of 2019 was only 10 times. Once again, the numbers that we have reached indicate that the COVID-19 pandemic is the cause of depression for Arab Twitter users.

For the eleven users who were classified as depressed during 2019 and 2020, when analyzing the periods during which they suffered from depression, it was noted that during the periods in 2020, the highest number of them was recorded in 2019, except for the fourth period in 2019 which was higher than in 2020. 9 times compared to 4 times in 2020, and our analysis above was due to the fact that this period of 2019 witnessed the birth of the COVID-19 pandemic, which was an alarm bell at all levels for the whole world. By looking at Table.4, you will find a summary of these analyzes.

Table 4. Summary of intervals depressed users.

Users Depression	**First Interval**	**Second Interval**	**Third Interval**	**Fourth Interval**
	Month (1,2 , 3)	Month (4 , 5 , 6)	Month (7, 8,9)	Month (10,11,12)
Users Depressed in 2019	8	4	11	32
Users Depressed in 2020	24	84	518	188
Users Depressed in 2019 & 2020				
2019	1	1	4	9
2020	4	5	4	4

5. Conclusion

We revealed the impact of COVID-19 on depression among Arab Twitter users, as in light of the spread of COVID-19; 36.69% of 1439 users in 2020 suffered from depression during COVID-19, compared with 1.18% of users were suffering from depression in 2019 before COVID-19. To reach this result, we first built a dictionary that contains the most frequently used Arabic words among Arab depressed patients in expressing their suffering from the nine symptoms of depression, according to the American Psychiatric Association.

The My Depression dictionary words were collected from interviews with depressive patients receiving services in psychiatric centers, and from online sources, we obtained 2020 words that were divided into nine symptoms of depression according to the American Psychiatric Association. It was reviewed by three psychologists, with an agreement of 83%. We used a My Depression dictionary to help us classify 22568 Arabic tweets collected from 1,439 Arab users, and the classification was confirmed by the three specialists, and the correctness of the classification reached 84.7%. After getting rid of the repetition of tweets, we obtained a My Depression database of Arabic tweets, which includes 16,581 Arab tweets, categorized into depressing tweets with the identification of symptoms that they contain or a normal tweet, for the My Depression database of Arab Twitter users, which includes 1439 users, classified into depressed users if they suffer from symptoms of depression on the at least one of them is depressed mood over at least two weeks according to the APA, or normal users, this classification was made according to each user's tweets in 2019 and 2020 again; this means that each user was rated twice to compare their psychological state over the two years.

Author Contributions

All authors contributed equally to this work.

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Ethical approval

This article does not contain any studies with human participants or animals performed by any of the authors.

Conflicts of Interest

The authors declare that there is no conflict of interest in the research.

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