

Reducing Covid-19 Readmissions Using Machine Learning

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ABSTRACT

SARS-COV-2 is a new coronavirus that originated in bats that emerged in Wuhan, China in 2019 has spread globally and caused Thousands of Deaths, and having enormous impacts on human lives. As a result, hospitals are full of covid patients. So there are only limited resources like ICU facilities, no. of beds, specialized doctors available in every hospital. They were unable to provide certain services to the critical patient. So by using Machine Learning we can analyze the risk factors for hospital readmissions, which can help in allocating such limited resources to critical patients also. So by using machine learning model approaches we can predict the adverse factors for the threat and can reduce the unwanted readmissions. An emergency hospital readmission is a point at which a patient who is released from the hospital, gets re-conceded again inside a specific period. So by using Machine Learning we can analyze the risk factors for hospital readmissions, which can help in allocating such limited resources to critical patients also. So by using machine learning model approaches we can predict the adverse factors for the threat and can reduce the unwanted readmissions. The number of admissions of covid-19 distance patients was increasing from time to time in various hospitals. As we can see there are also some readmissions also takes place in some hospitals. So to lessen the readmission of covid19 patients, we propose a methodology that utilizations Machine learning innovation to look at the clinic records of different patients. We have used various Covid-19 dataset features for our technique to predict the readmission probability rates of various patients Predicting the readmission rate early can alleviate the financial and medical consequences.

Keywords: Covid-19, Machine Learning, Predictive Analysis, Hospital Readmissions, Covid-19 Deaths

I. INTRODUCTION

Coronaviruses(CoVs) are a large group of viruses. We can't see them with our eyes, we need a magnifying instrument to see them. Corona means crown. Severe acute respiratory syndrome(SARS) CoV emerged in Guangdong, China, in 2002. Middle eastern respiratory syndrome(MERS) CoV emerged in the middle east, in 2012. SARS-CoV2 emerged in Wuhan, China, in 2019. SARS-CoV-2 is originated in bats. Infects humans through mild respiratory illness. Unique Covid viruses have bounced species and can be transmitted between individuals. The coronavirus disease(COVID-19) is rapidly spread all over the world and caused Thousands of Deaths and infected millions of people.

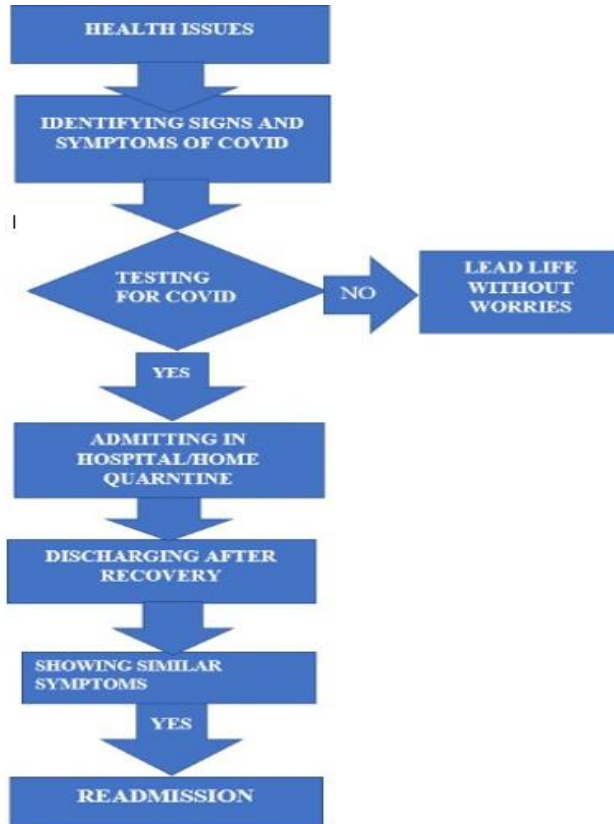
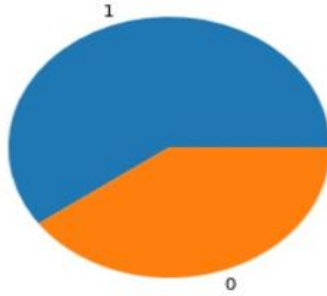
Covid patients Readmission-

Hospital readmission is the point at which a patient who is released from the hospital, gets re-conceded again inside a specific period. Hospital readmissions are mainly responsible for the reputation of the hospital. Thereby this brings a dreadful name to the hospital and is also considered as an act of irresponsibility of doctors. The number of admissions of covid-

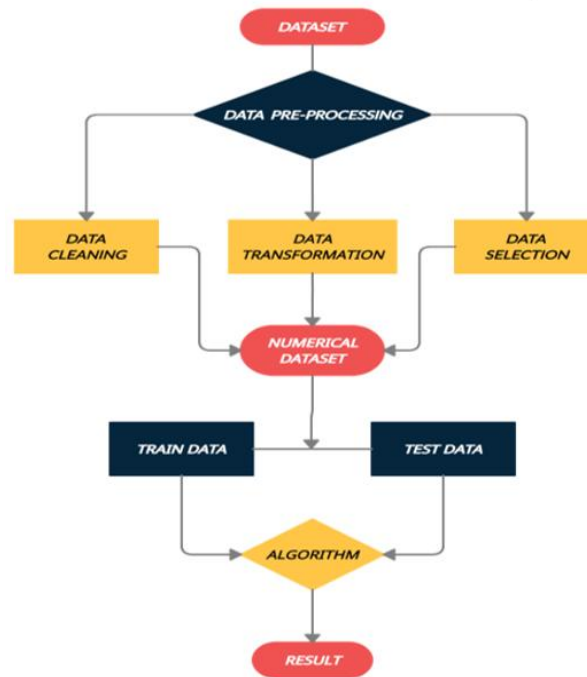
19 distance patients was increasing from time to time in various hospitals. As we can see there are also some readmissions also takes place in some hospitals. Out of 1368 patients who were discharged, 61 patients(4.1%) were readmitted[5]. 7 (2.29%) patients were re-admitted because of fever or positive SARS-CoV-2 retest[5].

Here in readmission column the value '1' refers to patient's 'Readmission' and '0' refers to 'No Readmission'.

plot between Readmission & No-Readmission



RELATED WORK



Data Collection:

US Covid-19 Dataset composed of 1417 samples of patients data who affected with covid and admitted in hospital. Dataset contains different attributes such as age group, number of Covid deaths, Readmissions.

Data as of	Start week	End Week	State	Sex	Age group	COVID-19 Deaths	Total Deaths	Pneumonia Deaths	
0	08-12-2020	02-01-2020	08-08-2020	United States	All	Under 1 year	16.0	9159.0	83.0
1	08-12-2020	02-01-2020	08-08-2020	United States	All	1-4 years	10.0	1751.0	56.0
2	08-12-2020	02-01-2020	08-08-2020	United States	All	5-14 years	23.0	2714.0	88.0

x_test		
	age_group	total_deaths
319	8	5761.0
1347	8	3666.0
374	10	0.0
1401	10	1051.0
781	1	48.0
...
500	7	2330.0
320	9	7478.0
102	11	90.0
1208	11	68.0
107	3	402.0

310 rows × 2 columns

DataPreprocessing:

Removing unwanted/incomplete data with inaccurate values.

LabelEncoding:

Dataset contains categorical attribute 'age group' values as 'under 10 years', '20-34 years'. Since machine cannot understand this Label Encoder converts those values into machine readable form.

Splitting ofData:

Here dataset is splitted into training and testing data in the ratio of 2:8. So from the total dataset 20% of data is taken for training the machine and 80% of data is taken for testing themachine.

Algorithm:

Here for the prediction we have used Linear Regression algorithm.

Linear regression algorithm establishes a relationship that is linear between a dependent (y) and one or more independent (x) variables, hence called rectilinear regression. Since rectilinear regression shows the linear relationship, which suggests it finds how the worth of the variable is changing consistent with the worth of the experimental variable.

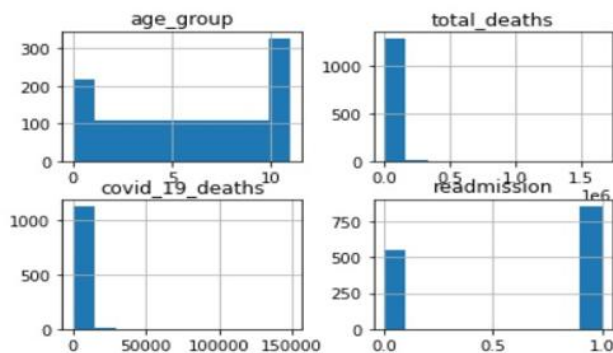
f)Result:

Here we have considered Covid Deaths and Readmissions as our target variable. Finally predicting the no.of covid deaths,readmissions according to various age groups.

```
[ ] y_test
```

	covid_19_deaths	readmission
319	419.0	0
1347	131.0	1
374	0.0	1
1401	23.0	0
781	0.0	1
...
500	59.0	0
320	522.0	0
102	0.0	0
1208	0.0	1
107	38.0	1

310 rows × 2 columns



Predicted values using linear regression-
Accuracy of Prediction:

```
clf.score(X_test, y_test)
```

```
/usr/local/lib/python3.6/di  
"multioutput='uniform_ave  
0.9943696410396128
```

```
clf.predict(x_test)
```

```
array([[ 1.51136252e+03,  5.91885975e-01],  
 [ 1.17299205e+03,  5.84429085e-01],  
 [ 4.18168570e+02,  5.82093922e-01],  
 [-2.34495627e+00,  5.83128798e-01],  
 [ 4.17874103e+02,  5.80735867e-01],  
 [ 3.55681465e+02,  5.82522885e-01],  
 [ 9.65991442e+01,  5.83523829e-01],  
 [ 6.01453567e+03,  6.03758757e-01],  
 [-9.92571818e+00,  5.85812292e-01],  
 [ 5.73181696e+01,  5.79296362e-01],  
 [ 4.23503657e+01,  5.82628803e-01],  
 [ 1.70665478e+03,  5.86559713e-01],  
 [ 4.99899849e+02,  5.81741791e-01],  
 [-4.55435998e+01,  5.86348529e-01],  
 [-2.53230517e+01,  5.85072379e-01],  
 [ 2.17454191e+02,  5.83327898e-01],  
 [ 7.48739466e+03,  6.12352848e-01],  
 [ 7.21593087e+02,  5.83983773e-01],  
 [ 1.68185834e+02,  5.84488075e-01],  
 [ 2.42745935e+02,  5.84107314e-01],  
 [ 2.57386498e+01,  5.82562481e-01],  
 [-4.59974718e+01,  5.86346717e-01],  
 [ 7.27674972e+02,  5.84008054e-01],  
 [ 5.15407246e+01,  5.84022374e-01],  
 [ 1.06858932e+03,  5.86047581e-01],  
 [-1.79360098e+01,  5.84423431e-01],  
 [ 2.33045245e+02,  5.82033265e-01],  
 [ 4.43474026e+01,  5.82636776e-01],  
 [ 2.79393795e+01,  5.83928147e-01],  
 [ 5.24163517e+01,  5.79276791e-01],  
 [ 7.59269224e+01,  5.79370656e-01],  
 [ 4.53215787e+01,  5.86711304e-01],  
 [ 2.26215020e+02,  5.80649115e-01],  
 [-3.46856431e+00,  5.83802752e-01],  
 [ 5.39000777e+03,  6.01265354e-01],  
 [-2.63215701e+01,  5.85068392e-01],  
 [ 1.26895651e+02,  5.82287906e-01],
```

CONCLUSION

As the spread of Virus increases the number of deaths increases. So here Covid virus and patient's death or Re-admission is directly related. So to obtain the accurate results we used Linear Regression approach. This article represents various predicted values such as number of Covid deaths according to various age groups and also Re-admissions according to various age groups.

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