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Forecasting Covid-19 New Cases in Somalia

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***Abstract* - COVID-19 continues to have a devastating effect on the health and well-being of the world population. One of the crucial steps in the fight against COVID-19 is to come up with accurate forecasting models. In this research endeavor, the ANN approach was applied to analyze confirmed COVID-19 cases in Somalia. This study is based on monthly new cases of COVID-19 in Somalia for the period 1 January 2020 – 25 March 2021. The out-of-sample forecast covers the period 26 March 2021 – 31 July 2021. The residuals and forecast evaluation criteria (Error, MSE and MAE) of the applied technique indicate that the model is quite stable and acceptable. It is projected that daily COVID-19 cases in Somalia are likely to range between 30 and 200 cases per day over the out-of-sample period. We recommend the continued compliance to control and preventive COVID-19 measures such as social distancing, quarantine, isolation, face-mask wearing and so on; including vaccinations.**

Keywords: ANN, COVID-19, Forecasting.

I. INTRODUCTION

The outbreak of COVID-19 started in China in December 2019 and has spread worldwide (Bayyurt & Bayyurt, 2020), largely because of a lack of prior immunity combined with relatively high infectiousness (Wolfel *et al*., 2020). The common symptoms of the disease are fever, fatigue and dry cough (Drosten *et al*., 2020). COVID-19 may cause fatality, especially among elderly, and people with chronic health problems (Direkoglu & Sah, 2020). The disease is highly contagious. A single infected person will transmit the virus (usually via human-to-human transmission) with a reproduction number of approximately 1.4 to 2.5 (WHO, 2020). People infected with COVID-19 are placed under quarantine, so that the virus does not spread (Uddin *et al*., 2020) and their own immune system is expected to fight off the virus (Chan *et al*., 2020). As of late, vaccinations are now being used to help the immune system in fighting the virus. Modeling and future forecast of daily number of confirmed cases and deaths can help the treatment system (Dehesh *et al*., 2020). This research seeks to model and forecast COVID-19 daily confirmed cases in Somalia.

II. METHODOLOGY

The Artificial Neural Network (ANN) approach, which is flexible and capable of nonlinear modeling; will be applied in this study. The ANN is a data processing system consisting of a large number of highly interconnected processing elements in architecture inspired by the way biological nervous systems of the brain appear like. Since no explicit guidelines exist for the determination of the ANN structure, the study applies the popular ANN (12, 12, 1) model based on the hyperbolic tangent activation function. This paper applies the Artificial Neural Network (ANN) approach in predicting new COVID-19 cases in Somalia.

Data Issues

This study is based on daily new cases of COVID-19 in Somalia for the period 1 January 2020 – 25 March 2021.The out-of-sample forecast covers the period 26 March 2021 – 31 July 2021.All the data employed in this research paper was gathered from the Johns Hopkins University (USA).

III. FINDINGS OF THE STUDY

ANN Model Summary

Table 1: ANN model summary

Variable	S

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Observations	438 (After Adjusting Endpoints)
Neural Network Architecture:	
Input Layer Neurons	12
Hidden Layer Neurons	12
Output Layer Neurons	1
Activation Function	Hyperbolic Tangent Function
Back Propagation Learning:	
Learning Rate	0.005
Momentum	0.05
Criteria:	
Error	0.145553
MSE	690.658635
MAE	18.274794

Residual Analysis for the Applied Model

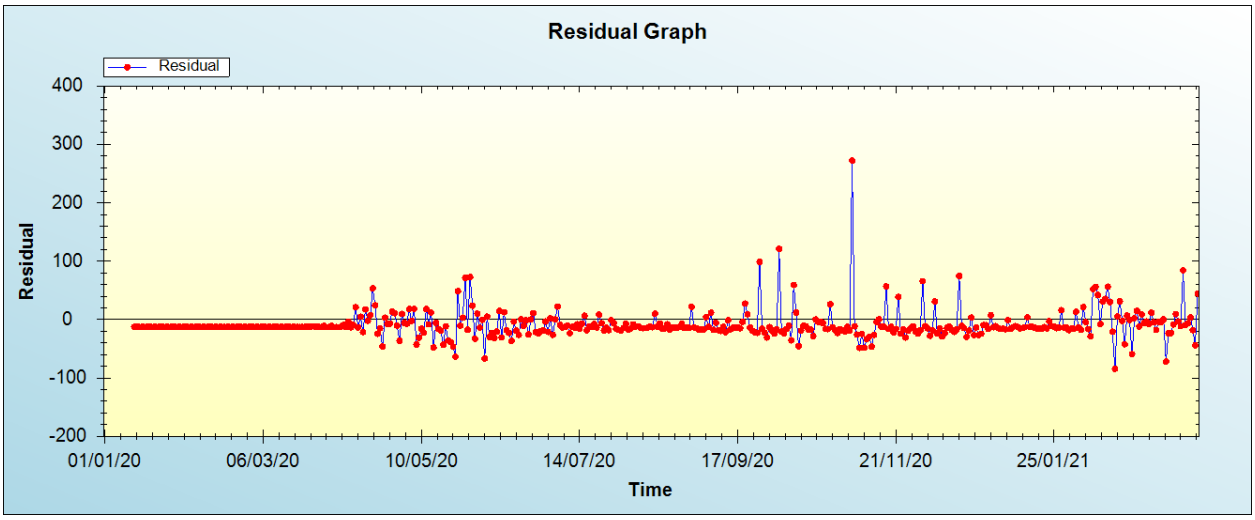

Figure 1: Residual analysis

In-sample Forecast for S

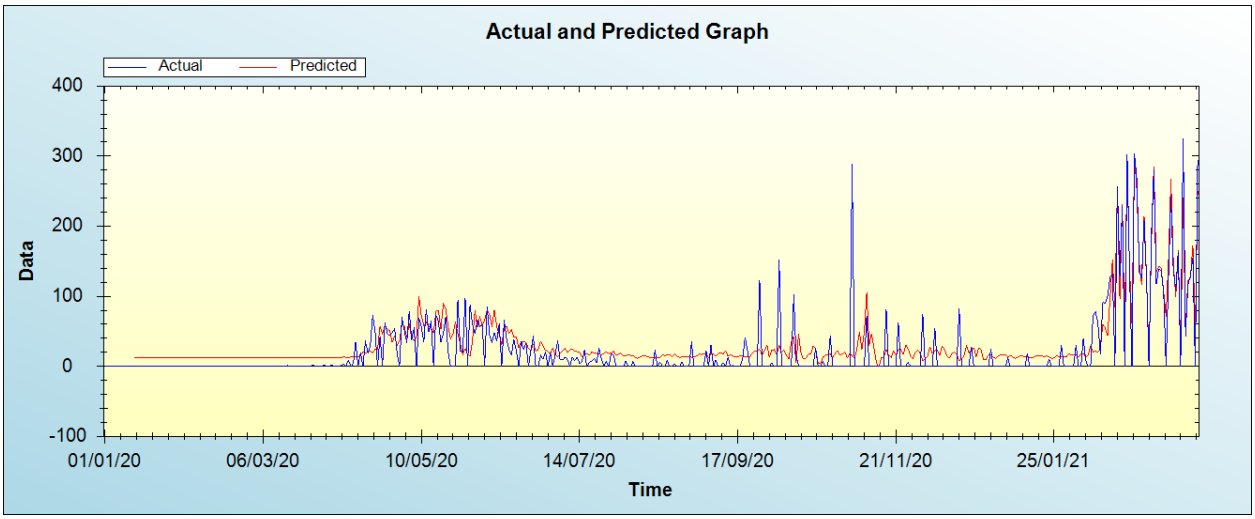

Figure 2: In-sample forecast for the S series

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Out-of-Sample Forecast for S: Actual and Forecasted Graph

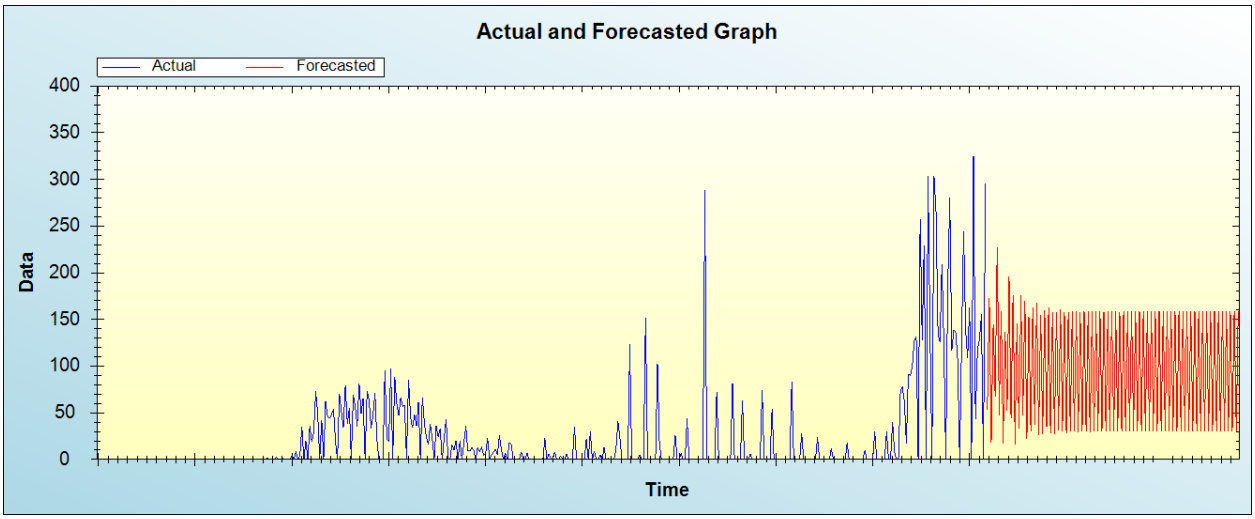

Figure 3: Out-of-sample forecast for S: actual and forecasted graph

Out-of-Sample Forecast for S: Forecasts only

Table 2: Tabulated out-of-sample forecasts

Date	Forecasts
26/03/21	53.7409
27/03/21	173.2951
28/03/21	18.4187
29/03/21	145.1280
30/03/21	67.1588
31/03/21	227.3289
01/04/21	47.8145
02/04/21	158.6803
03/04/21	17.2076
04/04/21	137.0112
05/04/21	52.5294
06/04/21	196.4903
07/04/21	44.4934
08/04/21	175.8427
09/04/21	16.7183
10/04/21	145.7855
11/04/21	34.0623
12/04/21	175.3231
13/04/21	47.0326
14/04/21	170.1081
15/04/21	21.6387
16/04/21	152.4264
17/04/21	30.0187
18/04/21	163.0619
19/04/21	37.7273
20/04/21	167.7212
21/04/21	26.8235
22/04/21	154.9459
23/04/21	27.1939
24/04/21	160.1756
25/04/21	34.8952
26/04/21	162.3397
27/04/21	28.4975
28/04/21	157.7364
29/04/21	27.8374

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30/04/21	157.4752
01/05/21	31.6023
02/05/21	160.9717
03/05/21	29.8818
04/05/21	157.7838
05/05/21	28.2282
06/05/21	157.7754
07/05/21	30.7722
08/05/21	158.9611
09/05/21	30.0757
10/05/21	158.4973
11/05/21	29.0985
12/05/21	157.4717
13/05/21	30.0956
14/05/21	158.6992
15/05/21	30.3503
16/05/21	158.2866
17/05/21	29.5566
18/05/21	157.9735
19/05/21	30.0947
20/05/21	158.2365
21/05/21	30.3072
22/05/21	158.4866
23/05/21	29.9713
24/05/21	158.0594
25/05/21	30.0722
26/05/21	158.3406
27/05/21	30.3493
28/05/21	158.3981
29/05/21	30.1422
30/05/21	158.3198
31/05/21	30.1735
01/06/21	158.3084
02/06/21	30.3088
03/06/21	158.4784
04/06/21	30.2597
05/06/21	158.3751
06/06/21	30.2116
07/06/21	158.4121
08/06/21	30.3094
09/06/21	158.4557
10/06/21	30.2839
11/06/21	158.4647
12/06/21	30.2558
13/06/21	158.4298
14/06/21	30.2874
15/06/21	158.4873
16/06/21	30.2961
17/06/21	158.4731
18/06/21	30.2645
19/06/21	158.4718
20/06/21	30.2819
21/06/21	158.4786
22/06/21	30.2850
23/06/21	158.4922
24/06/21	30.2714
25/06/21	158.4748
26/06/21	30.2707
27/06/21	158.4864
28/06/21	30.2780
29/06/21	158.4855
30/06/21	30.2676
01/07/21	158.4834
02/07/21	30.2666

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03/07/21	158.4799
04/07/21	30.2687
05/07/21	158.4854
06/07/21	30.2656
07/07/21	158.4793
08/07/21	30.2620
09/07/21	158.4799
10/07/21	30.2642
11/07/21	158.4792
12/07/21	30.2621
13/07/21	158.4788
14/07/21	30.2605
15/07/21	158.4760
16/07/21	30.2608
17/07/21	158.4773
18/07/21	30.2608
19/07/21	158.4756
20/07/21	30.2593
21/07/21	158.4751
22/07/21	30.2598
23/07/21	158.4745
24/07/21	30.2597
25/07/21	158.4747
26/07/21	30.2593
27/07/21	158.4735
28/07/21	30.2592
29/07/21	158.4738
30/07/21	30.2596
31/07/21	158.4734

The main results of the study are shown in table 1. It is clear that the model is stable as confirmed by evaluation criterion as well as the residual plot of the model shown in figure 1. It is projected that daily COVID-19 cases in Somalia are likely to range between 30 and 200 cases per day over the out-of-sample period.

IV. CONCLUSION & RECOMMENDATIONS

Forecasting COVID-19 has become a key research interest, especially for health economists and epidemiologists. There is no doubt, these forecasts are important for the effective allocation of healthcare resources, stockpiling and help in strategic planning for clinicians and relevant government authorities. This study used the ANN (12, 12, 1) model to come up with COVID-19 forecasts for Somalia. It is projected that daily COVID-19 cases in Somalia are likely to range between 30 and 200 cases per day over the out-of-sample period. We recommend the continued compliance to control and preventive COVID-19 measures such as social distancing, quarantine, isolation, face-mask wearing and so on; including vaccinations.

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