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Forecasting Covid-19 New Cases in Timorletse

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***Abstract* - COVID-19 is indeed a serious global public health emergency. In this research paper, the ANN approach was applied to analyze COVID-19 cases in Timorletse. This study is based on daily new cases of COVID-19 in Timorletse 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 model indicate that the model is stable in forecasting COVID-19 cases in Timorletse. The results of the study indicate that daily COVID-19 cases in Timorletse are likely to remain very high at an equilibrium case volume of approximately 57 cases per day over the out-of-sample period. The government of Timorletse, through the ministry of health, should continue to implement COVID-19 control and prevention measures such as isolation, quarantine, testing and tracing, face-mask wearing, sanitization of hands, including vaccinations, amongst other measures in line with WHO guidelines.**

Keywords: ANN, COVID-19, Forecasting.

I. INTRODUCTION

COVID-19 initially came to attention in a series of patients with pneumonia of unknown etiology in Wuhan city in China (Huang et al., 2020). Coronaviruses are single-stranded, positive-sense RNA viruses belonging to the Coronaviridae family (Chen et al., 2020). COVID-19 is transferable from human to human and it's spreading, and infection factors are very high (Jin et al., 2020). It is characterized by respiratory symptoms, which deteriorate into respiratory failure in substantial proportion of cases, requiring intensive care up to a third of patients admitted to hospital (Carsana et al., 2020). The main aim of this study is to use Artificial Neural Networks (ANNs) to explore the transmission dynamics, forecasting and control of COVID-19 in Timorletse.

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 Timorletse.

Data Issues

This study is based on daily new cases of COVID-19 in Timorletse 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	TL
Observations	438 (After Adjusting Endpoints)
Neural Network Architecture:	
Input Layer Neurons	12
Hidden Layer Neurons	12
Output Layer Neurons	1

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Activation Function	Hyperbolic Tangent Function
Back Propagation Learning:	
Learning Rate	0.005
Momentum	0.05
Criteria:	
Error	0.053216
MSE	2.644045
MAE	0.653203

Residual Analysis for the Applied Model

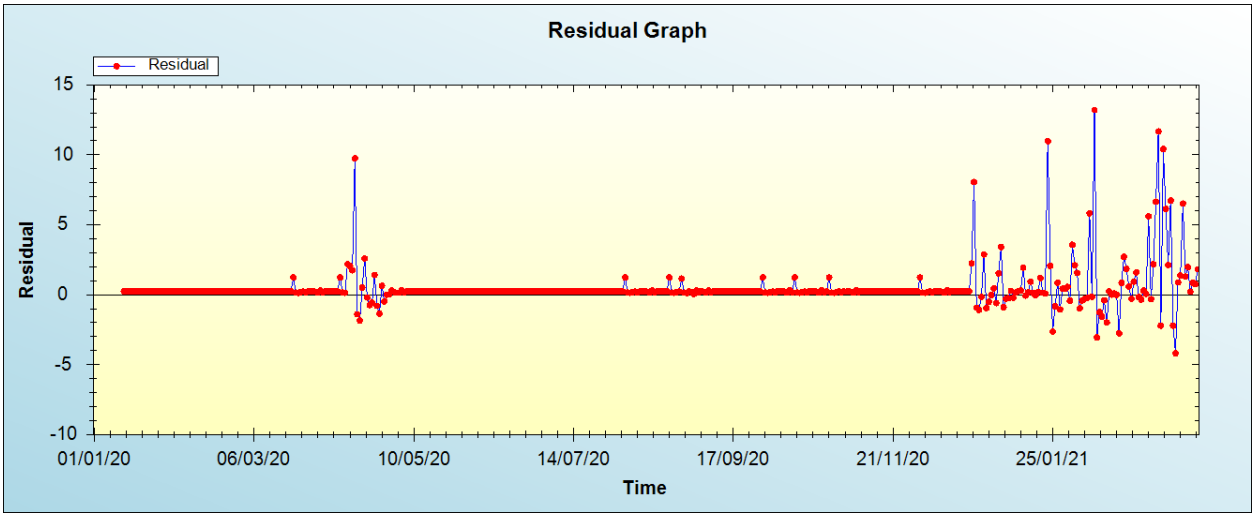

Figure 1: Residual analysis

In-sample Forecast for TL

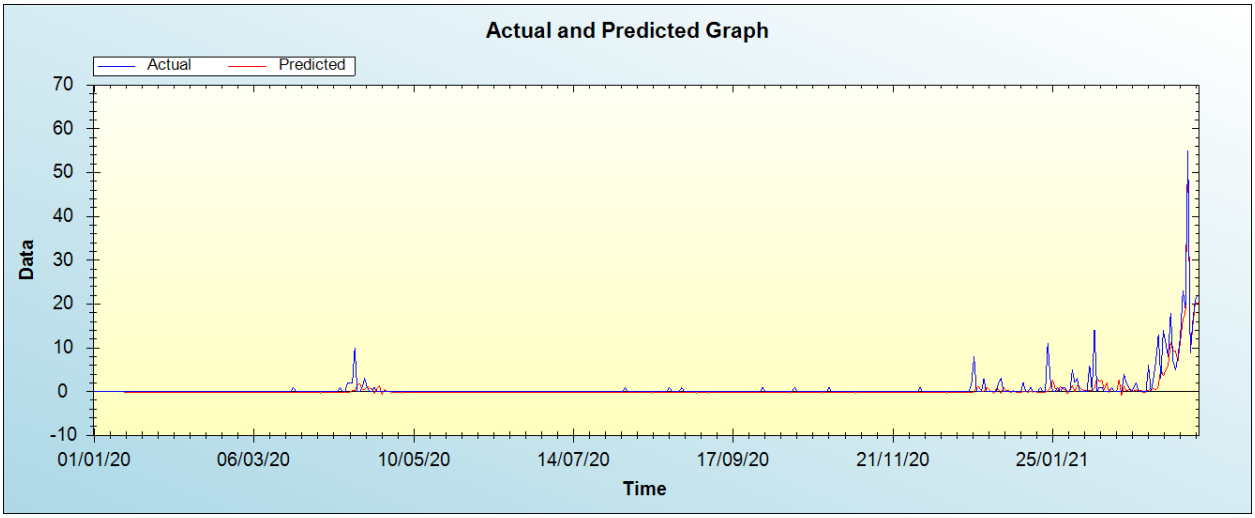

Figure 2: In-sample forecast for the TL series

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

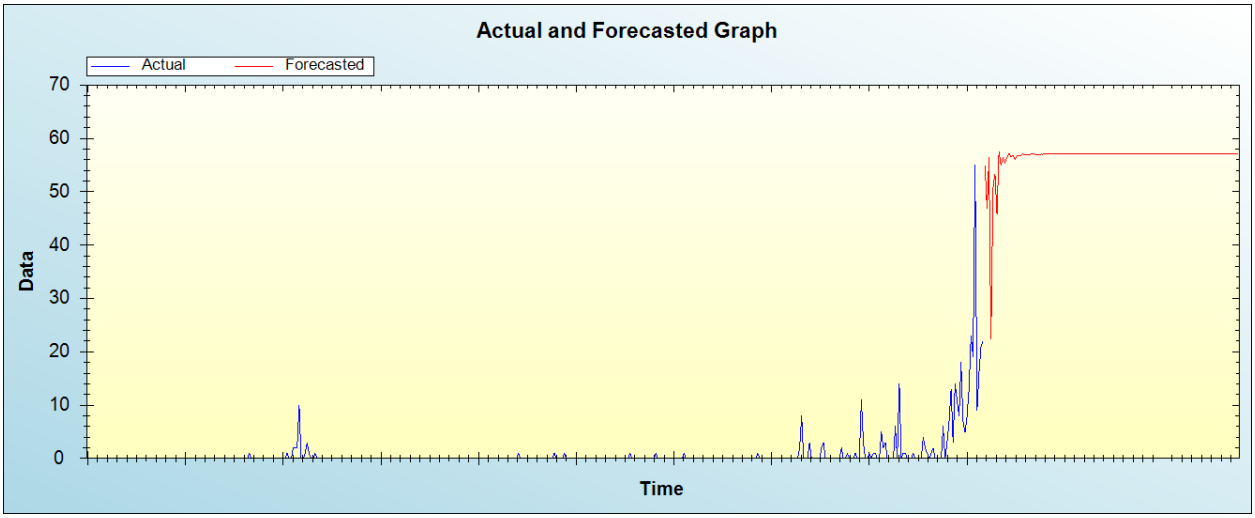

Figure 3: Out-of-sample forecast for TL: actual and forecasted graph

Out-of-Sample Forecast for TL: Forecasts only

Table 2: Tabulated out-of-sample forecasts

Date	Forecasts
26/03/21	54.7979
27/03/21	46.8984
28/03/21	56.3969
29/03/21	22.4468
30/03/21	50.5937
31/03/21	53.3361
01/04/21	45.7413
02/04/21	57.5849
03/04/21	54.9814
04/04/21	56.4005
05/04/21	55.3779
06/04/21	56.3900
07/04/21	57.2528
08/04/21	56.4493
09/04/21	56.7764
10/04/21	56.0801
11/04/21	56.7983
12/04/21	56.7678
13/04/21	56.6950
14/04/21	57.0571
15/04/21	56.9221
16/04/21	57.0113
17/04/21	56.9530
18/04/21	57.0347
19/04/21	57.0394
20/04/21	57.0000
21/04/21	57.0113
22/04/21	56.9829
23/04/21	57.0179
24/04/21	57.0122
25/04/21	57.0169
26/04/21	57.0260
27/04/21	57.0207
28/04/21	57.0257
29/04/21	57.0233
30/04/21	57.0279
01/05/21	57.0262

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02/05/21	57.0247
03/05/21	57.0248
04/05/21	57.0239
05/05/21	57.0256
06/05/21	57.0252
07/05/21	57.0256
08/05/21	57.0257
09/05/21	57.0256
10/05/21	57.0259
11/05/21	57.0258
12/05/21	57.0260
13/05/21	57.0258
14/05/21	57.0258
15/05/21	57.0258
16/05/21	57.0257
17/05/21	57.0258
18/05/21	57.0258
19/05/21	57.0258
20/05/21	57.0258
21/05/21	57.0258
22/05/21	57.0258
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05/07/21	57.0258
06/07/21	57.0258
07/07/21	57.0258
08/07/21	57.0258
09/07/21	57.0258
10/07/21	57.0258
11/07/21	57.0258
12/07/21	57.0258
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25/07/21	57.0258
26/07/21	57.0258
27/07/21	57.0258
28/07/21	57.0258
29/07/21	57.0258
30/07/21	57.0258
31/07/21	57.0258

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 Timorletse are likely to remain very high at an equilibrium case volume of approximately 57 cases per day over the out-of-sample period.

IV. CONCLUSION & RECOMMENDATIONS

Nowadays, a significant number of infectious diseases such as COVID-19 are threatening the globe by spreading at an alarming rate. In this research, we attempt to model and forecast COVID-19 daily cases in Timorletse. We applied the basic ANN (12, 12, 1) model and found out that daily COVID-19 cases in Timorletse are likely to remain very high at an equilibrium case volume of approximately 57 cases per day over the out-of-sample period. The government of Timorletse, through the ministry of health, should continue to implement COVID-19 control and prevention measures such as isolation, quarantine, testing and tracing, face-mask wearing, sanitization of hands., including vaccinations, amongst other measures in line with WHO guidelines.

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