

# Forecasting Covid-19 New Cases in Seychelles

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**Abstract -** In this research paper, the ANN model was applied to forecast COVID-19 confirmed cases in Seychelles. This study is based on monthly new cases of COVID-19 in Seychelles 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 and adequate in forecasting daily confirmed cases of COVID-19 in the country. The results of the study indicate that that daily COVID-19 cases in Seychelles are likely to remain high, although characterized by recurrent downward trends over the out-of-sample period. We encourage relevant authorities to continue to implement preventive and control measures such as wearing of masks, banning of unnecessary travel, social distancing, and proper washing of hands and vaccinations.

**Keywords:** ANN, COVID-19, Forecasting.

## I. INTRODUCTION

Since the COVID-19 case was recorded in Wuhan in China in the tail end of December 2019, the virus has quickly spread to the rest of the world, mostly facilitated by the global air travel to the major cities in Europe, the US and elsewhere (Zhang *et al.*, 2020a & b). By September 4, 2020; there were 26331492 confirmed cases of COVID-19 and continuing to grow by the day and 869290 deaths have been reported worldwide with more than 185 countries being affected by the pandemic (Johns Hopkins University, 2020). Although governments around the world, including the government of Seychelles; impose numerous containment and social distancing measures, the need for the healthcare systems has dramatically increased and the effective management of infected patients becomes a challenging problem for hospitals. Therefore, accurate forecasting of the number of new COVID-19 cases is crucial for optimizing the available resources and arresting or slowing down the progression of the pandemic (Zeroual *et al.*, 2020). In this endeavor, we attempt to model and forecast daily confirmed COVID-19 cases in the country.

## 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 Seychelles.

### Data Issues

This study is based on daily new cases of COVID-19 in Seychelles 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
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	0.105857
MSE	159.872366
MAE	8.218781

*Residual Analysis for the Applied Model*

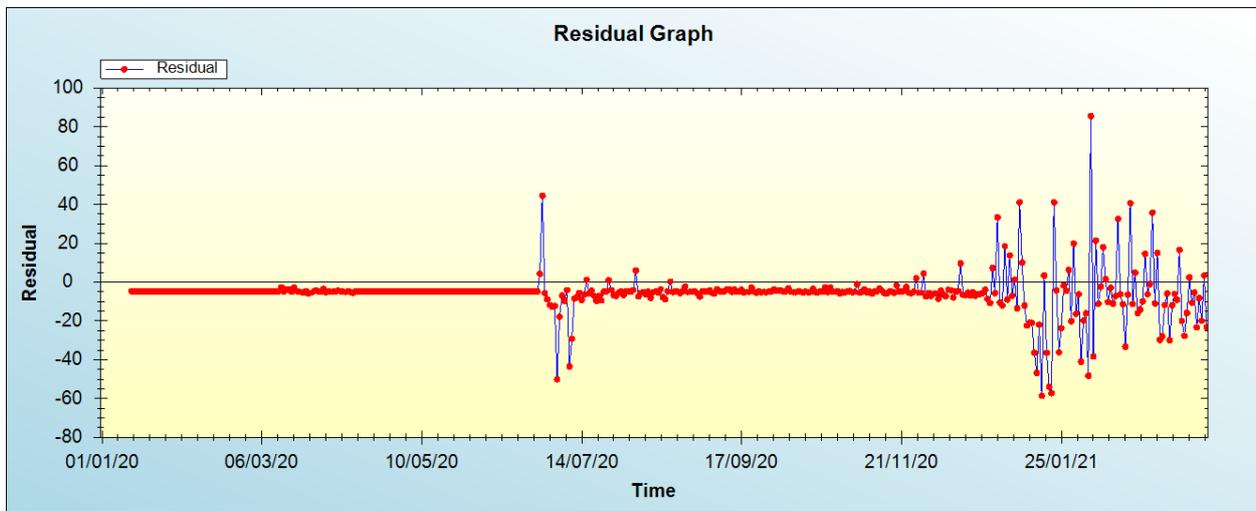


Figure 1: Residual analysis

*In-sample Forecast for S*

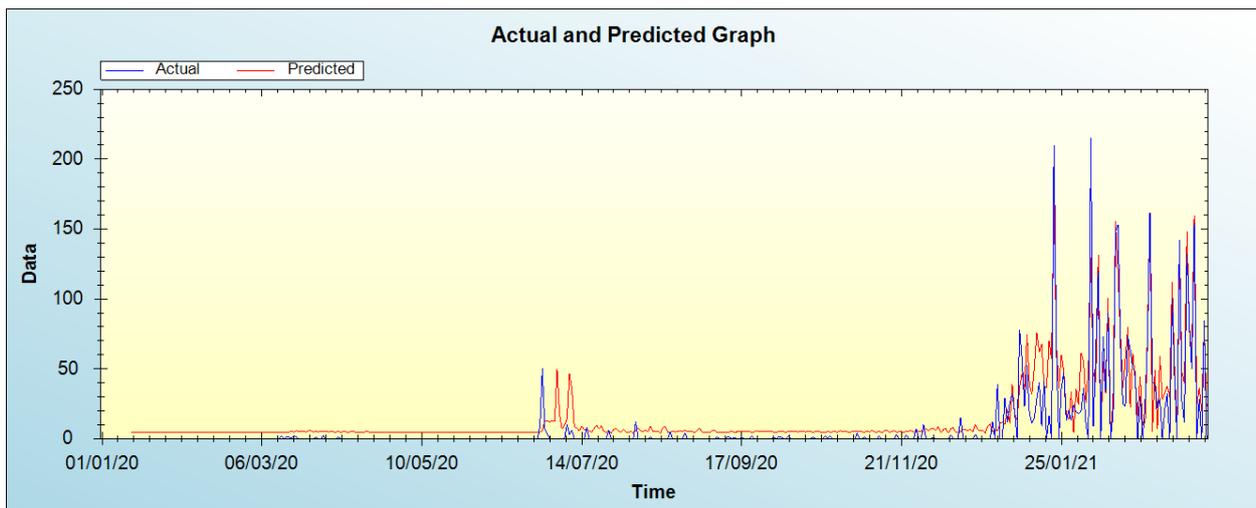


Figure 2: In-sample forecast for the S series

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

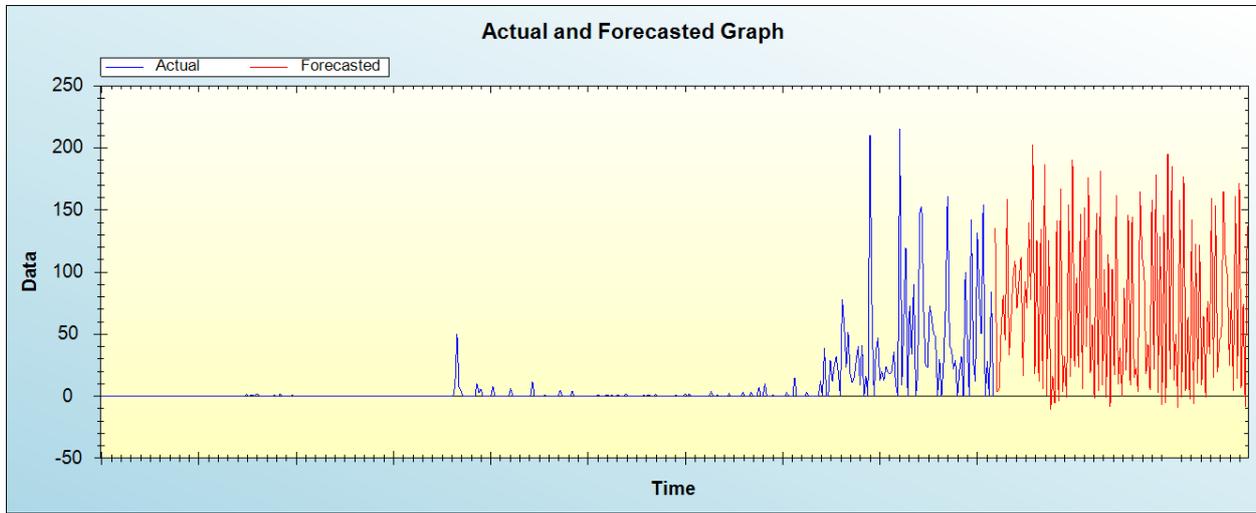


Figure 3: Out-of-sample forecast for S: actual and forecasted graph

Out-of-Sample Forecast for S: Forecasts only

Table 2: Tabulated out-of-sample forecasts

Date	Forecasts
26/03/21	135.3601
27/03/21	3.5090
28/03/21	5.3058
29/03/21	51.0868
30/03/21	80.8039
31/03/21	45.1582
01/04/21	158.3763
02/04/21	33.3603
03/04/21	59.3122
04/04/21	94.8222
05/04/21	109.2343
06/04/21	70.3987
07/04/21	92.6862
08/04/21	111.9802
09/04/21	16.6979
10/04/21	92.6122
11/04/21	70.6938
12/04/21	139.4556
13/04/21	77.3199
14/04/21	202.5425
15/04/21	17.6501
16/04/21	125.8557
17/04/21	12.1066
18/04/21	134.4519
19/04/21	5.7572
20/04/21	186.7835
21/04/21	0.6807
22/04/21	125.8470
23/04/21	-10.6162
24/04/21	16.1073
25/04/21	-5.4244
26/04/21	141.1432
27/04/21	-3.6402
28/04/21	166.7045
29/04/21	3.6969

30/04/21	31.7742
01/05/21	-0.8393
02/05/21	153.8952
03/05/21	15.3085
04/05/21	190.9187
05/05/21	23.8208
06/05/21	95.4054
07/05/21	23.5922
08/05/21	146.2407
09/05/21	6.0676
10/05/21	151.6134
11/05/21	39.8531
12/05/21	176.4893
13/05/21	18.3042
14/05/21	57.8257
15/05/21	-1.7540
16/05/21	147.8022
17/05/21	4.4341
18/05/21	181.0892
19/05/21	8.8638
20/05/21	101.8547
21/05/21	-0.8175
22/05/21	114.4623
23/05/21	-8.6086
24/05/21	102.3985
25/05/21	17.4985
26/05/21	161.8041
27/05/21	9.4697
28/05/21	38.3350
29/05/21	-0.2712
30/05/21	87.3208
31/05/21	20.9795
01/06/21	145.9883
02/06/21	8.9096
03/06/21	144.7734
04/06/21	14.9956
05/06/21	22.9011
06/06/21	3.6621
07/06/21	164.8798
08/06/21	111.5070
09/06/21	100.5377
10/06/21	17.9228
11/06/21	41.8576
12/06/21	4.8013
13/06/21	158.2921
14/06/21	21.5540
15/06/21	178.4921
16/06/21	2.7558
17/06/21	128.6159
18/06/21	-7.1194
19/06/21	145.6845
20/06/21	-5.3837
21/06/21	194.7922
22/06/21	21.6233
23/06/21	185.2499
24/06/21	13.0424
25/06/21	50.0969
26/06/21	-9.3463
27/06/21	158.2206
28/06/21	-1.1120
29/06/21	177.1421
30/06/21	4.3634
01/07/21	63.5228
02/07/21	-2.4571

03/07/21	141.6932
04/07/21	-6.2023
05/07/21	122.3361
06/07/21	10.2595
07/07/21	122.1271
08/07/21	8.8438
09/07/21	64.5324
10/07/21	-0.8513
11/07/21	76.4227
12/07/21	33.5975
13/07/21	159.0394
14/07/21	14.9987
15/07/21	153.2485
16/07/21	19.5130
17/07/21	45.0111
18/07/21	49.2437
19/07/21	165.1665
20/07/21	109.3882
21/07/21	97.1501
22/07/21	24.8709
23/07/21	83.0636
24/07/21	4.5431
25/07/21	161.1509
26/07/21	13.8424
27/07/21	171.5548
28/07/21	6.6513
29/07/21	74.4082
30/07/21	-8.2038
31/07/21	136.7102

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 Seychelles are likely to remain high, although characterized by recurrent downward trends over the out-of-sample period.

#### IV. CONCLUSION & RECOMMENDATIONS

Since the recent challenge that humanity is facing against COVID-19, several initiatives have been put forward with the goal of creating measures to help control the spread of the pandemic (Varela-Santos & Melin, 2020). This piece of work is a scientific initiative whose goal is to forecast COVID-19 daily confirmed cases in Seychelles in order to inform policy. The applied model has been shown to be stable and adequate. The forecasts of the model are consistent with reality. Basically, we establish that daily COVID-19 cases in Seychelles are likely to remain high, although characterized by recurrent downward trends over the out-of-sample period. We encourage relevant authorities to continue to implement preventive and control measures such as wearing of masks, banning of unnecessary travel, social distancing, and proper washing of hands and vaccinations.

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