

# Forecasting Covid-19 New Cases in Thailand

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**Abstract - Circulating across the world, the ongoing COVID-19 pandemic continues to cause devastating mortality and is indeed a great threat to global public health. In this research paper, the ANN model was applied to analyze daily COVID-19 cases in Thailand. This study is based on monthly new cases of COVID-19 in Thailand 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 model reveal that the model is quite stable. It is projected that the COVID-19 pandemic may disappear in the country around mid-April 2021. Given the results of the study, the country should still ensure 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

COVID-19 started in Wuhan, China, and has extensively spread all over the world since January 2020 (WHO, 2020). The specific symptoms of COVID-19 are fever (98%) and cough (76%) in addition to other non-specific symptoms such as fatigue (44%), headache (8%) and dyspnea (3%) (Wang *et al.*, 2020). Humans can acquire COVID-19 when they come into contact contaminated surfaces or form droplets released by infectious symptomatic and asymptomatic individuals (Bai *et al.*, 2020). Understanding current patterns of COVID-19 and forecasting its trajectory is essential in guiding policies aimed at curtailing the pandemic (Taboe *et al.*, 2020). In order to help the government in controlling the pandemic, this research seeks to model and forecast daily confirmed COVID-19 cases in Thailand.

## 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 Thailand.

### Data Issues

This study is based on daily new cases of COVID-19 in Thailand 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	T
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	0.084255
MSE	6648.723272
MAE	42.020190

*Residual Analysis for the Applied Model*

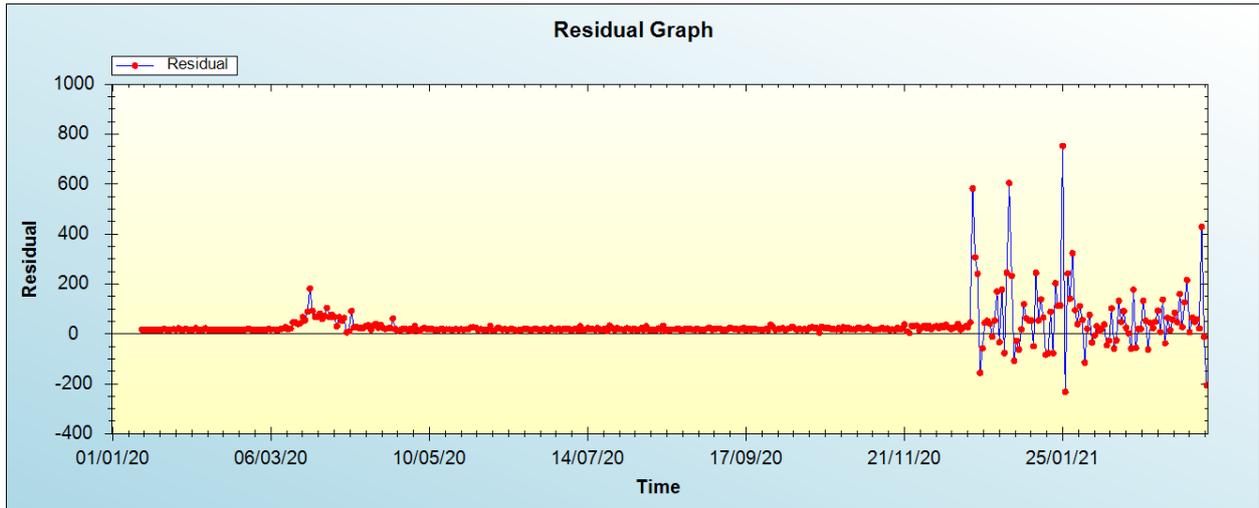


Figure 1: Residual analysis

*In-sample Forecast for T*

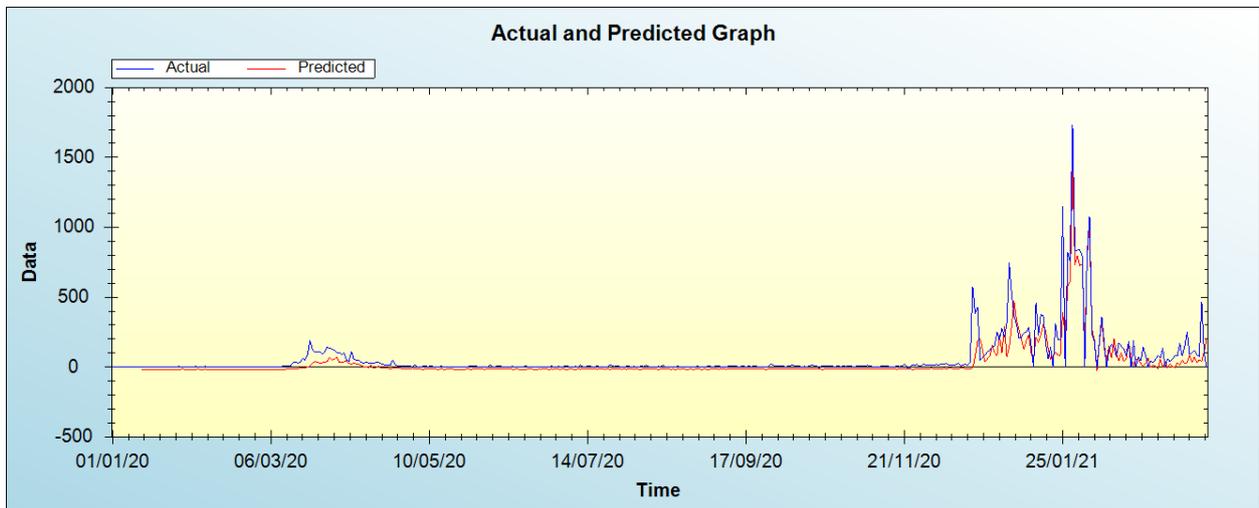


Figure 2: In-sample forecast for the T series

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

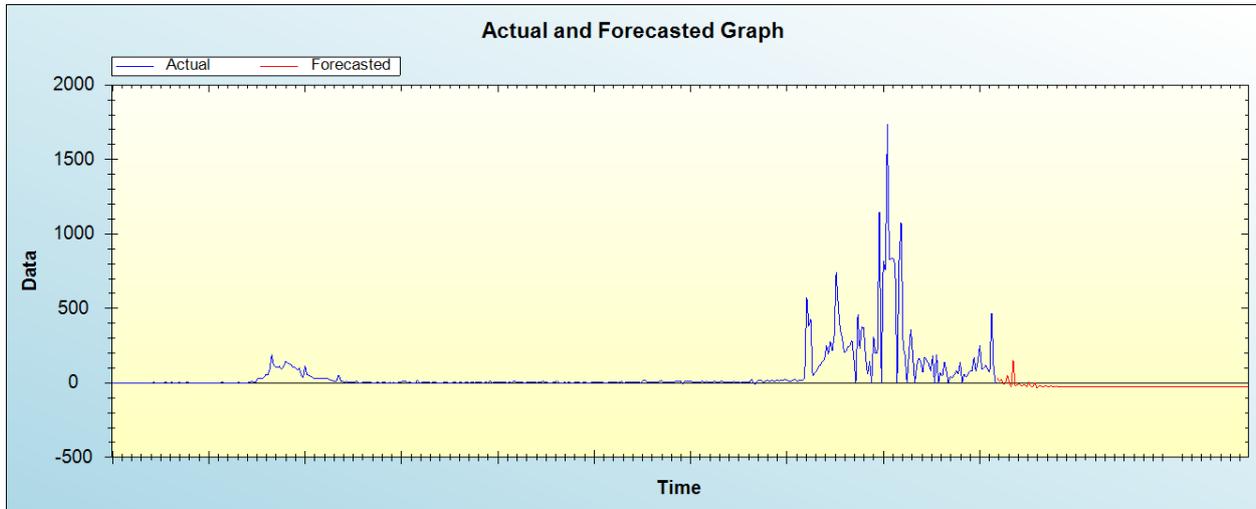


Figure 3: Out-of-sample forecast for T: actual and forecasted graph

Out-of-Sample Forecast for T: Forecasts only

Table 2: Tabulated out-of-sample forecasts

Date	Forecasts
26/03/21	30.0072
27/03/21	13.3577
28/03/21	24.5857
29/03/21	-8.4462
30/03/21	1.2150
31/03/21	51.6797
01/04/21	-0.7644
02/04/21	-27.3001
03/04/21	152.9440
04/04/21	-18.6001
05/04/21	-12.1176
06/04/21	-2.3832
07/04/21	-20.5956
08/04/21	-16.7337
09/04/21	-14.0429
10/04/21	-24.2070
11/04/21	4.8161
12/04/21	-24.2254
13/04/21	-27.2490
14/04/21	5.2610
15/04/21	-34.0605
16/04/21	-23.0138
17/04/21	-20.0491
18/04/21	-26.5958
19/04/21	-22.0608
20/04/21	-22.4023
21/04/21	-26.8886
22/04/21	-18.6679
23/04/21	-27.4886
24/04/21	-25.5659
25/04/21	-21.0212
26/04/21	-28.0220
27/04/21	-23.9500
28/04/21	-23.8846
29/04/21	-25.8846
30/04/21	-23.9389

01/05/21	-24.8316
02/05/21	-25.6379
03/05/21	-23.6781
04/05/21	-25.8279
05/05/21	-24.7888
06/05/21	-24.2734
07/05/21	-25.5714
08/05/21	-24.5193
09/05/21	-24.7565
10/05/21	-25.2071
11/05/21	-24.5869
12/05/21	-24.9912
13/05/21	-25.0116
14/05/21	-24.6139
15/05/21	-25.1186
16/05/21	-24.7939
17/05/21	-24.7880
18/05/21	-25.0344
19/05/21	-24.7740
20/05/21	-24.8845
21/05/21	-24.9536
22/05/21	-24.7930
23/05/21	-24.9280
24/05/21	-24.8890
25/05/21	-24.8250
26/05/21	-24.9384
27/05/21	-24.8492
28/05/21	-24.8699
29/05/21	-24.9130
30/05/21	-24.8497
31/05/21	-24.8881
01/06/21	-24.8921
02/06/21	-24.8575
03/06/21	-24.8956
04/06/21	-24.8767
05/06/21	-24.8698
06/06/21	-24.8934
07/06/21	-24.8702
08/06/21	-24.8797
09/06/21	-24.8861
10/06/21	-24.8716
11/06/21	-24.8833
12/06/21	-24.8809
13/06/21	-24.8746
14/06/21	-24.8841
15/06/21	-24.8776
16/06/21	-24.8780
17/06/21	-24.8825
18/06/21	-24.8768
19/06/21	-24.8801
20/06/21	-24.8806
21/06/21	-24.8775
22/06/21	-24.8807
23/06/21	-24.8794
24/06/21	-24.8785
25/06/21	-24.8806
26/06/21	-24.8787
27/06/21	-24.8793
28/06/21	-24.8801
29/06/21	-24.8787
30/06/21	-24.8797
01/07/21	-24.8796
02/07/21	-24.8790
03/07/21	-24.8798

04/07/21	-24.8793
05/07/21	-24.8793
06/07/21	-24.8797
07/07/21	-24.8792
08/07/21	-24.8795
09/07/21	-24.8795
10/07/21	-24.8793
11/07/21	-24.8795
12/07/21	-24.8794
13/07/21	-24.8793
14/07/21	-24.8795
15/07/21	-24.8794
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24/07/21	-24.8794
25/07/21	-24.8795
26/07/21	-24.8794
27/07/21	-24.8794
28/07/21	-24.8794
29/07/21	-24.8794
30/07/21	-24.8794
31/07/21	-24.8794

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 the COVID-19 pandemic may disappear in the country around mid-April 2021.

#### IV. CONCLUSION & RECOMMENDATIONS

COVID-19 is still spreading rapidly in many countries around the world. This study used the ANN (12, 12, 1) model to come up with daily predictions for new cases, ranging over the period late March 2021 to late July 2021. It is projected that the COVID-19 pandemic may disappear in the country around mid-April 2021. Given the results of the study, the country should still ensure 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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