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Forecasting Covid-19 New Cases in Cambodia

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***Abstract* - In this study, the ANN approach was applied to analyze COVID-19 new cases in Cambodia. The employed data covers the period 1 January 2020 – 25 March 2021 and the out-of-sample period ranges over the period 26 March – 31 July 2021. The residuals and forecast evaluation criteria (Error, MSE and MAE) of the applied model indicate that the model is quite stable. The results of the study indicate that COVID-19 cases are likely to range between 0 and 200 cases over the out-of-sample period. Amongst other suggested policy directions, there is need for the government of Cambodia to ensure adherence to safety guidelines while continuing to create awareness about the COVID-19 pandemic.**

Keywords: ANN, COVID-19, Forecasting.

I. INTRODUCTION

Since the beginning of the COVID-19 pandemic many people continue to suffer from the effects of the deadly virus which include high morbidity and mortality, economic meltdown and disruption of delivery of essential services such as education, transport system, legal services and health care services. Although Cambodia was not spared by the COVID-19 pandemic, its daily COVID-19 cases and mortality have remained low (Nit et al, 2021). The country reported its first case of SARS-COV-2 on the 27th of January 2020 (Reuters, 2020). The Asian nation has done very well in the prevention and control of COVID-19 due to several reasons which include strong support from international partners, timely response to the pandemic, compliance to the preventive measures and existence of a strong surveillance system prior to the emergence of COVID-19 pandemic (WHO, 2020; Luck, 2020; Mirchandani, 2020; Chheng, 2020; World Vision, 2020).The purpose of this paper is to predict daily new coronavirus infections in Cambodia using the artificial neural network approach. The findings of this study are expected to reveal future trends of SARS COV2 infections and help in planning and resource allocation in order to prevent and control the epidemic (Nyoni et al, 2021, Nyoni et al, 2020).

II. LITERATURE REVIEW

Based on LSTM networks, Chimmula and Zhang (2020) forecasted COVID-19 transmission in Canada and predicted that the possible ending point of the pandemic would be around June 2020.The compartmental SEIR model was applied by Mahmud& Lim et al (2020) to forecast the COVID-19 Trend in Malaysia using data from March 17 39 to 27, 2020. Based on several predetermined assumptions, the results of the analyses 40 showed that after the implementation of the 14-day MCO from March 18 to 31, 2020, it was forecasted that the epidemic in Malaysia will peak approximately in the end of April 2020 and will subside by about the first week of July 2020. A systematic review was performed by Gnanv et al (2020) and they did a global systematic literature review to summarize trends in the modelling techniques used for Covid-19 from January 1st 2020 to June 30th 2020.They further examined the reliability and correctness of predictions by comparing predicted and observed values for cumulative cases and deaths. From an initial 2170 peer-reviewed articles and preprints found with our defined keywords, 148 were fully analyzed. The study revealed that most studies on the modelling of Covid-19 were from Asia (52.70%) and Europe (25%). Most of them used compartmental models (SIR and SEIR) (57%) and statistical models (growth models and time series) (28%) while few used artificial intelligence (5%) and Bayesian approach (3%). The findings suggested that while predictions made by the different models are useful to understand the pandemic course and guide policy-making, there should be caution in their usage.

III. 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

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activation function. This paper applies the Artificial Neural Network (ANN) approach in predicting new COVID-19 cases Cambodia.

Data Issues

This study is based on daily new cases of COVID-19 in Cambodia 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).

IV. FINDINGS OF THE STUDY

ANN Model Summary

Table 1: ANN model summary

Variable	C
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	0.051292
MSE	26.308844
MAE	2.232824

Residual Analysis for the Applied Model

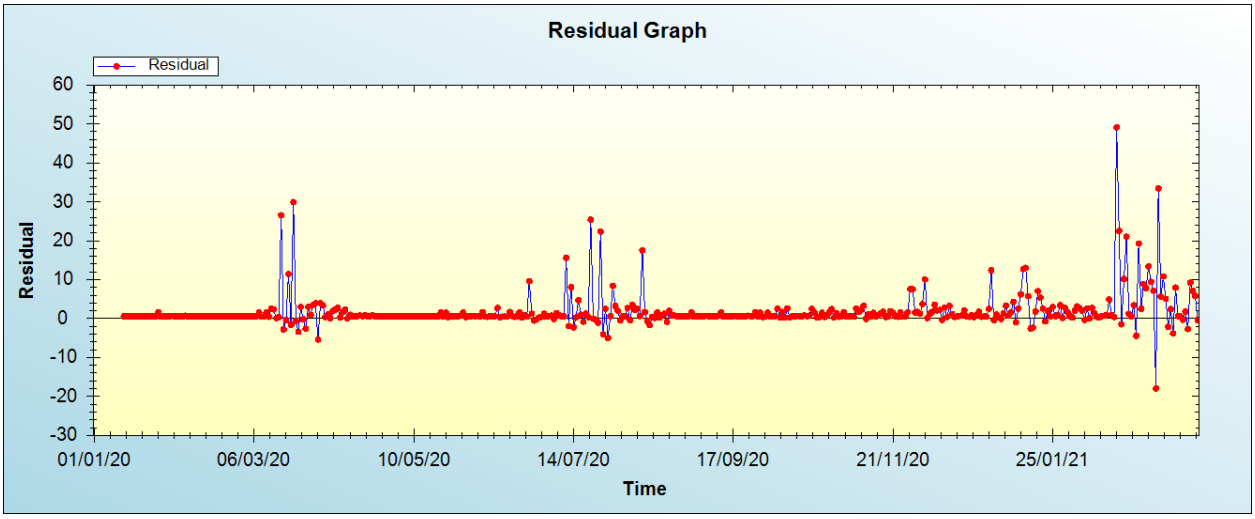

Figure 1: Residual analysis

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In-sample Forecast for C

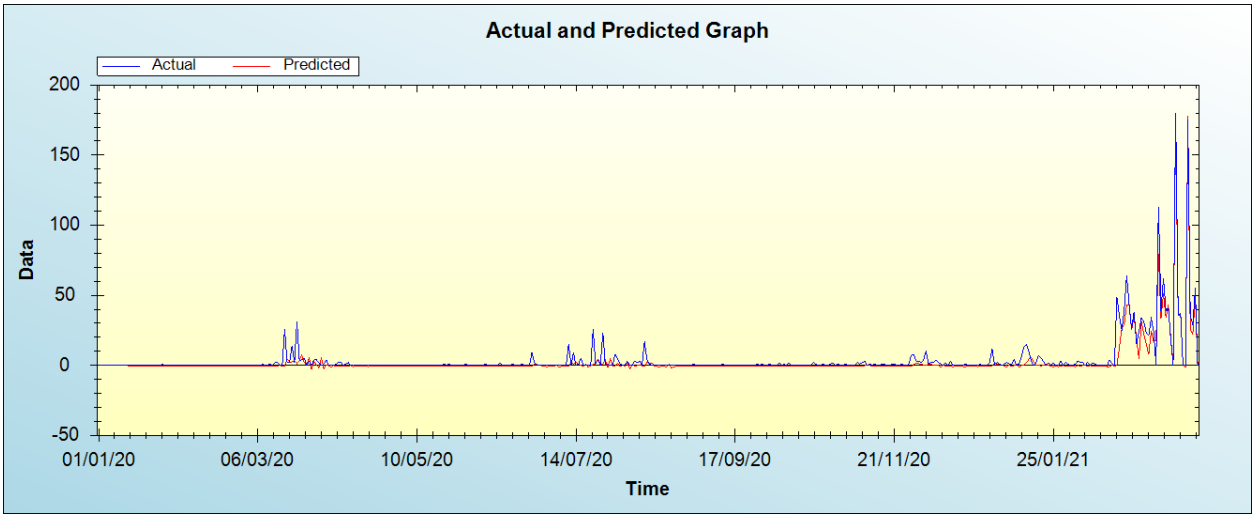

Figure 2: In-sample forecast for the C series

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

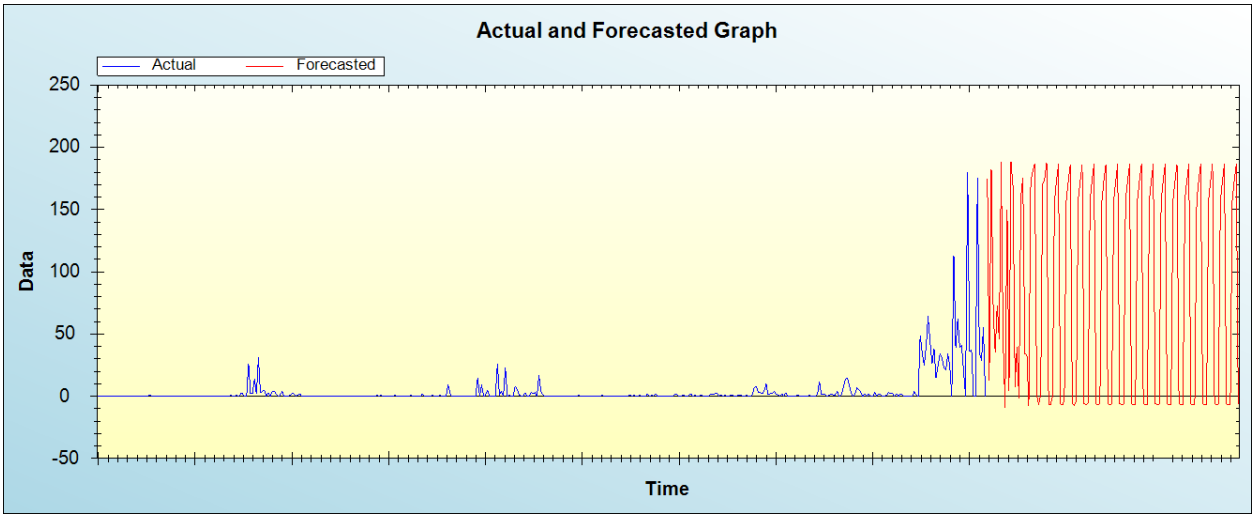

Figure 3: Out-of-sample forecast for C: actual and forecasted graph

Out-of-Sample Forecast for C: Forecasts only

Table 2: Tabulated out-of-sample forecasts

Day/Month/Year	Forecasts
26/03/21	174.8848
27/03/21	12.2583
28/03/21	182.5086
29/03/21	67.5767
30/03/21	35.6782
31/03/21	72.9980
01/04/21	45.9246
02/04/21	187.7931
03/04/21	43.9939
04/04/21	-9.2990
05/04/21	149.8200
06/04/21	4.5109
07/04/21	188.4198
08/04/21	167.7766
09/04/21	7.6651

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10/04/21	39.4415
11/04/21	-1.6177
12/04/21	160.5250
13/04/21	175.4429
14/04/21	34.0413
15/04/21	33.3127
16/04/21	-7.9299
17/04/21	173.8244
18/04/21	180.6078
19/04/21	186.6956
20/04/21	1.5272
21/04/21	-6.4580
22/04/21	0.9269
23/04/21	170.2095
24/04/21	174.2997
25/04/21	187.9307
26/04/21	-6.7726
27/04/21	-7.1191
28/04/21	-0.0010
29/04/21	156.4393
30/04/21	173.4265
01/05/21	186.2816
02/05/21	-5.9113
03/05/21	-7.1138
04/05/21	-2.4511
05/05/21	157.4877
06/05/21	173.0292
07/05/21	185.9876
08/05/21	-5.9572
09/05/21	-7.0870
10/05/21	-4.2762
11/05/21	157.6951
12/05/21	173.1303
13/05/21	186.0420
14/05/21	-5.9684
15/05/21	-7.0511
16/05/21	-5.2062
17/05/21	157.5934
18/05/21	173.1589
19/05/21	186.1952
20/05/21	-5.9742
21/05/21	-7.0227
22/05/21	-5.7803
23/05/21	157.5428
24/05/21	173.1463
25/05/21	186.2939
26/05/21	-5.9802
27/05/21	-7.0092
28/05/21	-6.0958
29/05/21	157.5244
30/05/21	173.1383
31/05/21	186.3577
01/06/21	-5.9837
02/06/21	-7.0006
03/06/21	-6.2754
04/06/21	157.5156
05/06/21	173.1350
06/06/21	186.3928
07/06/21	-5.9857
08/06/21	-6.9960
09/06/21	-6.3720
10/06/21	157.5108
11/06/21	173.1332
12/06/21	186.4130

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13/06/21	-5.9868
14/06/21	-6.9933
15/06/21	-6.4246
16/06/21	157.5081
17/06/21	173.1321
18/06/21	186.4239
19/06/21	-5.9874
20/06/21	-6.9919
21/06/21	-6.4528
22/06/21	157.5067
23/06/21	173.1315
24/06/21	186.4298
25/06/21	-5.9877
26/06/21	-6.9911
27/06/21	-6.4680
28/06/21	157.5060
29/06/21	173.1312
30/06/21	186.4330
01/07/21	-5.9879
02/07/21	-6.9907
03/07/21	-6.4761
04/07/21	157.5056
05/07/21	173.1310
06/07/21	186.4348
07/07/21	-5.9880
08/07/21	-6.9905
09/07/21	-6.4805
10/07/21	157.5054
11/07/21	173.1309
12/07/21	186.4357
13/07/21	-5.9880
14/07/21	-6.9904
15/07/21	-6.4828
16/07/21	157.5053
17/07/21	173.1309
18/07/21	186.4362
19/07/21	-5.9881
20/07/21	-6.9903
21/07/21	-6.4841
22/07/21	157.5052
23/07/21	173.1309
24/07/21	186.4364
25/07/21	-5.9881
26/07/21	-6.9903
27/07/21	-6.4847
28/07/21	157.5052
29/07/21	173.1309
30/07/21	186.4366
31/07/21	-5.9881

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 Cambodia are likely to range between 0 and 200 cases over the out-of-sample period.

V. CONCLUSION AND POLICY RECOMMENDATIONS

The control of the COVID-19 pandemic around the world is a challenge due to the rapid spread of the virus and emergence of new strains. However Cambodia has made significant efforts to effectively control the epidemic in the country. The ANN (12, 12, 1) model predictions suggest that COVID-19 cases are likely to range between 0 and 200 cases over the out-of-sample period. Therefore the government should continue enforcing WHO guidelines on prevention and control of COVID-19 including expansion of the COVID-19 vaccination programme in order to achieve herd immunity.

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REFERENCES

[1] K. Chheng (2020). Cambodia's political and economic response to COVID-19, Available from: https://www.eastasiaforum.org/2020/05/08/cambodias-political-and-econo mic-response-to-covid-19/, , 2020

[2] M. Kimseng., & Luck (2020). Culture helped Cambodia contain coronavirus, Available from: https://www.voanews.com/covid-19-pandemic/luck-culture-helped-cambodia-contain-coronavirus, 2020.

[3] M. Mirchandani (2020).How did Vietnam and Cambodia contain COVID-19 with few resources? brink, Available from: https://www.brinknews.com/how-did-vietnamand-cambodia-contain-covid-19-with-few-resources/, 2020.

[4] Reuters (2020). Cambodia confirms first case of coronavirus, Available from: https://www .nst.com.my/world/world/2020/01/560203/cambodia-confirms-first-case-coronavirus, 2020.

[5] Smartson P Nyoni., Thabani Nyoni & Tatenda A Chihoho (2020) Prediction of new Covid-19 cases in Ghana using artificial neural networks. IJARIIE Vol-6 Issue-6 2395-4396

[6] World Health Organization (2020). Available from: https://www.who.int/, 2020.

[7] World vision Cambodia (2020). COVID-19 emergency response situation report #13 - 12 august 2020, Available from: https://reliefweb.int/report/cambodia/w orld-vision-cambodia-covid-19-emergency-response-situation-report-13-1 2-august-2020? Fbclid=IwAR0oPZXs5BwmFKNtsg4kw2tNWIdHw1G9X2RThG7E s4_2NrcB2viiy7QbrSA, 2020.

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