

# Forecasting Covid-19 New Cases in Austria

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**Abstract - In Austria, just like in any other affected country, COVID-19 has registered disastrous effects. The worldwide research community has responded with a surge in forecasting models. In this research paper, the ANN approach was applied to examine COVID-19 cases in Austria. This study is based on daily new cases of COVID-19 in Austria 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 statistics (Error, MSE and MAE) of the applied model suggest that the model is quite stable and generally acceptable for forecasting daily COVID-19 cases in Austria. The results of the study indicate that daily COVID-19 cases in Austria are likely to remain significantly high over the out-of-sample period. The government of Austria in line with the findings of the study; should ensure the continued compliance to control and preventive COVID-19 measures.**

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

## I. INTRODUCTION

Coronavirus Disease 2019 (COVID-19) is a respiratory disease caused by a highly infectious single-stranded RNA corona virus, SARS-CoV-2 (Wu *et al.*, 2020). Its first case was reported in Wuhan, the capital city of the Hubei province of China, in late December 2019 (Zhu *et al.*, 2020). Austria's first cases of COVID-19 were identified in late January 2020. Models focusing on analyzing the COVID-19 pandemic in Austria remain scanty. Therefore, it is this informational hiatus that this study seeks to fill. Forecasting daily COVID-19 cases is pivotal for management and future directions as well as allocating necessary resources to restrict the virus spreading (Wang *et al.*, 2020).

## 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 Austria.

### Data Issues

This study is based on daily new cases of COVID-19 in Austria 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	A
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	0.051337
MSE	74746.420640
MAE	188.623073

*Residual Analysis for the Applied Model*

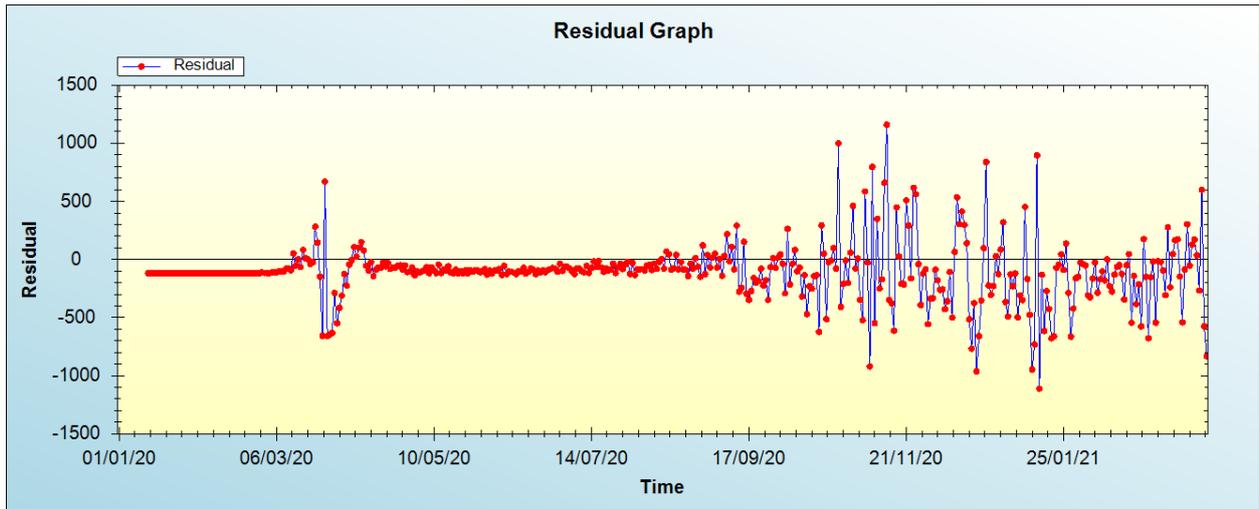


Figure 1: Residual analysis

*In-sample Forecast for A*

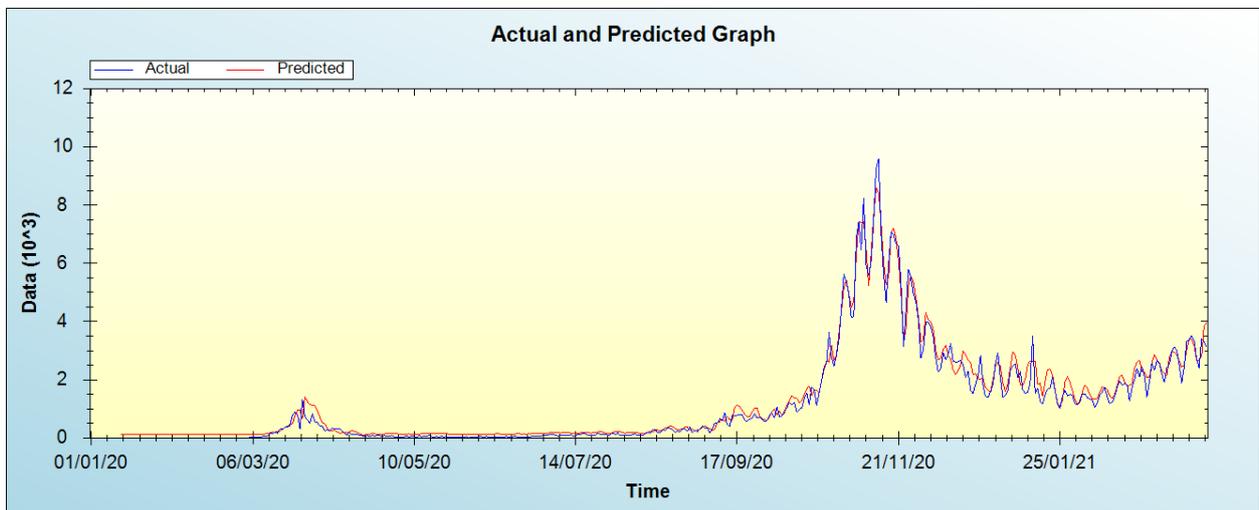


Figure 2: In-sample forecast for the A series

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

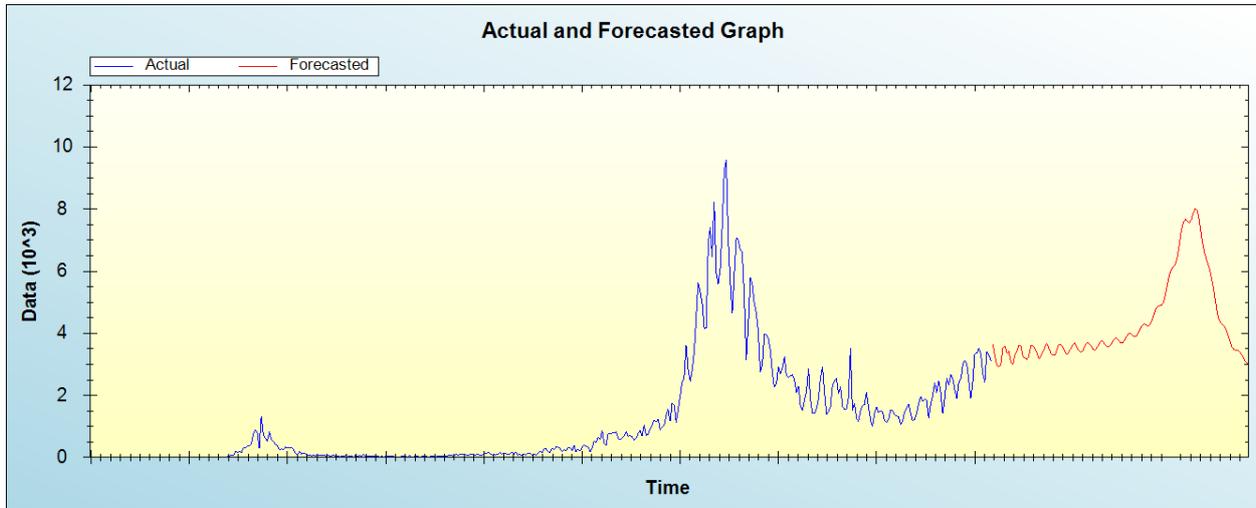


Figure 3: Out-of-sample forecast for A: actual and forecasted graph

Out-of-Sample Forecast for A: Forecasts only

Table 2: Tabulated out-of-sample forecasts

Day/Month/Year	Forecast
26/03/21	3648.1075
27/03/21	3291.2586
28/03/21	2966.8074
29/03/21	2933.8268
30/03/21	2984.0602
31/03/21	3514.8774
01/04/21	3582.8433
02/04/21	3366.4384
03/04/21	3417.6594
04/04/21	3057.9491
05/04/21	2989.0046
06/04/21	3306.6805
07/04/21	3412.8901
08/04/21	3627.1182
09/04/21	3575.1257
10/04/21	3247.3977
11/04/21	3208.4336
12/04/21	3149.6311
13/04/21	3266.0755
14/04/21	3607.3280
15/04/21	3604.0834
16/04/21	3521.3257
17/04/21	3391.1427
18/04/21	3171.8517
19/04/21	3251.0544
20/04/21	3417.4111
21/04/21	3542.8934
22/04/21	3681.8452
23/04/21	3534.3788
24/04/21	3349.2907
25/04/21	3303.3606
26/04/21	3286.0441
27/04/21	3463.0611
28/04/21	3643.4861
29/04/21	3624.6874
30/04/21	3561.7633
01/05/21	3406.0822

02/05/21	3306.4063
03/05/21	3399.5028
04/05/21	3516.7043
05/05/21	3644.1435
06/05/21	3684.3956
07/05/21	3546.7673
08/05/21	3440.4955
09/05/21	3397.1156
10/05/21	3436.4475
11/05/21	3598.8125
12/05/21	3693.9702
13/05/21	3679.9495
14/05/21	3605.8715
15/05/21	3482.7946
16/05/21	3459.0209
17/05/21	3545.0298
18/05/21	3653.7341
19/05/21	3755.6152
20/05/21	3742.8996
21/05/21	3641.0357
22/05/21	3573.4512
23/05/21	3558.1774
24/05/21	3639.8970
25/05/21	3775.4720
26/05/21	3839.0879
27/05/21	3826.5065
28/05/21	3752.8043
29/05/21	3680.6101
30/05/21	3705.8352
31/05/21	3803.9116
01/06/21	3924.3130
02/06/21	4006.3430
03/06/21	3983.9406
04/06/21	3919.4131
05/06/21	3889.7255
06/06/21	3929.7254
07/06/21	4060.7486
08/06/21	4206.5180
09/06/21	4283.4852
10/06/21	4285.6484
11/06/21	4242.9823
12/06/21	4244.4957
13/06/21	4350.6313
14/06/21	4532.9509
15/06/21	4729.9335
16/06/21	4855.8875
17/06/21	4882.2181
18/06/21	4891.4882
19/06/21	4975.4195
20/06/21	5191.8616
21/06/21	5520.5851
22/06/21	5839.7833
23/06/21	6045.6347
24/06/21	6136.3827
25/06/21	6213.3998
26/06/21	6424.6903
27/06/21	6816.5952
28/06/21	7259.7693
29/06/21	7565.6224
30/06/21	7662.2409
01/07/21	7611.8117
02/07/21	7560.2060
03/07/21	7652.1476
04/07/21	7868.2260

05/07/21	8021.4662
06/07/21	7958.4571
07/07/21	7642.2230
08/07/21	7179.1420
09/07/21	6772.7940
10/07/21	6504.3907
11/07/21	6308.4953
12/07/21	6094.7426
13/07/21	5825.6738
14/07/21	5493.3273
15/07/21	5076.8747
16/07/21	4662.9776
17/07/21	4410.0308
18/07/21	4322.9357
19/07/21	4271.7711
20/07/21	4171.6725
21/07/21	4007.8038
22/07/21	3804.5670
23/07/21	3613.3225
24/07/21	3492.7782
25/07/21	3458.3418
26/07/21	3452.3278
27/07/21	3415.0362
28/07/21	3332.8910
29/07/21	3214.6528
30/07/21	3100.4385
31/07/21	3033.2765

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 Austria are likely to remain significantly high over the out-of-sample period.

#### IV. CONCLUSION AND POLICY RECOMMENDATIONS

COVID-19 is a very serious concern for all governments across the world. By studying its behavior, we can save millions of lives as authorities can make use of this information to prepare and face the crisis. Every day, thousands of COVID-19 patients arrive at different hospitals around the globe needing urgent assistance, which; unfortunately, is usually not available. Therefore, it is fundamental to predict the number of infected people and anticipate the future disease progression. Based on 450 daily observations of COVID-19 cases in Austria, this study used the ANN (12, 12, 1) model to come up with forecasts ranging over the period 26 March 2021 to 31 July 2021. The Austrian government in line with the results of our study, should ensure the continued compliance to control and preventive COVID-19 measures such as social distancing, quarantine, isolation, face-mask wearing and so on. This will assist a lot, particularly in terms of avoiding extremely catastrophic daily COVID-19 case volumes in the country.

#### REFERENCES

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#### Citation of this Article:

Dr. Smartson. P. NYONI, Mr. Thabani NYONI, Mr. Tatenda. A. CHIHOHO, “Forecasting Covid-19 New Cases in Austria” Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 5, Issue 6, pp 777-781, June 2021. Article DOI <https://doi.org/10.47001/IRJIET/2021.506136>

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