

Modelling Transmission Dynamics of COVID-19 during Pre-Vaccination Period in Malaysia: A predictive GUI-SEIRD model using Streamlit

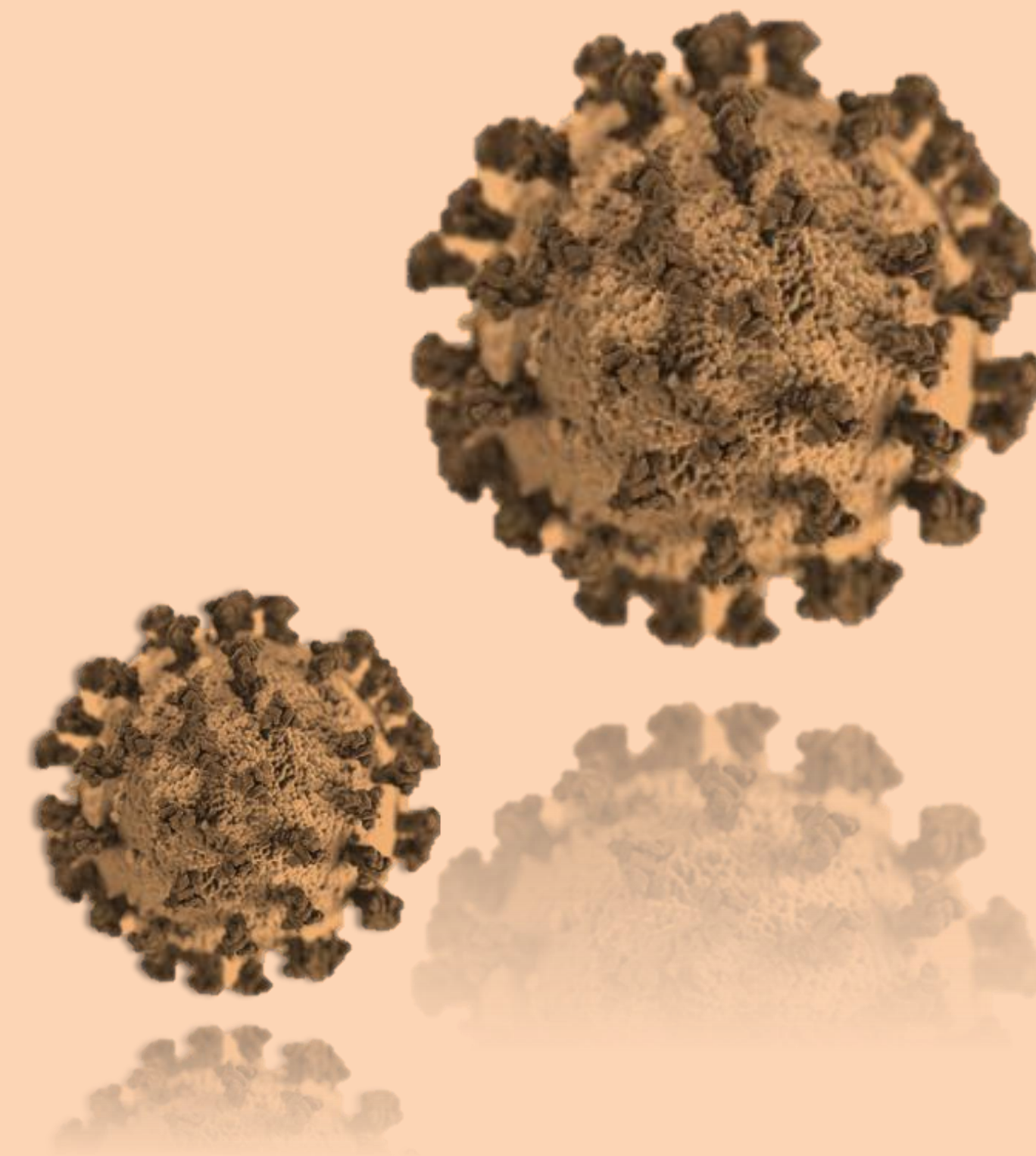
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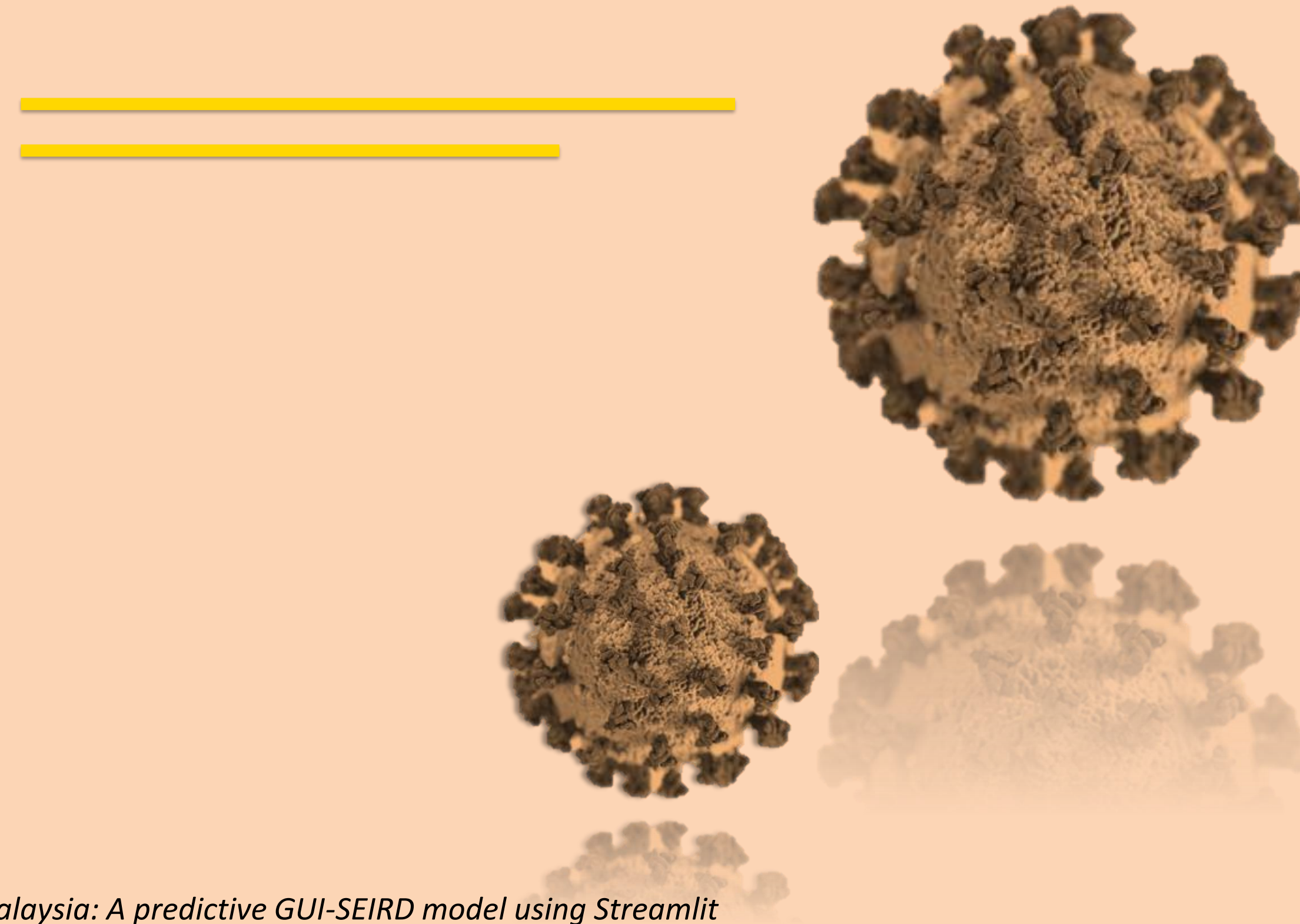
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PRESENTATION OUTLINE

1. Introduction
2. Methods
3. Results and Discussions
4. Conclusions



1. INTRODUCTION



INTRODUCTION

COVID-19: declared a global pandemic on 11 March 2020 (Cucinotta, & Vanelli, 2020)

COVID-19 Cases in Malaysia

25th January –
16th February 2020

First Wave

Second Wave

27th February –
8th July 2020

8th September 2020 –
present

Third Wave

Movement Control Order by Phase (pre-vaccination period)

Movement Control Order (MCO): 18th March 2020 – 3rd May 2020

Conditional Movement Control Order (CMCO) : 4th May 2020 – 9th June 2020

Recovery Movement Control Order (RMCO): 10th June 2020 – 31st March 2021

MCO by States: 11th January 2021 – 31st May 2021

(Wikipedia, 2023)



COVIDNOW



Malaysia

Cases

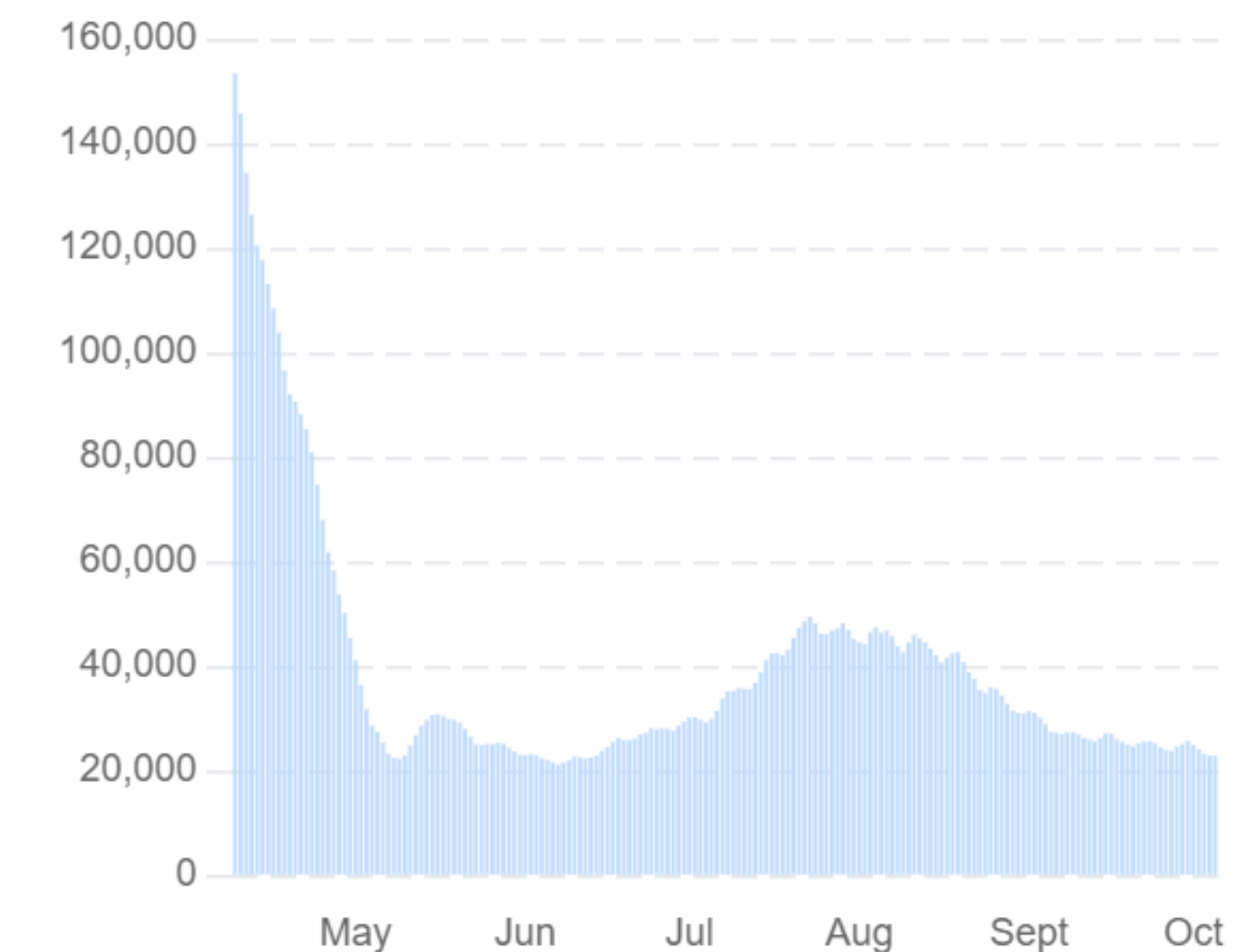
Data as of 5 Oct 2022, 11:59 pm

Active COVID-19 Cases

Data for Malaysia | Data for past 6 months

Active Cases

23,038



Source: covidnow.moh.gov.my/cases/

INTRODUCTION

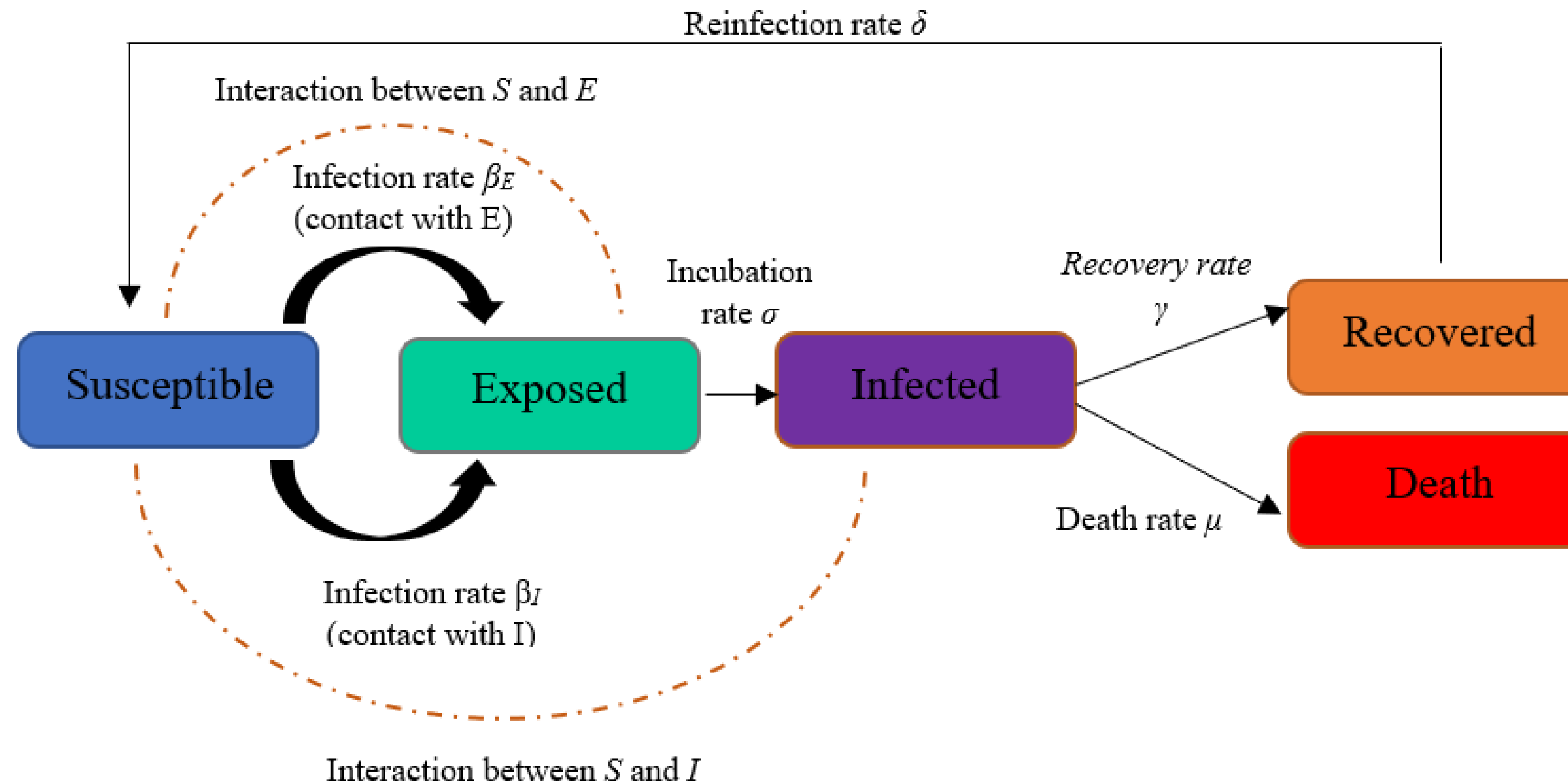
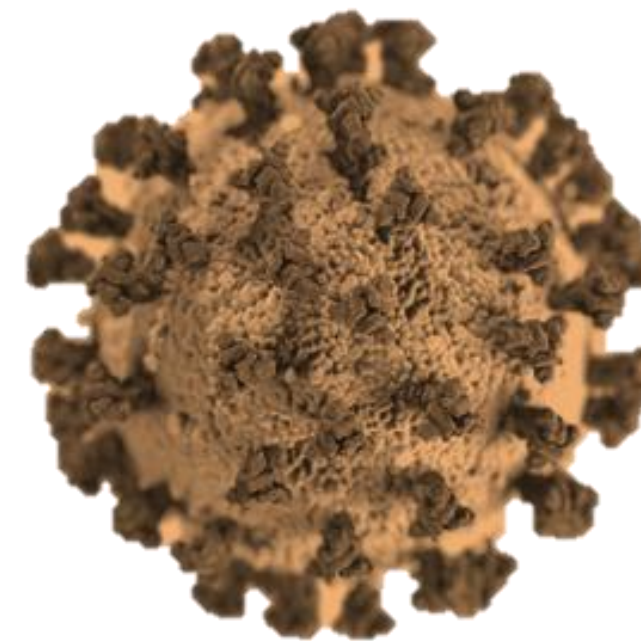
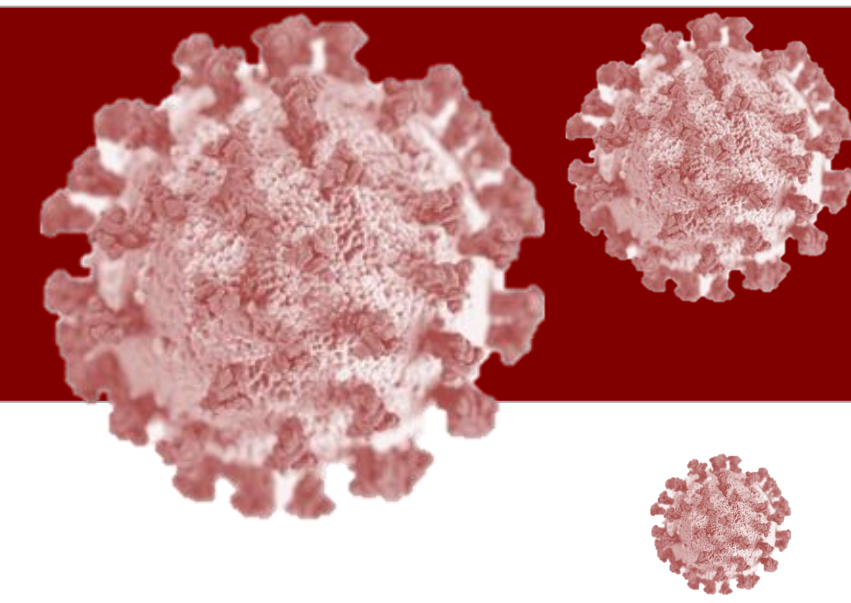


Fig. 1. Schematic diagram of disease progression



INTRODUCTION

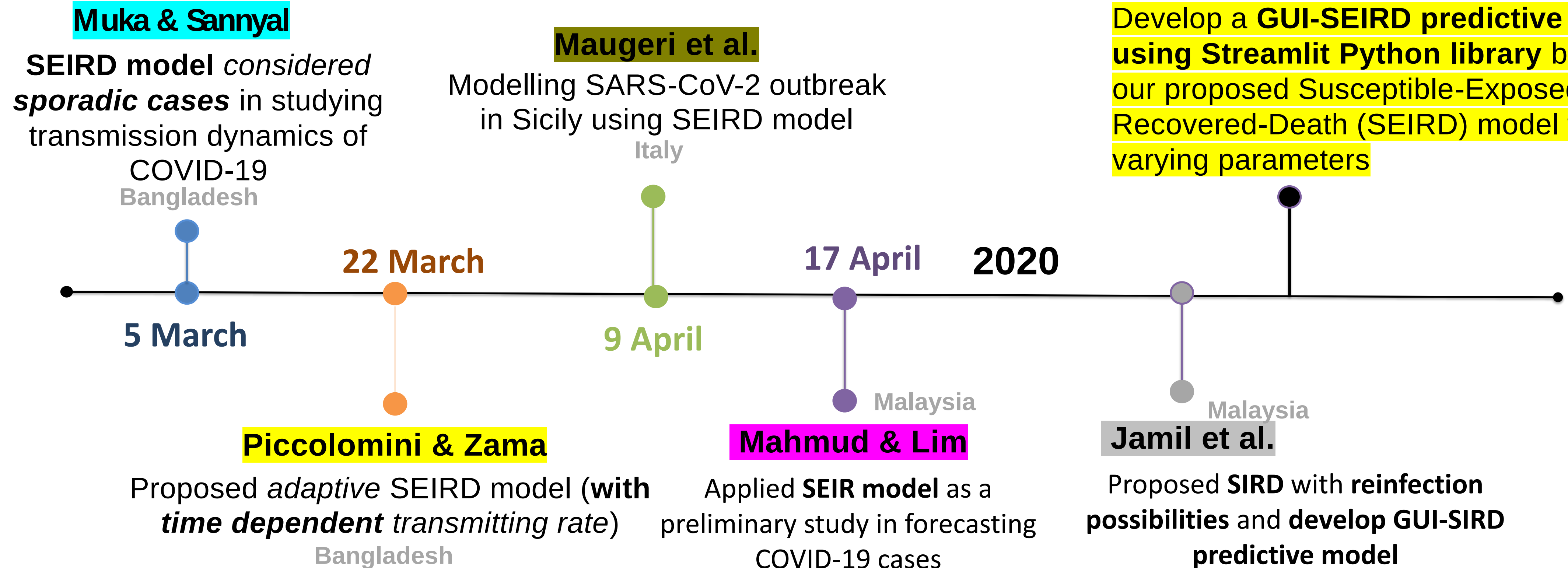


OBJECTIVE

OF THIS STUDY

Develop a **GUI-SEIRD predictive model** using **Streamlit Python library** based on our proposed Susceptible-Exposed-Infected-Recovered-Death (SEIRD) model with time-varying parameters

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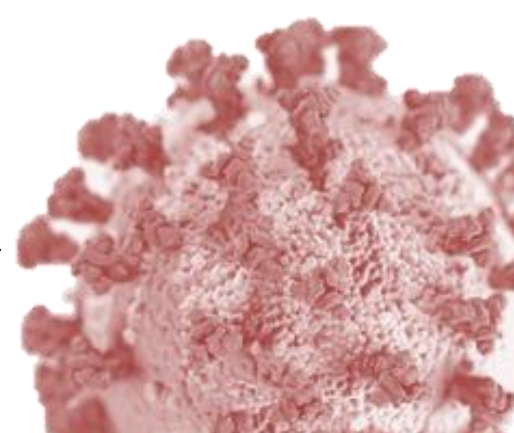


A. Mahmud, and P.Y. Lim, "Applying the SEIR model in forecasting the COVID-19 trend in Malaysia: A preliminary study," BioRxiv, (2020)

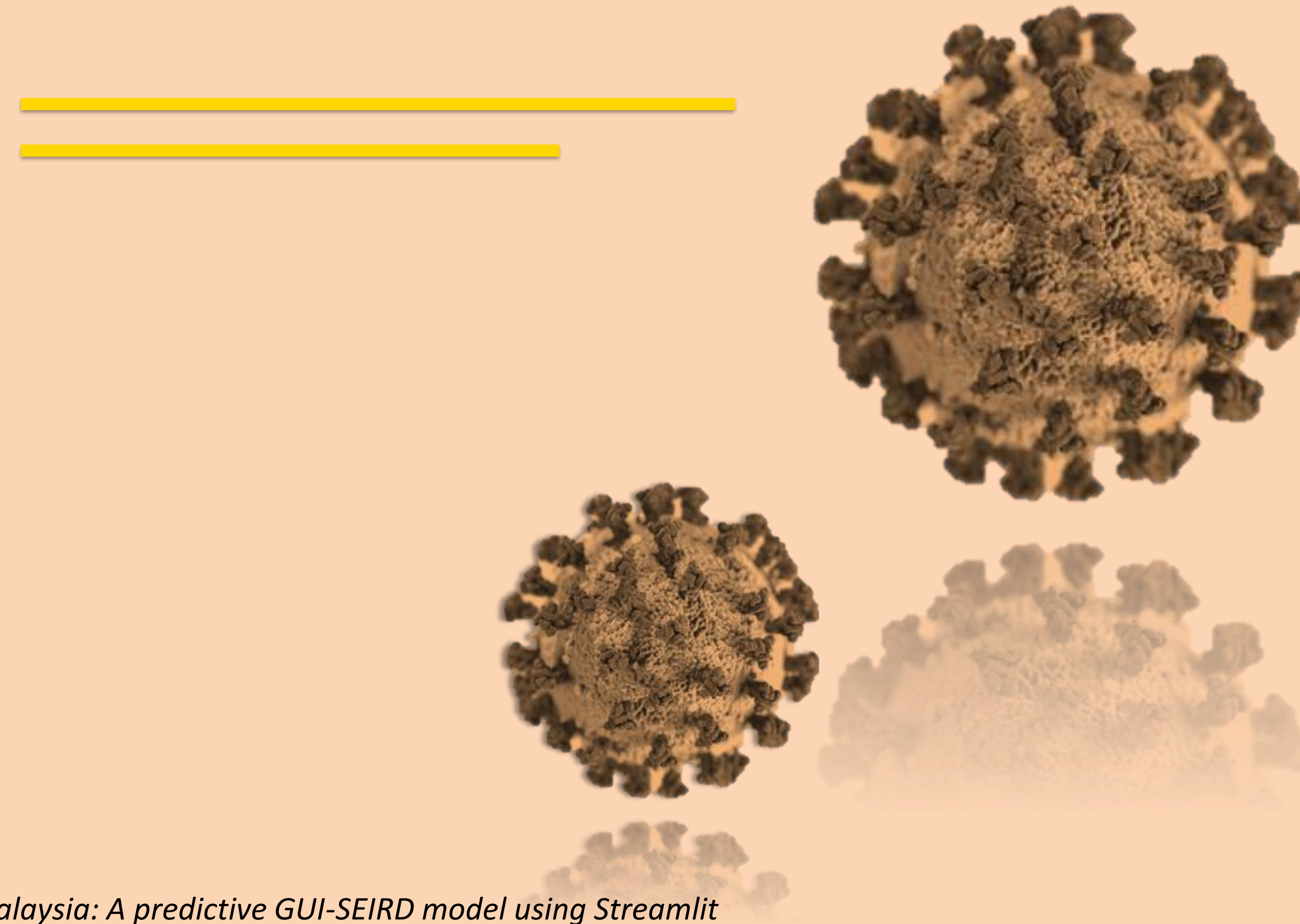
A.M.M. Muka, and M. Sannyal, "Transmission dynamics of COVID-19 in Bangladesh- A compartmental modeling approach," Research Square, (2020).

E.L. Piccolomini, and F. Zama, "Monitoring Italian COVID-19 spread by an adaptive SEIRD model," BioRxiv, (2020).

A. Maugeri, M. Barchitta, S. Battiato, and A. Agodi, "Modeling the novel Coronavirus (SARS-CoV-2) outbreak in Sicily, Italy," Preprints, (2020).



2. METHODS



Epidemiological Compartmental Model

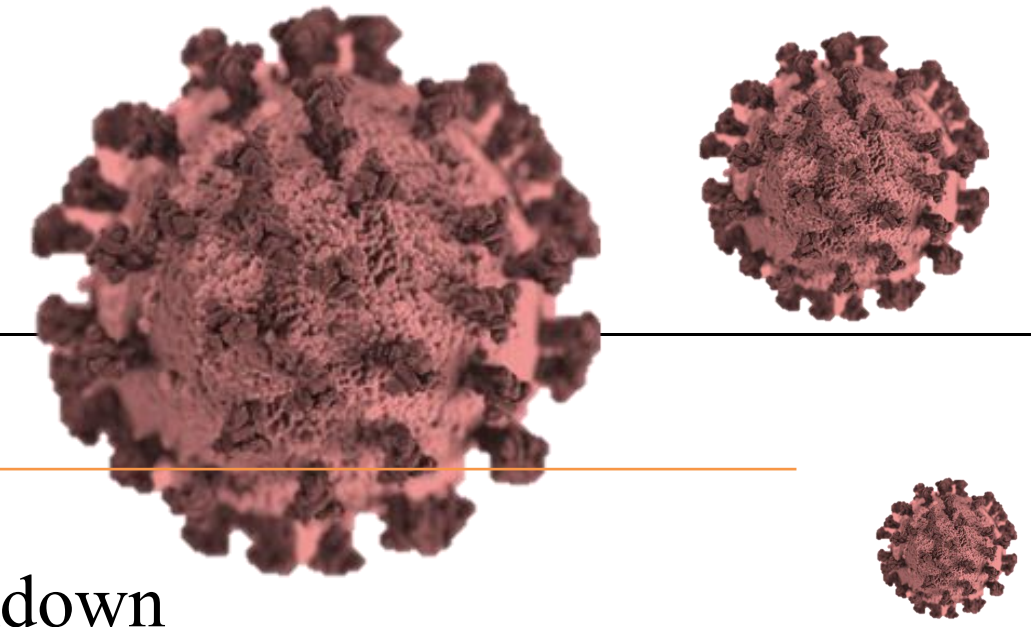


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Model	Equations	No.	Model	Equations	No.
Modified SEIRD Model Considering Sporadic Possibility (<i>mSEIRDs</i>) <i>Inspired by Muka & Sannyal (2020)</i>	$\frac{dS(t)}{dt(t)} = -\frac{\beta_I(t)S(t)I(t)}{N} - \frac{\beta_E(t)S(t)E(t)}{N}$ $\frac{dE(t)}{dt(t)} = \frac{\beta_I(t)S(t)I(t)}{N} + \frac{\beta_E(t)S(t)E(t)}{N} - \sigma E(t)$ $\frac{dI(t)}{dt(t)} = \sigma E(t) - \gamma(t)I(t) - \mu(t)I(t)$ $\frac{dR(t)}{dt(t)} = \gamma(t)I(t)$ $\frac{dD(t)}{dt(t)} = \mu(t)I(t)$	(1)	Classical SEIRD Model without additional possibility (<i>cSEIRD</i>) <i>Inspired by Mahmud & Lim (2020)</i>	$\frac{dS(t)}{dt(t)} = -\frac{\beta(t)S(t)I(t)}{N}$ $\frac{dE(t)}{dt(t)} = \frac{\beta(t)S(t)I(t)}{N} - \sigma E(t)$ $\frac{dI(t)}{dt(t)} = \sigma E(t) - \gamma(t)I(t) - \mu(t)I(t)$ $\frac{dR(t)}{dt(t)} = \gamma(t)I(t)$ $\frac{dD(t)}{dt(t)} = \mu(t)I(t)$	(3)
Modified SIRD Model Considering Reinfection Possibility (<i>mSIRDsr</i>) <i>Inspired by Jamil et al. (2021)</i>	$\frac{dS(t)}{dt(t)} = -\frac{\beta(t)S(t)I(t)}{N} + \delta(t)R(t)$ $\frac{dI(t)}{dt(t)} = \frac{\beta(t)S(t)I(t)}{N} - \gamma(t)I(t) - \mu(t)I(t)$ $\frac{dR(t)}{dt(t)} = \gamma(t)I(t) - \delta(t)R(t)$ $\frac{dD(t)}{dt(t)} = \mu(t)I(t)$	(2)	Modified SEIRD Model Considering Sporadic and Reinfection Possibilities (<i>mSEIRDsr</i>) <i>Our proposed model</i>	$\frac{dS(t)}{dt(t)} = -\frac{\beta_I(t)S(t)I(t)}{N} - \frac{\beta_E(t)S(t)E(t)}{N} + \delta(t)R(t)$ $\frac{dE(t)}{dt(t)} = \frac{\beta_I(t)S(t)I(t)}{N} + \frac{\beta_E(t)S(t)E(t)}{N} - \sigma E(t)$ $\frac{dI(t)}{dt(t)} = \sigma E(t) - \gamma(t)I(t) - \mu(t)I(t)$ $\frac{dR(t)}{dt(t)} = \gamma(t)I(t) - \delta(t)R(t)$ $\frac{dD(t)}{dt(t)} = \mu(t)I(t)$	(4)
$N = S(t) + E(t) + I(t) + R(t) + D(t)$					(5)



Formulation of Time-varying Parameters



Time interval of these piecewise function was divided into three phases:

- Phase I: Before Movement Control Order (MCO), $t < t_{\text{lock}}$ (27/2/20-17/3/20)
Phase II: During Movement Control Order (MCO) and Conditional Movement Control Order (CMCO), $t_{\text{lock}} \leq t < t_{\text{lift}}$ (18/3/20-9/6/20)
- Phase III: During Recovery Movement Control Order (RMCO), $t \geq t_{\text{lift}}$ (10/6/20-23/2/21)

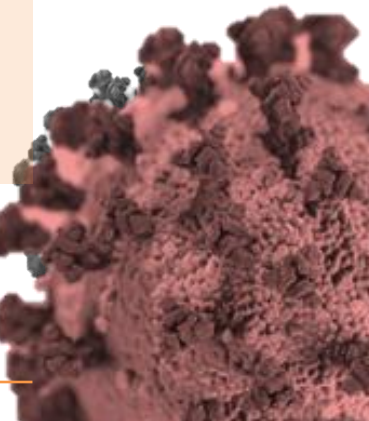
$$\beta_I(t) = \begin{cases} \beta_1 t + \beta_2, & t < t_{\text{lockdown}} \\ \beta_0 e^{-((t - t_{\text{lockdown}})/(\tau_\beta))}, & t_{\text{lockdown}} \leq t < t_{\text{lift}} \\ (1 - r)(\beta_1(t - t_{\text{lift}}) + \beta_2), & t \geq t_{\text{lift}} \end{cases} \quad (6)$$

$$\beta_E(t) = p \begin{cases} \beta_1 t + \beta_2, & t < t_{\text{lockdown}} \\ \beta_0 e^{-((t - t_{\text{lockdown}})/(\tau_\beta))}, & t_{\text{lockdown}} \leq t < t_{\text{lift}} \\ (1 - r)(\beta_1(t - t_{\text{lift}}) + \beta_2), & t \geq t_{\text{lift}} \end{cases} \quad (7)$$

$$\gamma(t) = \begin{cases} \gamma_2(t) + \gamma_3, & t < t_{\text{lockdown}} \\ \gamma_0 + \frac{\gamma_1}{1 + e^{(-t + t_{\text{lockdown}} + \tau_\gamma)}}, & t \geq t_{\text{lockdown}} \end{cases} \quad (8)$$

$$\mu(t) = \begin{cases} \mu_2(t) + \mu_3, & t < t_{\text{lockdown}} \\ \mu_0 e^{-((t - t_{\text{lockdown}})/(\tau_\mu))} + \mu_1, & t_{\text{lockdown}} \leq t < t_{\text{lift}} \\ \mu_2(t - t_{\text{lift}}) + \mu_3, & t \geq t_{\text{lift}} \end{cases} \quad (9)$$

$$\delta(t) = 0 \quad (10)$$



Research Designs

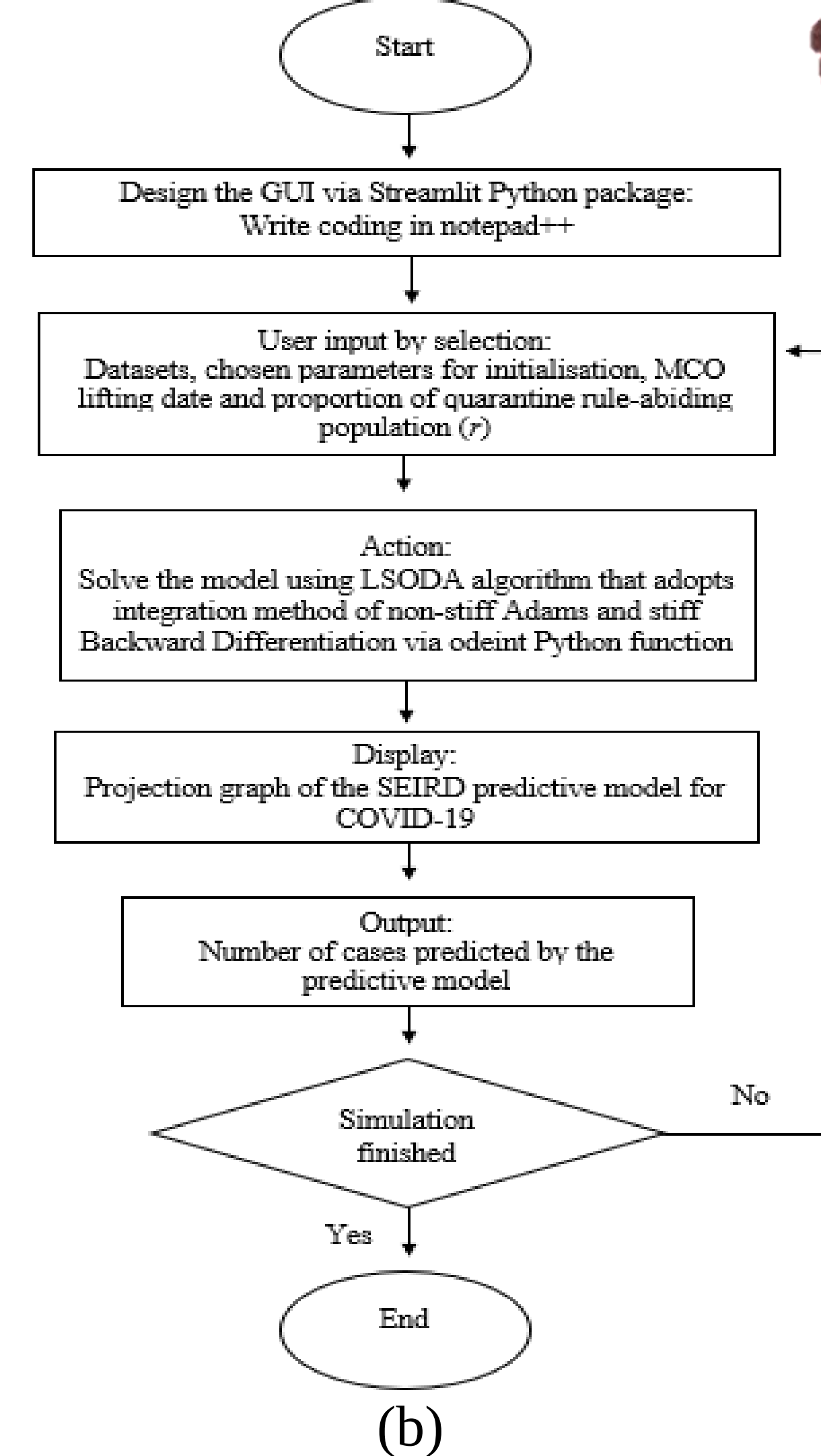
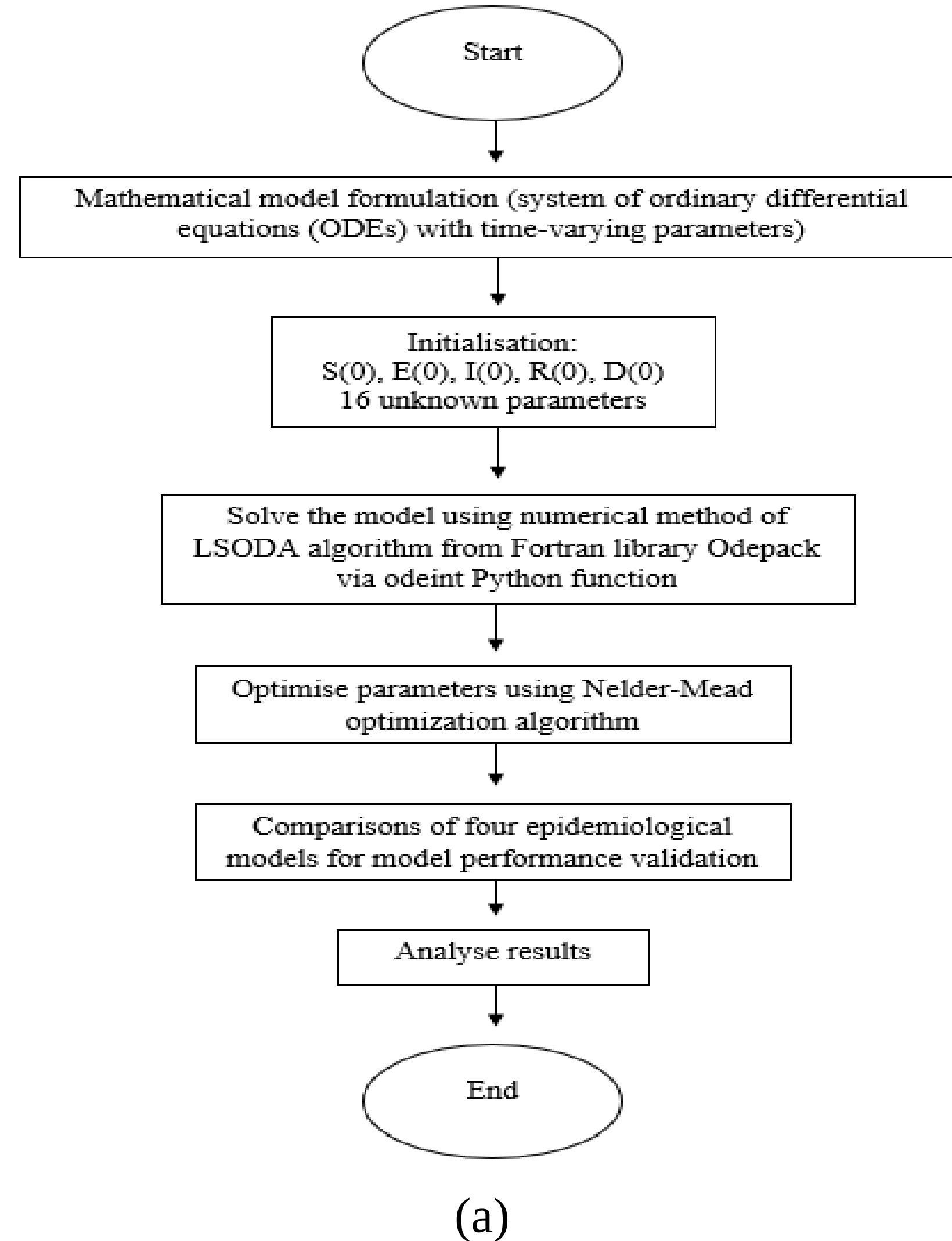


FIGURE 2. Process flowcharts: (a) Flowchart of developing an improved SEIRD model for COVID-19 (b) Flowchart of developing GUI-SEIRD predictive model for COVID-19 using Streamlit Python package

Epidemic Data and Initial Values

$N = 32657300$

TABLE 1. Initial Conditions for Solving the ODEs of SEIRD model

Datasets	Initial States	Values	Sources
DS ₁ : 25/1/20 – 18/9/20	Susceptible, S(0)	32657297	Eq. (5)
	Exposed, E(0)	0	Assumption
	Infected, I(0)	3	[8]
	Recovered, R(0)	0	[8]
	Death, D(0)	0	[8]
DS ₂ : 27/2/20 – 15/10/20	Susceptible, S(0)	32657177	Eq. (5)
	Exposed, E(0)	50	Assumption
	Infected, I(0)	1	[8]
	Recovered, R(0)	22	[8]
	Death, D(0)	0	[8]

**Data is collected from
MOH's Github Page
(25 January- 15 October
2020)**

Epidemic Data and Initial Values

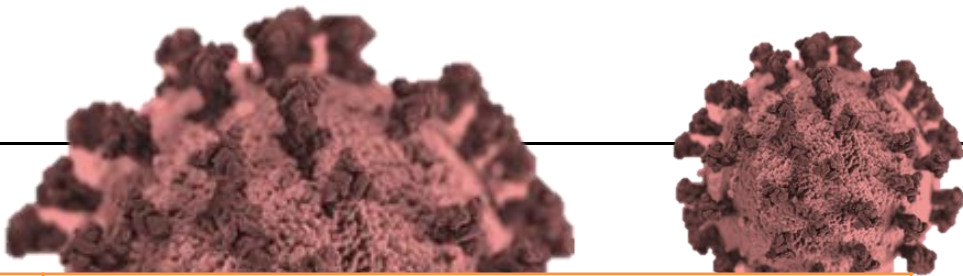
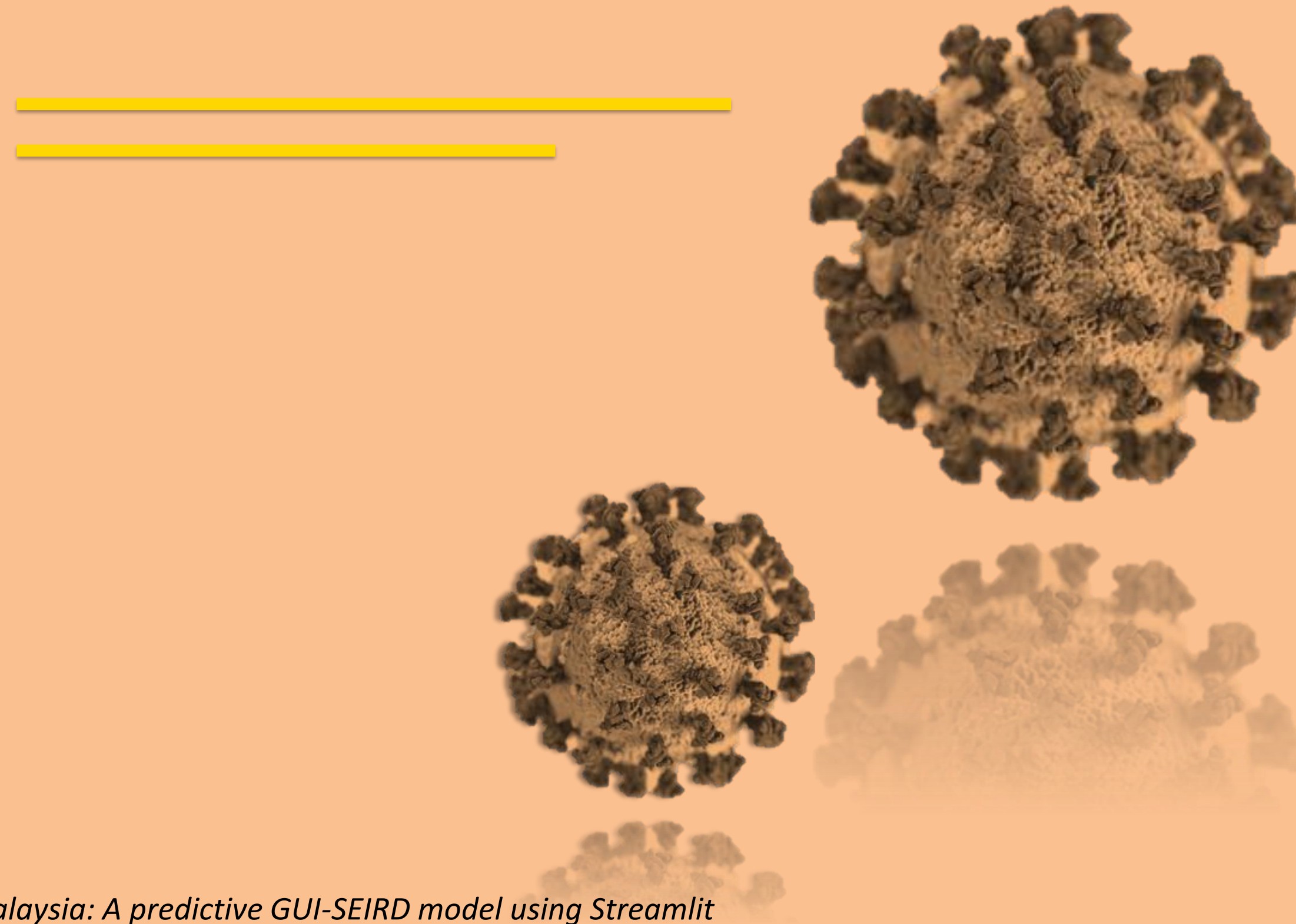


TABLE 2. Initial parameter input for the optimisation procedures

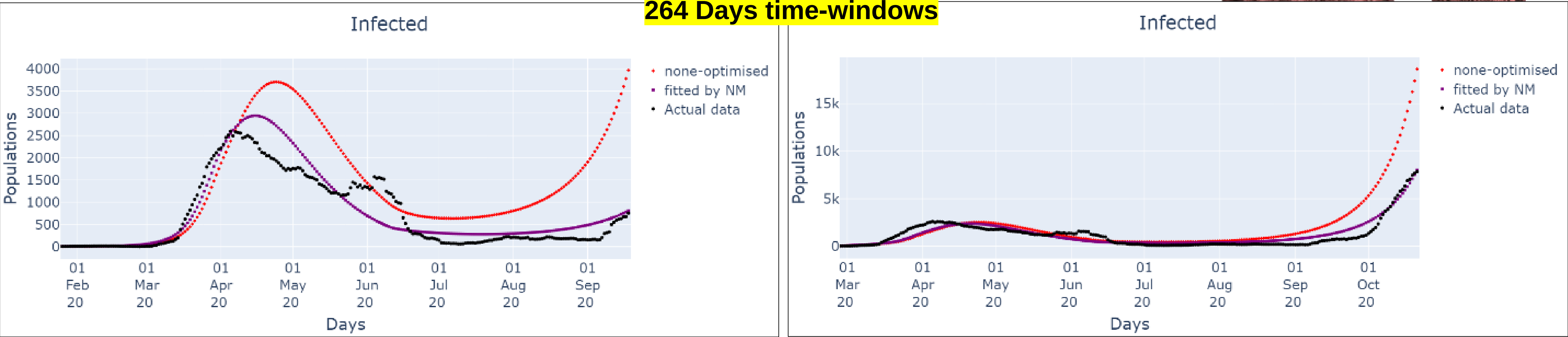
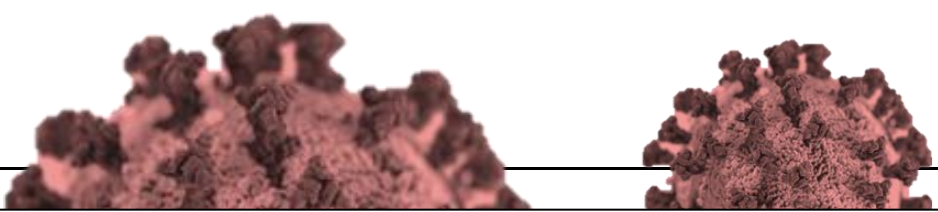
Parameters	Values	Sources
Infection rate, $\beta(t)$	$\beta_0 = 0.16100732$ $\beta_1 = 0.00142347$ $\beta_2 = 0.07373335$	[9]
Incubation rate, σ	0.15	[10]
Recovery rate, $\gamma(t)$	$\gamma_0 = 0.02590983$ $\gamma_1 = 0.0267004$ $\gamma_2 = 8.3000e-05$ $\gamma_3 = 0.00606688$	[9]
Mortality rate, $\mu(t)$	$\mu_0 = 0.00151062$ $\mu_1 = 1.5316e-04$ $\mu_2 = 8.0126e-05$ $\mu_3 = 2.5064e-04$	[9]
Characteristic time of transmission, τ_β	21.7321554	[9]
Characteristic time of recovery, τ_γ	12.3593006	[9]
Characteristic time of death, τ_μ	26.3593227	[9]
Proportion β_E over β_I , p	1	Assumption



3. Results and Discussions



Model Performance Validation

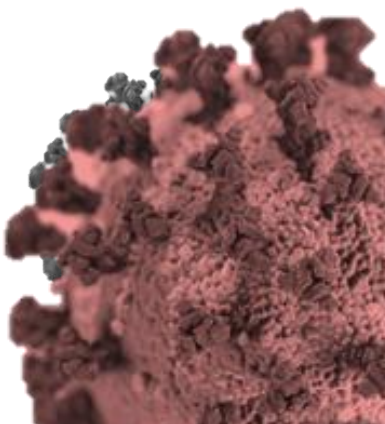


(a) (b)

FIGURE 3. Infected cases of COVID-19: (a) infected curve for dataset1, (b) infected curve for dataset2

TABLE 3. Comparison of measurement error to the actual COVID-19 cases of infected (I) for mSEIRDsr simulation using non-optimised and optimised parameters

Datasets	Optimization Algorithms	MAE	RMSE
Dataset 1: (25/1/2020-18/9/2020)	None	740.53	1027.60
	Nelder-Mead (NM)	245.028	346.102
Dataset 2: (27/2/2020-21/10/2020)	None	1130.25	2054.83
	Nelder-Mead (NM)	403.421	506.464



Model Performance Validation

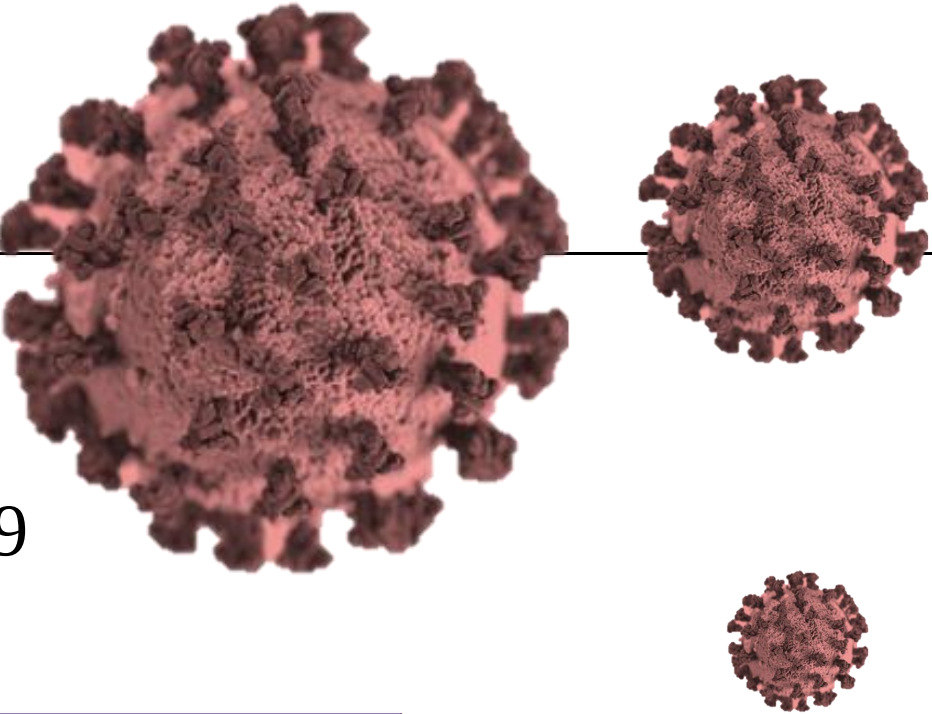
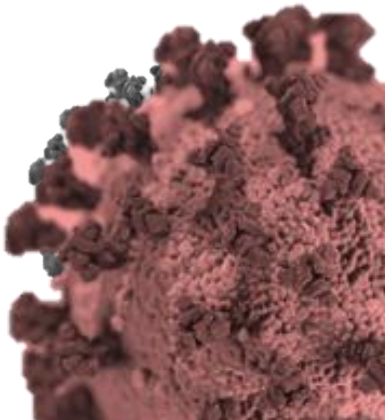


TABLE 4. Comparison of measurement error between epidemiological models to the case of COVID-19 infected (I) cases in Malaysia using different datasets

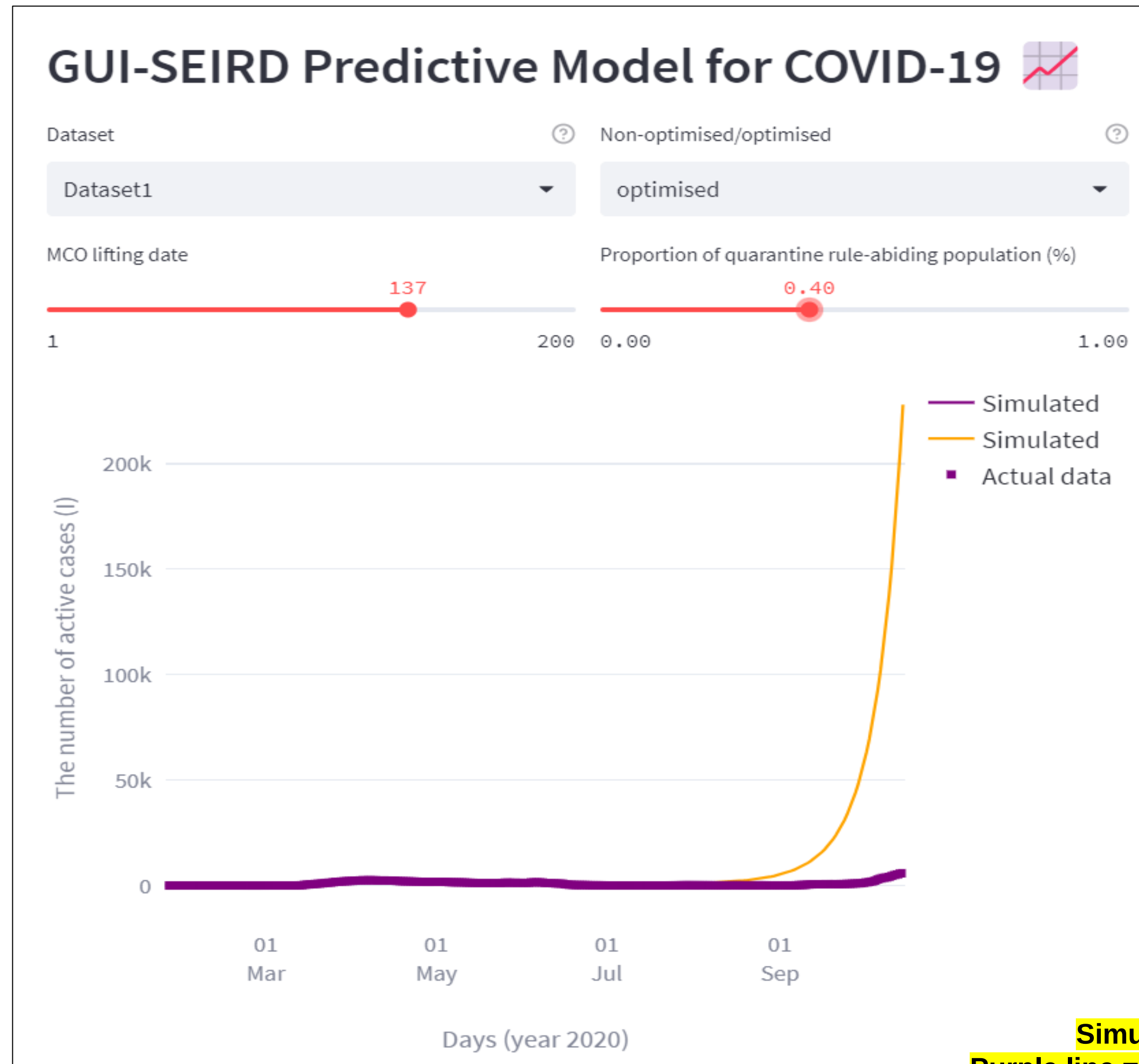
Datasets	Measurement error	cSEIRD	mSEIRDs	mSIRDr	mSEIRDsr (Our proposed model)
Dataset 1: (25/1/2020-18/9/2020)	MAE	5.359×10^2	2.45028×10^2	1.78387×10^2	2.45028×10^2
	RMSE	7.9672×10^2	3.46102×10^2	3.10317×10^2	3.46102×10^2
Dataset 2: (27/2/2020-21/10/2020)	MAE	8.858×10^2	4.03421×10^2	11.7703×10^2	4.03421×10^2
	RMSE	15.969×10^2	5.06464×10^2	18.6067×10^2	5.06464×10^2
Average values of error for 2 datasets	Average of MAE	7.1085×10^2	3.242245×10^2	6.777085×10^2	3.242245×10^2
	Average of RMSE	11.968×10^2	4.262835×10^2	10.854935×10^2	4.262835×10^2
	Average of accuracy metrics	9.53825×10^2	3.75×10^2	8.82×10^2	3.75×10^2

mSEIRDsr and mSEIRDs show similar numeric values due to Eq. (10)

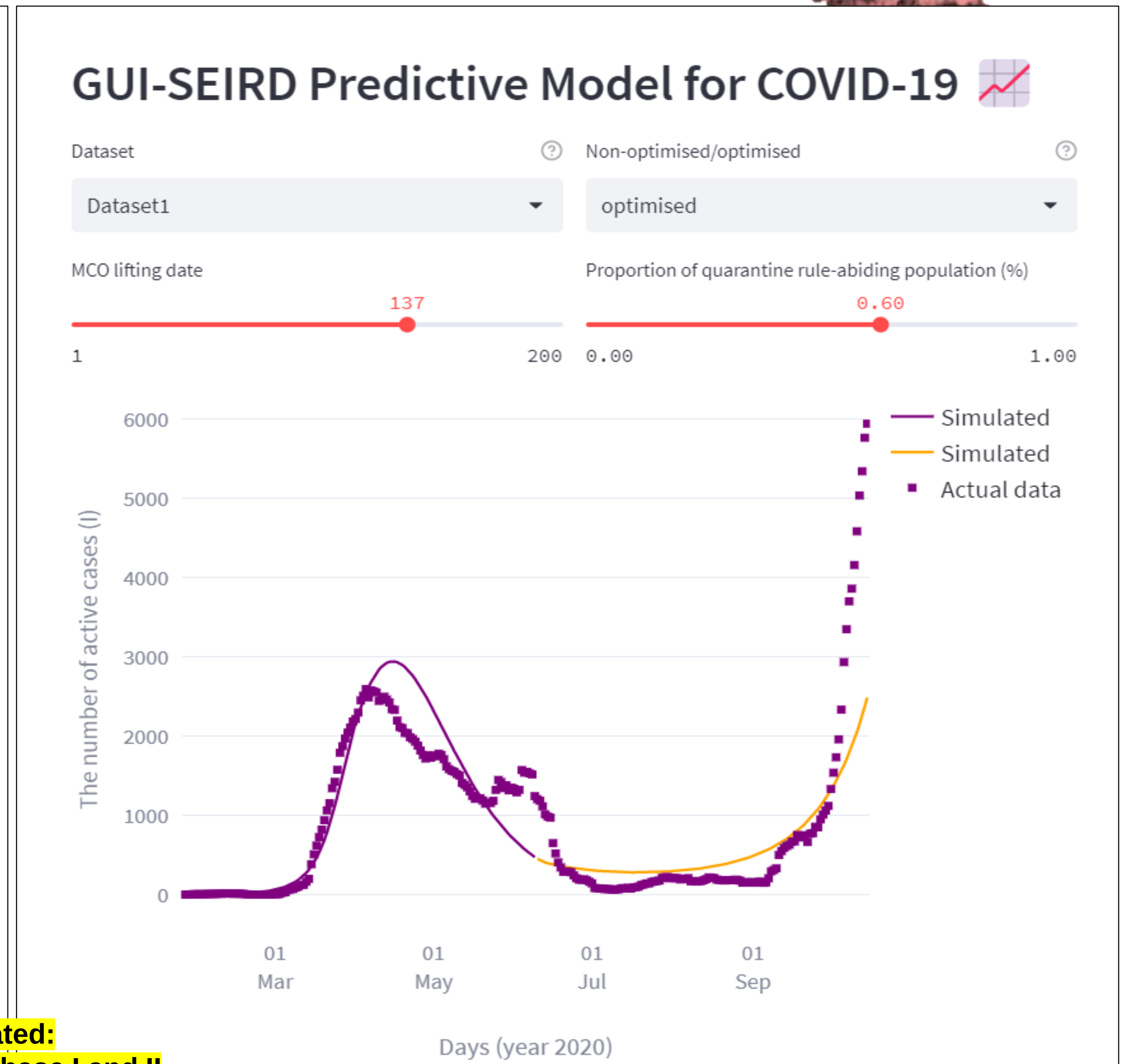
Our proposed model is proven to be robust indicated by the least average of MAE, average of RMSE and average of accuracy metrics compared to other models.



Prediction of COVID-19 cases via Graphical Users Interface (GUI) considering values of the quarantine-abiding population proportion (r) at different decisions of MCO lifting date



(a)



(b)

Simulated:
Purple line = Phase I and II
Yellow line = Phase III

Prediction of COVID-19 cases via Graphical Users Interface (GUI) considering values of the quarantine-abiding population proportion (r) at different decisions of MCO lifting date

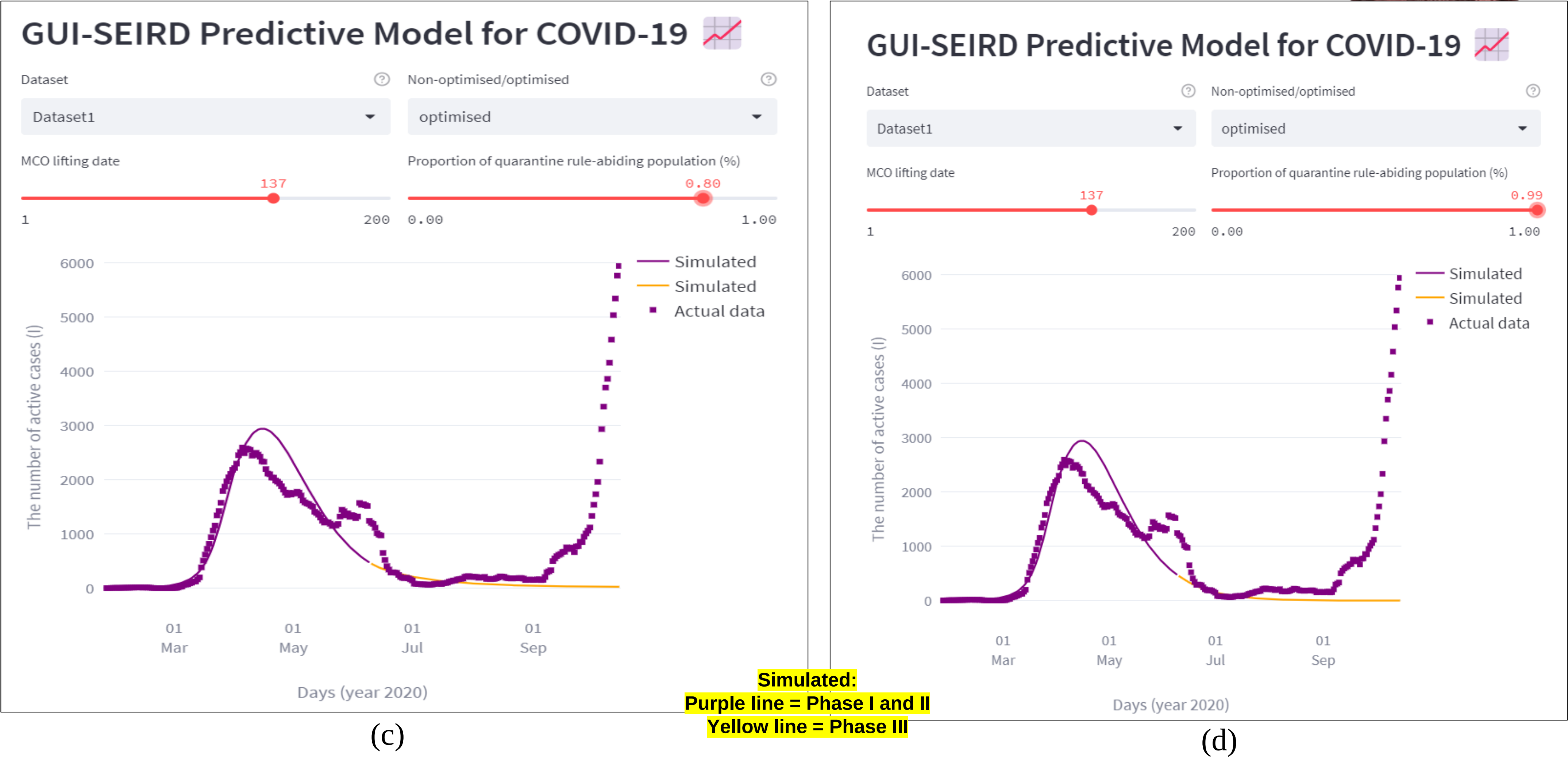
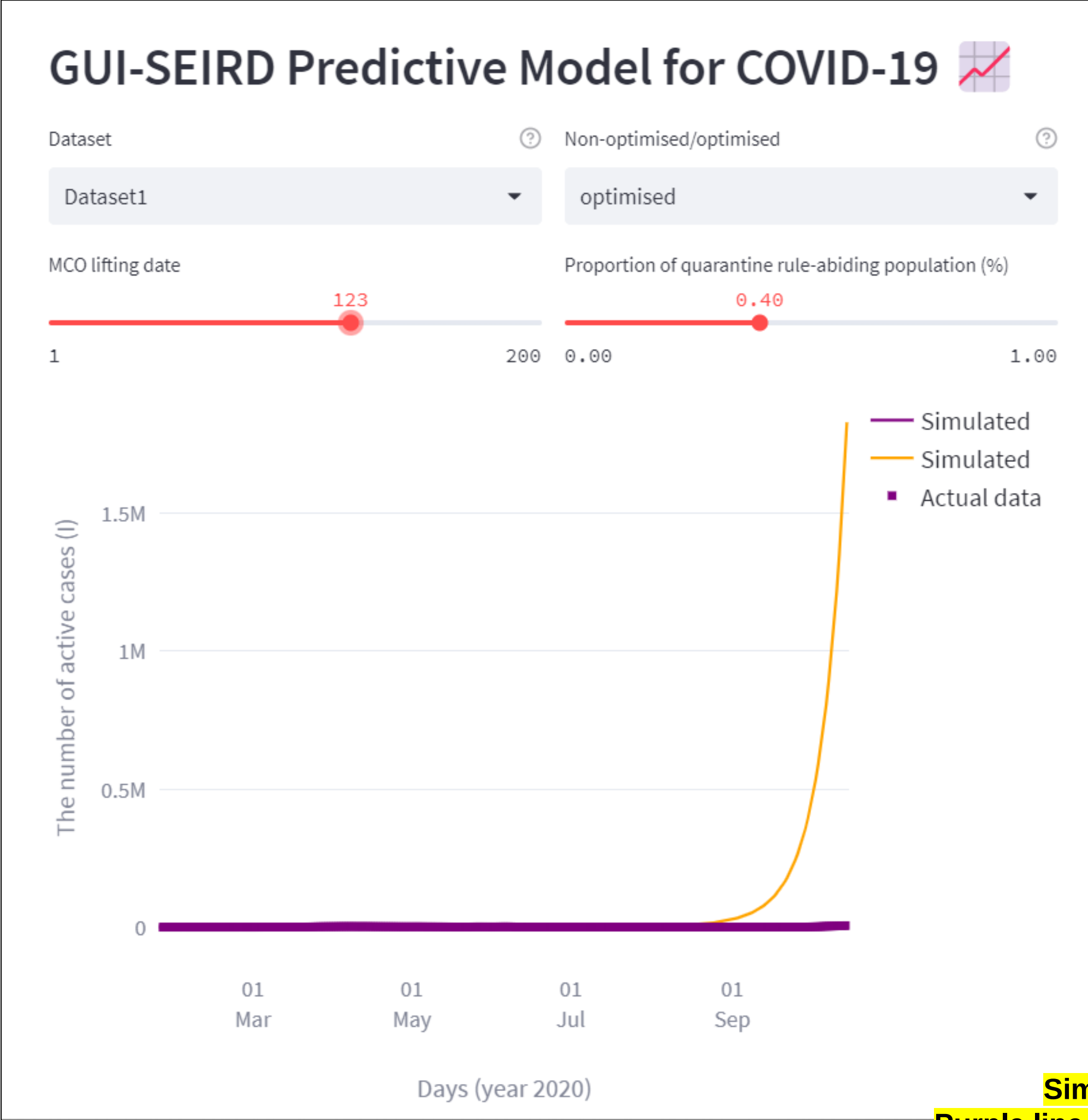
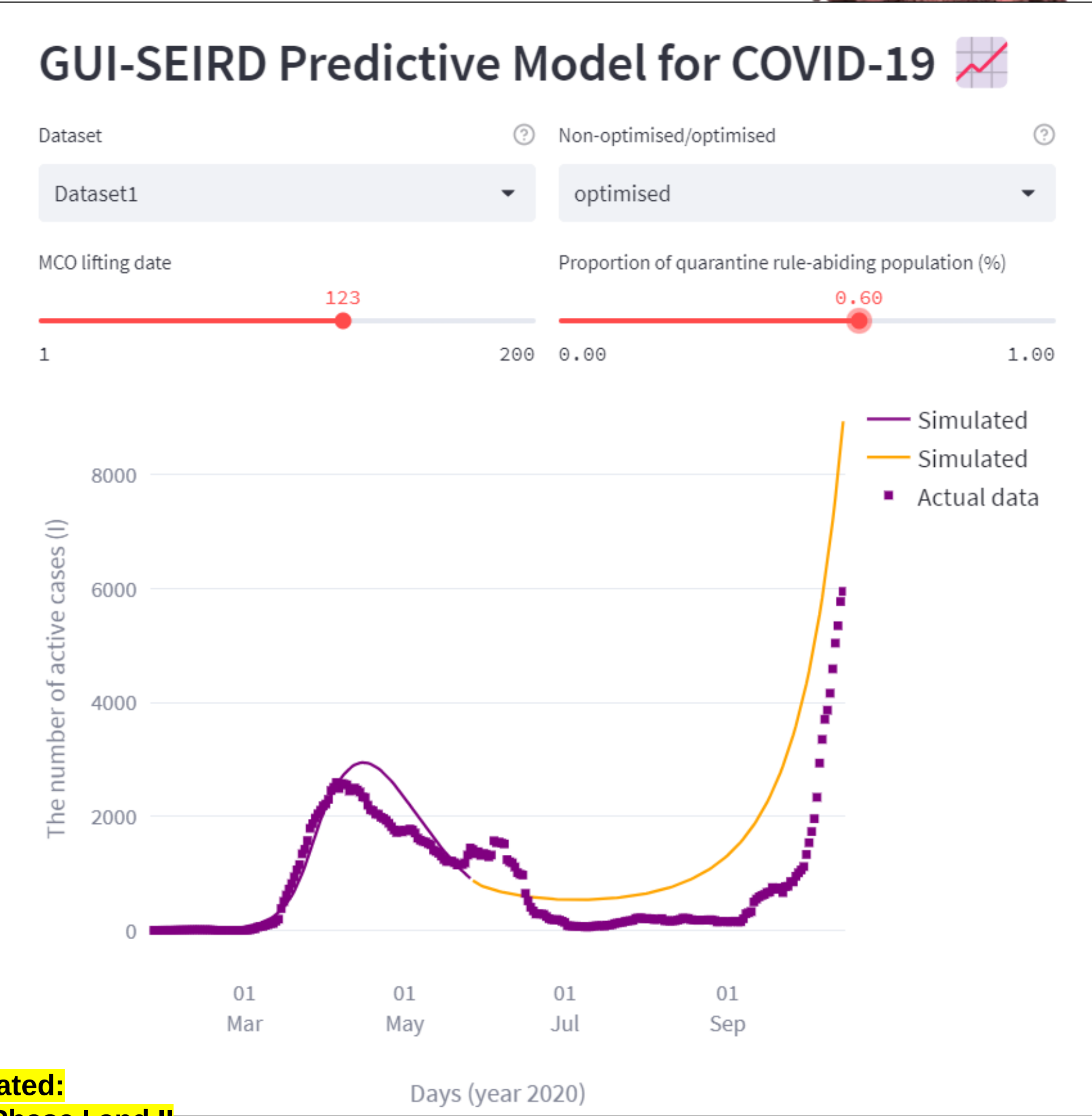


FIGURE 4. GUI-SEIRD simulator using advanced MCO lifting date 127 (31/5/2020) with different values of quarantine rule-abiding population proportion r : a) 40%, b) 60%, c) 80% and d) 99%

Prediction of COVID-19 cases via Graphical Users Interface (GUI) considering values of the quarantine-abiding population proportion (r) at different decisions of MCO lifting date



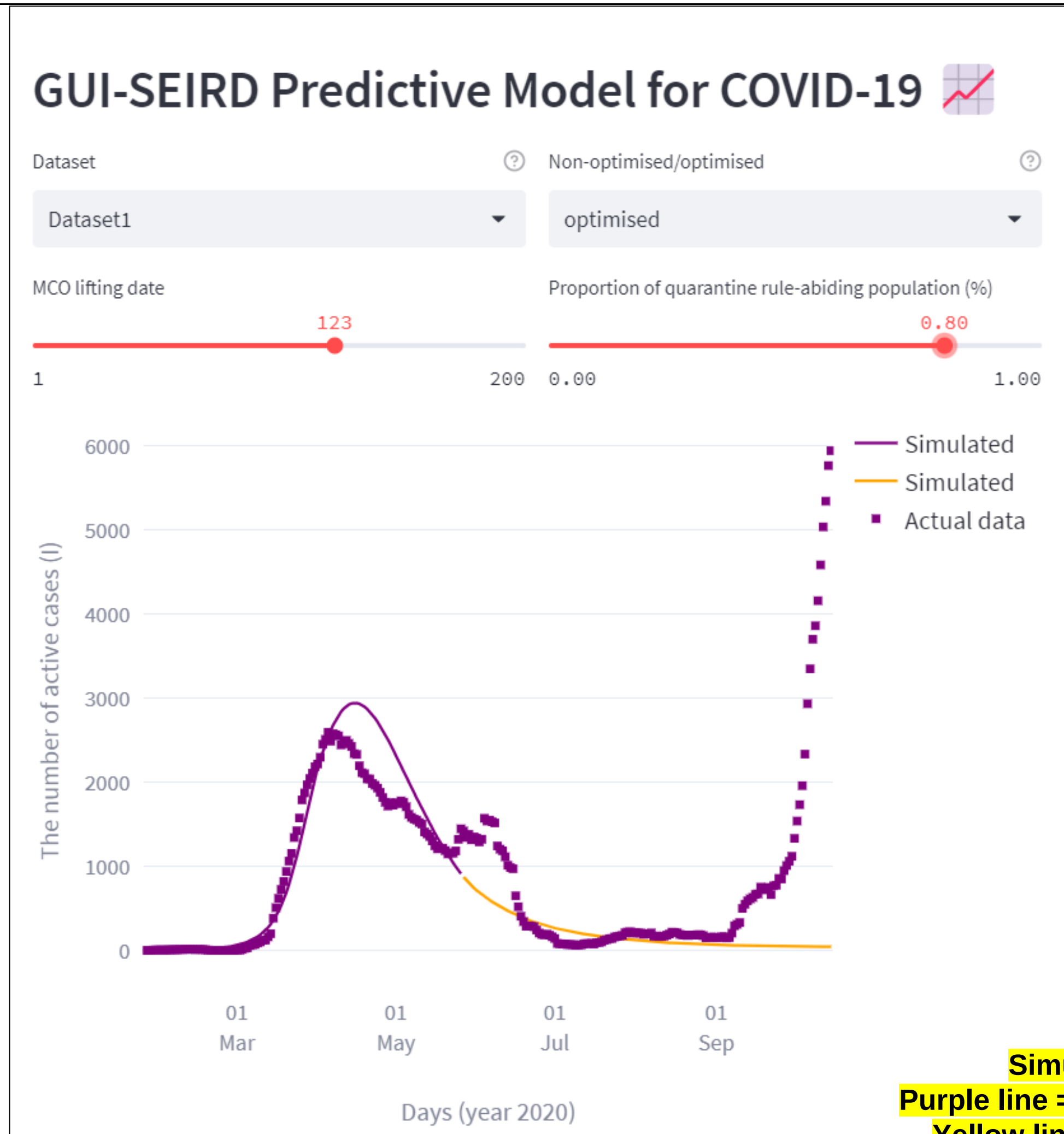
(a)



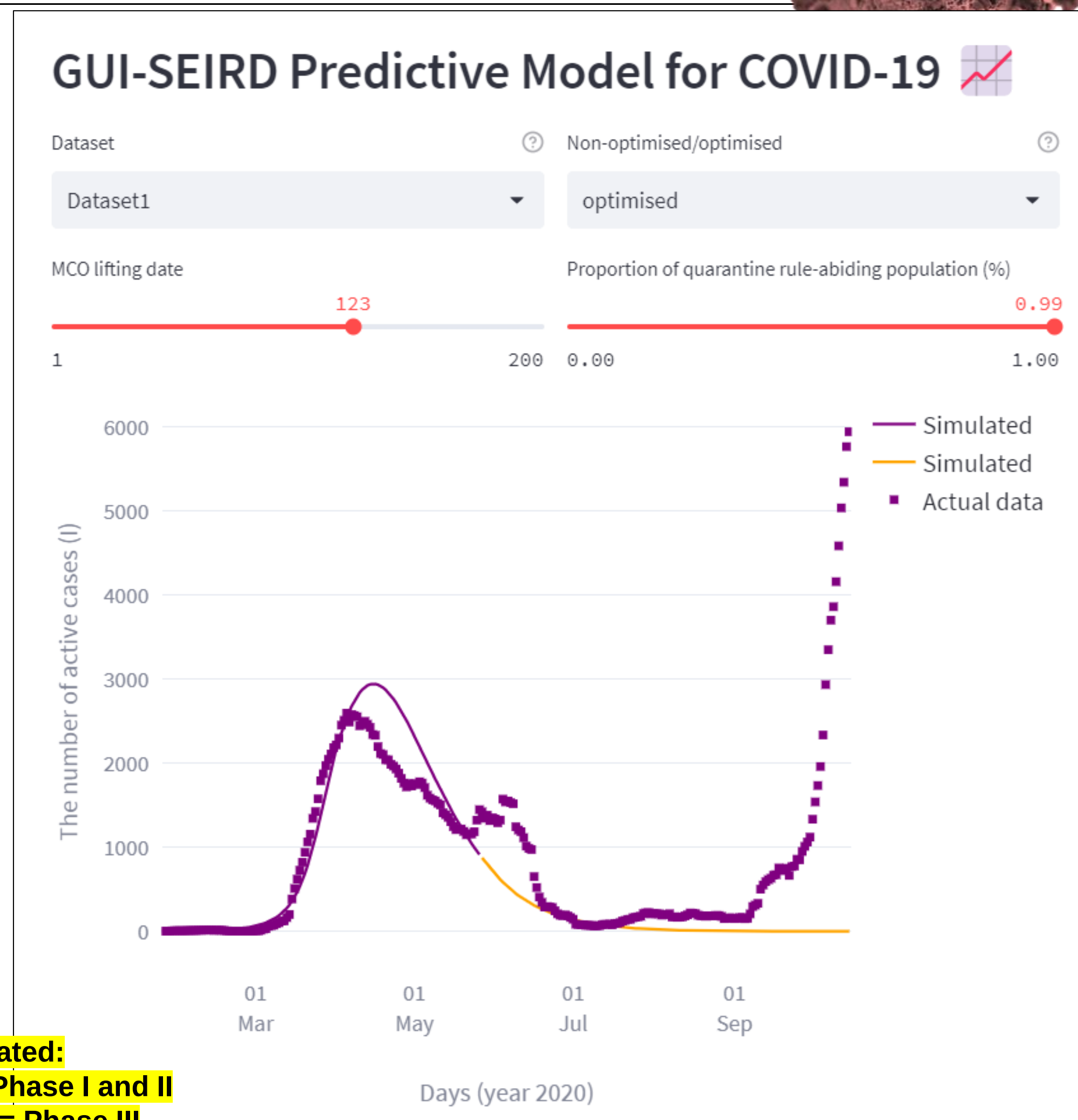
(b)

Simulated:
Purple line = Phase I and II
Yellow line = Phase III

Prediction of COVID-19 cases via Graphical Users Interface (GUI) considering values of the quarantine-abiding population proportion (r) at different decisions of MCO lifting date



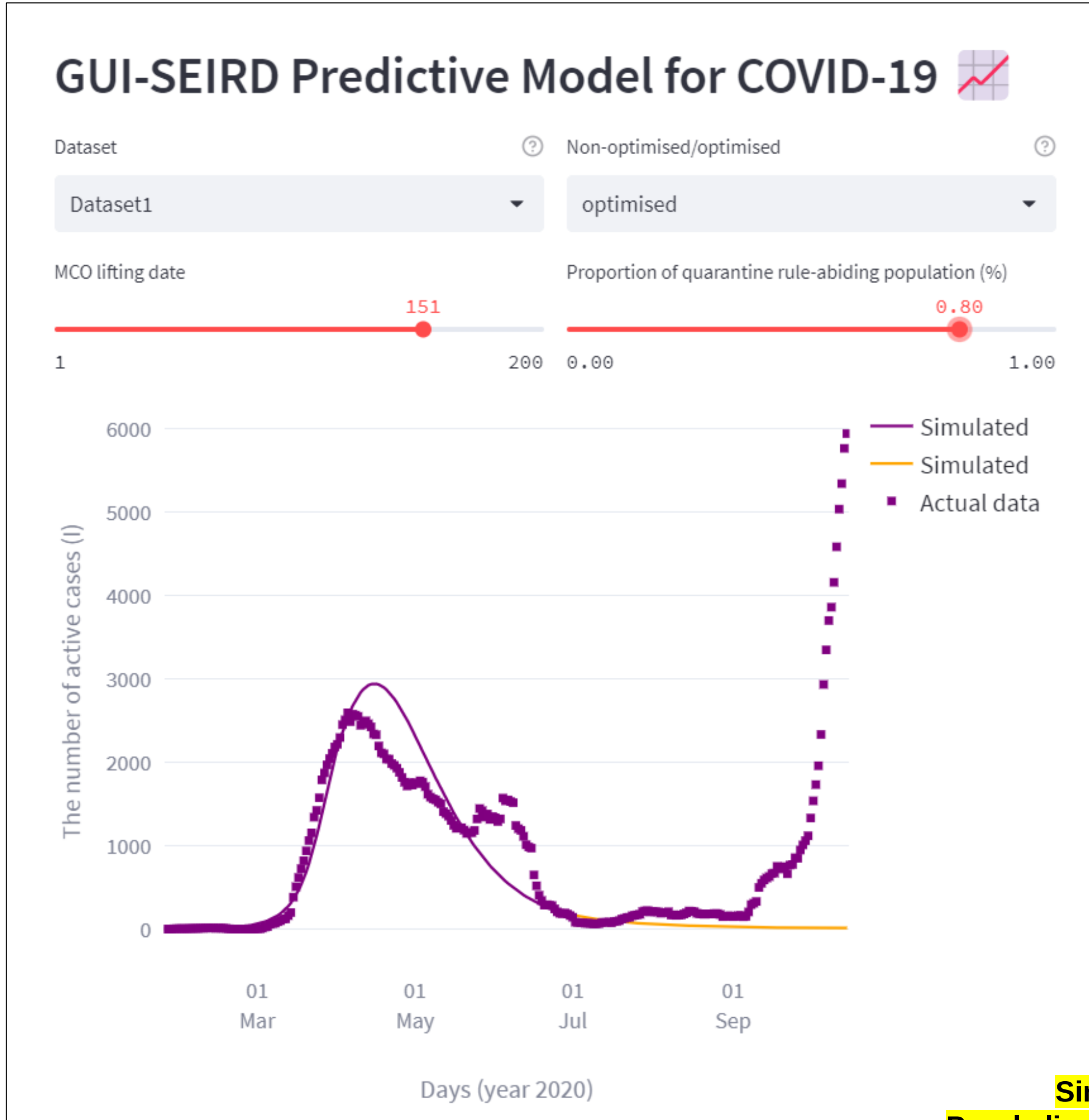
(c)



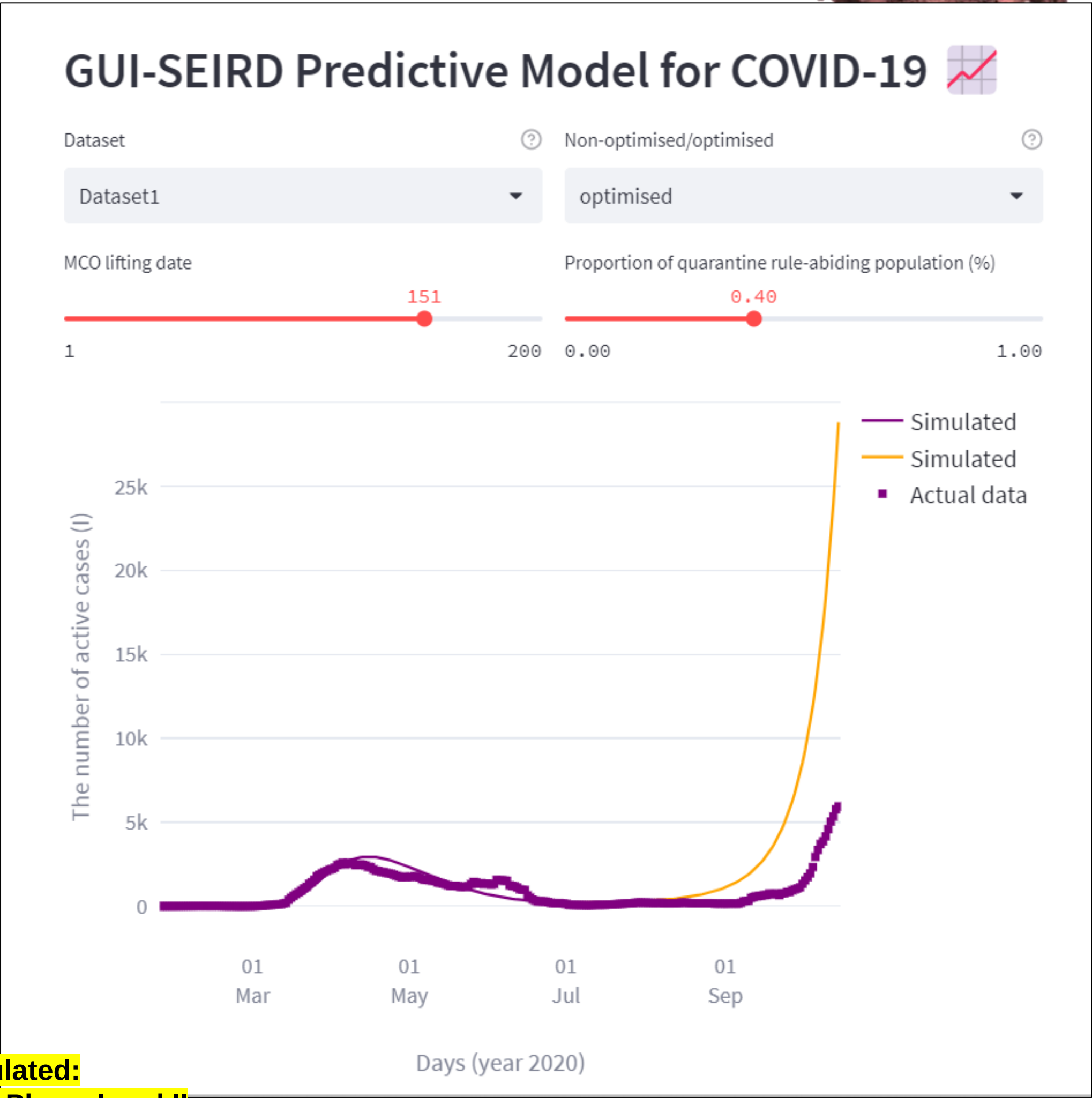
(d)

FIGURE 5. GUI-SEIRD simulator using actual MCO lifting date 137 (10/6/2020) with different values of quarantine rule-abiding population proportion r : a) 40%, b) 60%, c) 80% and d) 99%

Prediction of COVID-19 cases via Graphical Users Interface (GUI) considering values of the quarantine-abiding population proportion (r) at different decisions of MCO lifting date



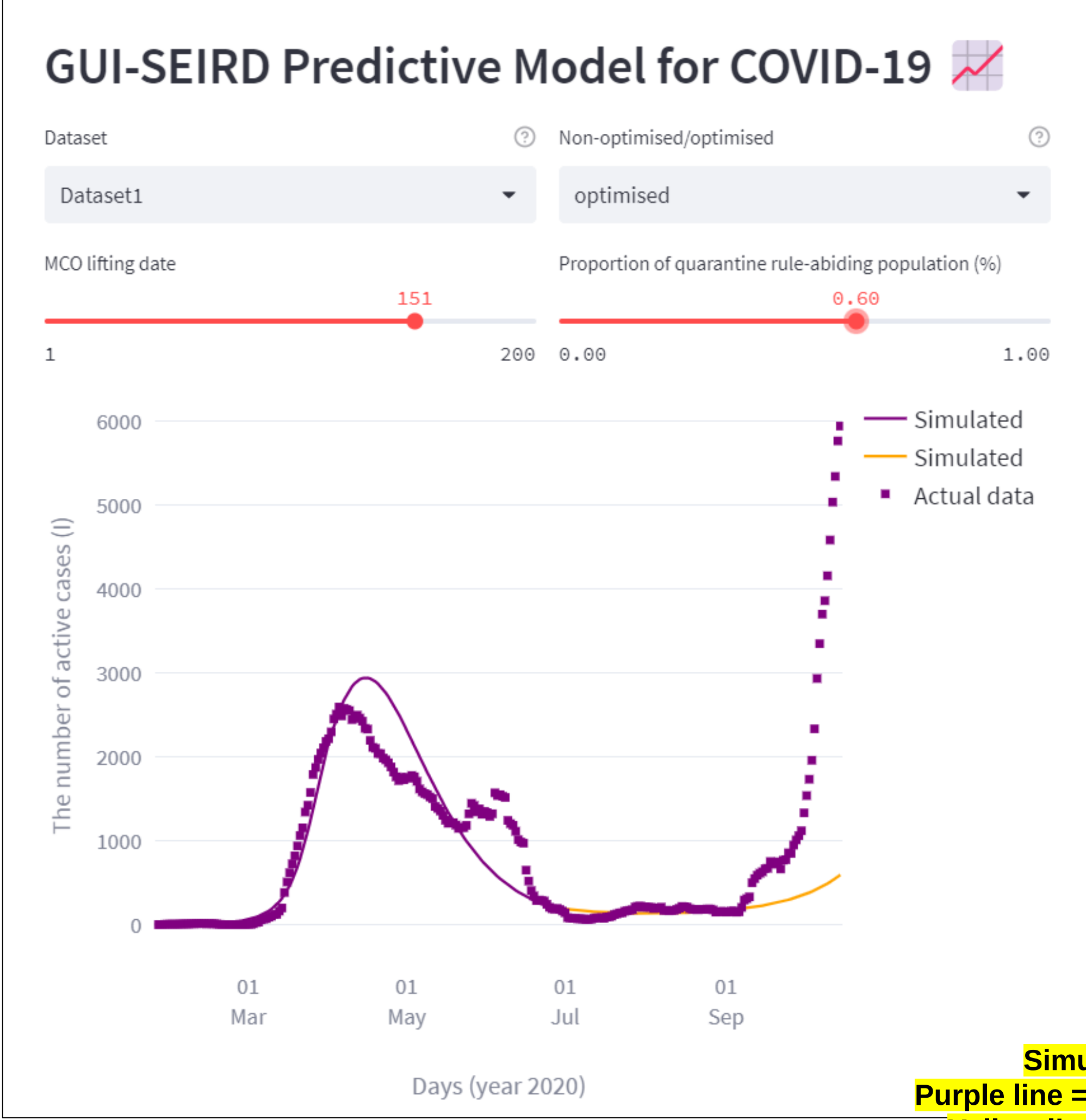
(a)



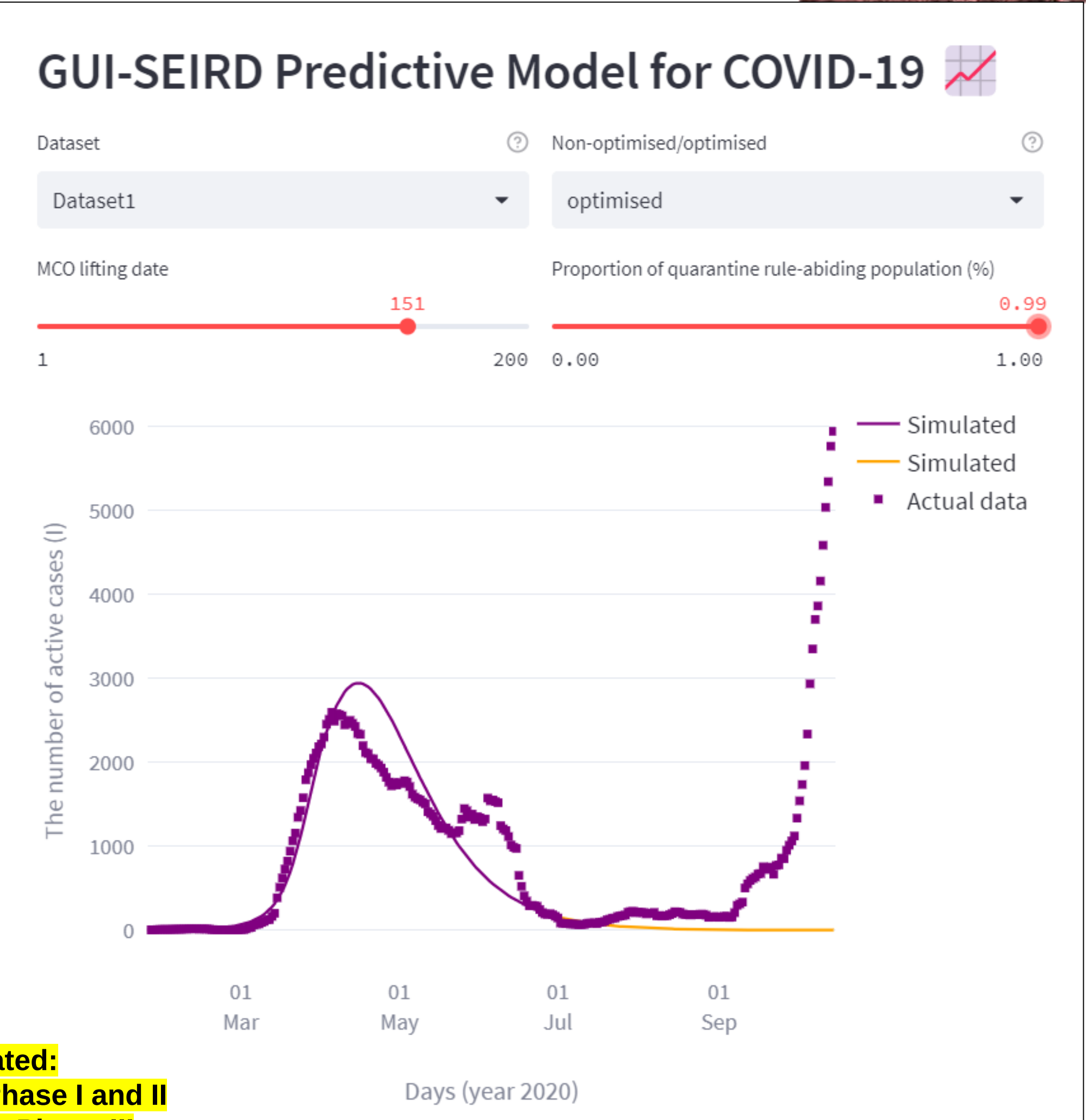
(b)

Simulated:
Purple line = Phase I and II
Yellow line = Phase III

Prediction of COVID-19 cases via Graphical Users Interface (GUI) considering values of the quarantine-abiding population proportion (r) at different decisions of MCO lifting date



(c)



(d)

FIGURE 5. GUI-SEIRD simulator using delayed MCO lifting date 147 (20/6/2020) with different values of quarantine rule-abiding population proportion r : a) 40%, b) 60%, c) 80% and d) 99%

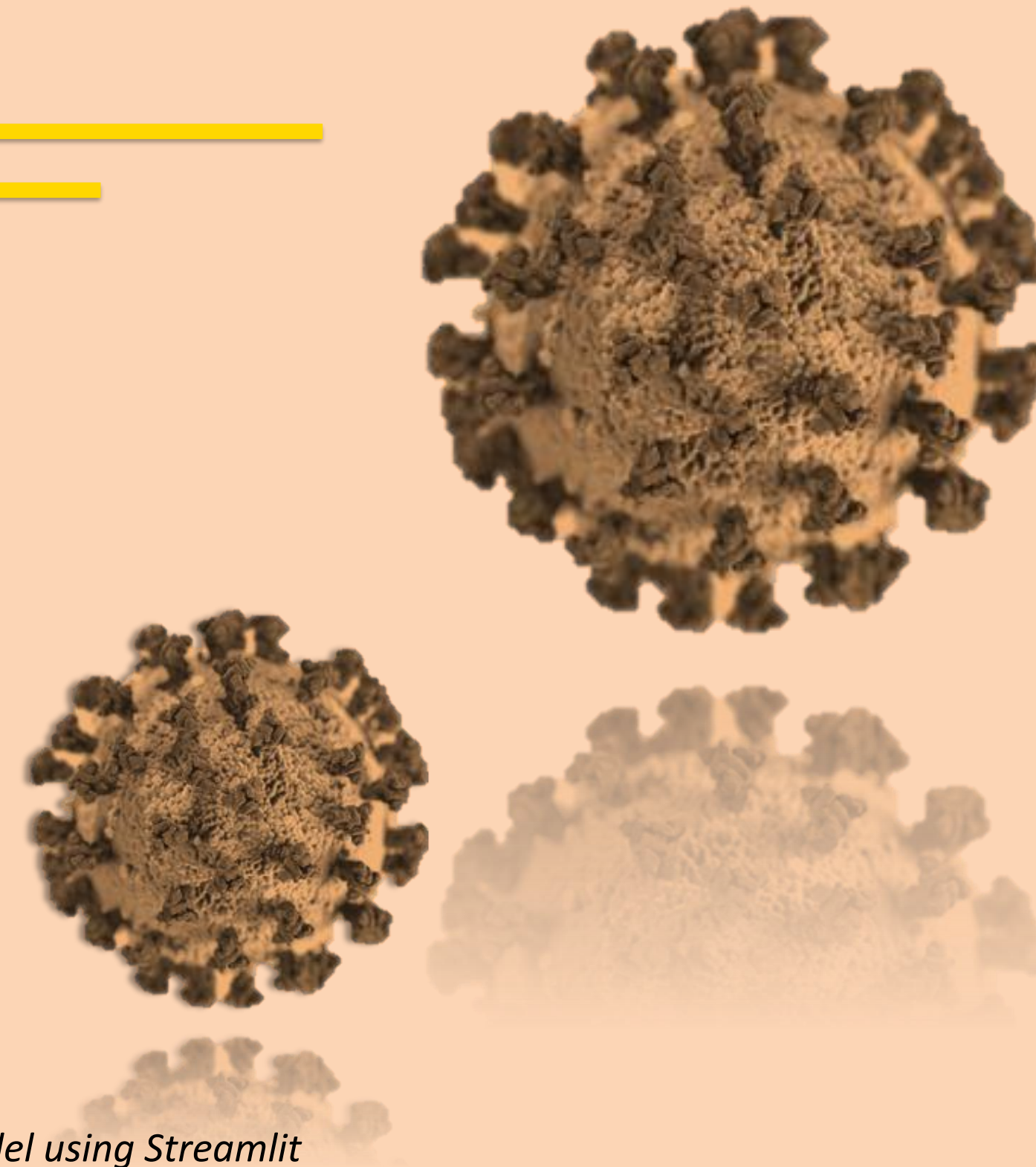
Prediction of COVID-19 cases via Graphical Users Interface (GUI) considering values of the quarantine-abiding population proportion (r) at different decisions of MCO lifting date

TABLE 5. Forecasted number of active cases (I) on day 264 (15 October 2020) based on different proportion of the quarantine rule-abiding population (r) and different decisions of MCO lifting date

Proportion of the quarantine rule-abiding population, r (%)	MCO lifting date		
	27/5/2020 (advanced)	10/6/2020 (actual)	24/6/2020 (delay)
99	0	0	0
80	50	27	15
60	10,1894	2489	655
40	1,669,833	209,027	26,749

Further exploration of the prediction of COVID-19 cases can be made through the deployed web app¹¹

4. Conclusions



- Proposed mSEIRDsr model is found to be robust as it adequately fit two datasets of COVID-19 in Malaysia.
- Based on our GUI-based SEIRD predictive model's graph, free-disease equilibrium can be achieved in Malaysia at the earliest date of 15 October 2020 by maintaining the quarantine rule-abiding population proportion (r) at 99% regardless of three different MCO lifting dates.
- This study is useful for decision making when controlling the outbreaks as GUI-SEIRD predictive model helps public and government agencies to understand COVID-19 transmission dynamics and how to deal with it.

ACKNOWLEDGMENTS

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References

1. D. Cucinotta, and M. Vanelli, “WHO declares COVID-19 a pandemic,” *Acta Biomed.* 91(1), 157–160 (2020).
2. Wikipedia contributors. "Wikipedia." Wikipedia, The Free Encyclopedia. Wikimedia Foundation, Inc. 22 March 2023. 8 May 2023. <https://en.wikipedia.org/wiki/Wikipedia>.
3. Ministry of Health Malaysia. "COVID-19 Cases in Malaysia." CovidNow. Web. Accessed 8 May 2023. <https://covidnow.moh.gov.my/cases/>.
4. A. Mahmud, and P.Y. Lim, “Applying the SEIR model in forecasting the COVID-19 trend in Malaysia: A preliminary study,” *BioRxiv*, (2020)
5. A.M.M. Muka, and M. Sannyal, “Transmission dynamics of COVID-19 in Bangladesh- A compartmental modeling approach,” *Research Square*, (2020).
6. E.L. Piccolomini, and F. Zama, “Monitoring Italian COVID-19 spread by an adaptive SEIRD model,” *BioRxiv*, (2020).
7. A. Maugeri, M. Barchitta, S. Battiato, and A. Agodi, “Modeling the novel Coronavirus (SARS-CoV-2) outbreak in Sicily, Italy,” *Preprints*, (2020).
8. COVID-19 Database in Github MOH [https://github.com/MoH-Malaysia/covid19-public/blob/main/epidemic/cases_malaysia.csv]
9. N. Mohd Jamil, N. Rosli, and N. Muhammad, “Simulation of COVID-19 outbreaks via Graphical User Interface (GUI),” *J. Public Health Res.* 11(1), jphr.2021.2130 (2021).
10. Q. Li, X. Guan, P. Wu, X. Wang, L. Zhou, Y. Tong, R. Ren, K.S.M. Leung, E.H.Y. Lau, J.Y. Wong, X. Xing, N. Xiang, Y. Wu, C. Li, Q. Chen, D. Li, T. Liu, J. Zhao, M. Liu, W. Tu, C. Chen, L. Jin, R. Yang, Q. Wang, S. Zhou, R. Wang, H. Liu, Y. Luo, Y. Liu, G. Shao, H. Li, Z. Tao, Y. Yang, Z. Deng, B. Liu, Z. Ma, Y. Zhang, G. Shi, T.T.Y. Lam, J.T. Wu, G.F. Gao, B.J. Cowling, B. Yang, G.M. Leung, and Z. Feng, “Early transmission dynamics in Wuhan, China, of novel Coronavirus-infected pneumonia,” *N. Engl. J. Med.* 382(13), 1199–1207 (2020).
11. GUI-SEIRD Predictive model Streamlit App [<https://norsyahidahzul-gui-seird-predictivemodel-gui-seird-0xkqh9.streamlit.app/>]

Q&A



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“The purpose of computing is insight, not numbers.”

- Richard Hamming

THANK YOU



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THE 5TH INTERNATIONAL CONFERENCE ON MATHEMATICAL SCIENCES (ICMS5)

MESSAGE FROM THE CHAIRMAN OF ICMS5



On behalf of the Organising Committee and the Department of Mathematical Sciences, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, I would like to extend my warmest welcome to all participants to the 5th International Conference on Mathematical Sciences (ICMS5). The conference is jointly organised by Department of Mathematical Sciences and the Center for Modeling and Data Analysis (DELTA) UKM with collaboration from the Malaysian Mathematical Sciences Society (PERSAMA). The 1st, 2nd, 3rd and 4th International Conference on Mathematical Sciences were successfully held in year 2007, 2010, 2013 and 2016 respectively.

The mathematical science is a subject of key global importance, underpinning developments in most areas of science and technology. The growing concern on the transfer of mathematical sciences knowledge demands the enhancement in the competency of this discipline. Applying mathematical sciences to challenging problems of the real world has made the field bustling with excitement and satisfaction.

Thus, it is with great pleasure for the Department of Mathematical Sciences, Universiti Kebangsaan Malaysia, to present the 5th International Conference on Mathematical Sciences, ICMS5 2023, to further bridge as well as nurture the understanding and collaboration amongst the regional and global mathematical scientists and practitioners. Hence the theme for this ICMS5 is “Embracing Development and Innovation in Mathematical Sciences”.

Research in mathematical sciences continues to grow, and this is marked by the emergence of several related conferences and journals in the field. About 200 local and international participants from Australia, Pakistan, Saudi Arabia, Nigeria, Iraq, Thailand, Indonesia, Jordan, China and Philippines registered to attend this conference. Ten best presenters will be identified at the end of the conference day.

All accepted papers presented in ICMS5 UKM will be peer-reviewed and published by the American Institute of Physics (AIP) in AIP Conference Proceedings Series which is indexed in The Conference Proceedings Citation Index (part of Web of Science), Scopus (Elsevier) and Inspec. The paper may also be considered, if desired, to be published in a Jurnal Pengurusan (indexed in Scopus), Journal of Quality Measurement and Analysis (JQMA), with no additional charge, Special Issue of Symmetry (Q2 Journal – indexed in Web of Science), Special Issue

of Applied Sciences related environmental modelling (Q2 Journal -indexed in Web of Science) and the article processing charge (APC) will only be applied once accepted.

On behalf of the Organising Committee, I would like to express our sincere gratitude to the co-organisers, keynote and plenary speakers, session chairpersons, participants, exhibitors, participated journals and the American Institute of Physics for their support and participation in this conference. I would also like to extend my heartfelt appreciation to the fellow members of the Organizing Committee, the organizers of the collocated workshops, and the student volunteers for their efforts to make this event a success. I sincerely hope that you will find the conference program and the networking opportunity rewarding. To the international participants, we hope you will experience a memorable stay in Malaysia.

PROFESSOR DR. ABD GHAFUR AHMAD

CHAIRMAN OF THE ICMS5

THE 5TH INTERNATIONAL CONFERENCE ON MATHEMATICAL SCIENCES (ICMS5)

CONFERENCE SCHEDULE

Day 1 - 16 May 2023		Venue
7.30 – 9.00	Registration	ICMS5 Counter
9.00 – 10.00	Welcoming Ceremony Doa Recital by Dr Razik Ridzuan Mohd Tajuddin Welcoming Speech by Prof. Dr. Abdul Ghafur Ahmad, The Chairman of ICMS5	Ballroom
10.00 – 10.45	Keynote 1 <u>Prof. Ir. Dr. Chee Seng Chan, Universiti Malaya</u> <u>Deep Hashing with One Loss</u>	Ballroom
10.45 – 11.00	Refreshment	
11.00 – 1.00	Parallel Session 1 Applied Mathematics Pure Mathematics Data Science Educational Mathematics Actuarial Science Quality & Productivity Applied Mathematics II	Mawar 1 Mawar 2 Seroja 2 Melur Orkid Kemboja Ballroom
1.00 – 2.00	Lunch Break	
2.00 – 2.45	Keynote 2 <u>Assoc. Prof. Dr. Jiwook Jang, Macquarie University</u> <u>Compound point processes to model aggregate catastrophic losses</u>	Ballroom
2.45 – 4.45	Parallel Session 2 Applied Mathematics Pure Mathematics Statistics Educational Mathematics Applied Mathematics II Operations Research Educational Mathematics II	Mawar 1 Mawar 2 Seroja 2 Melur Orkid Kemboja Ballroom
4.45 – 5.00	Refreshment	

Day 2 – 17 May 2023		Venue
8.20 – 9.40	Parallel Session 3 Applied Mathematics Pure Mathematics Statistics Statistics II Applied Mathematics II Applied Mathematics III Pure Mathematics II	Mawar 1 Mawar 2 Seroja 2 Melur Orkid Kemboja Ballroom
9.40 – 10.10	Plenary Sessions Speakers' Profile Applied Math - Assoc. Prof. Dr. Azmin Sham Rambely (UKM) Applied Mathematics Research in Stroke Pure Math - Assoc. Prof. Dr. Idham Arif Alias (UPM) Optimal Number of Pursuers in a Pursuit Game Described by an Infinite 3-System of Differential Equations Data Science - Mr. Ahmad Fairuz Ali (Bank Islam) Overfitting in Financial Data : Issues and Challenges Edu. Math - Assoc. Prof. Dr. Roslinda Rosli (UKM) Mathematics for the real world: Revisiting effective teaching Financial Math - Mr. Adam Johari (Senior Risk Specialist) Motor Insurance Pricing in a Liberalised Pricing Environment Quality & Productivity - Prof. Dr. Baharom Abdul Hamid (INCEIF Uni.) Applied Mathematical Sciences as Enabler of Sustainable Economic Growth and Driver of Socio-Economic Goals.	Mawar 1 Mawar 2 Seroja 2 Melur Orkid Kemboja
10.10 – 10.30	Refreshment	
10.30 – 11.15	Keynote Speaker 3 Prof. Ts. Dr. Heng Swee Huay, Multimedia University The Power of Cryptography	Ballroom
11.15 – 12.55	Parallel Session 4 Applied Mathematics	Mawar 1 Mawar 2

	Pure Mathematics Data Science Statistics Applied Mathematics II Statistics Actuarial Science	Seroja 2 Melur Orkid Kemboja Ballroom
12.55 – 2.00	Lunch Break	
2.00 – 3.40	Parallel Session 5 Applied Mathematics Statistics Data Science Applied Mathematics II Applied Mathematics III Quality & Productivity	Mawar 1 Mawar 2 Seroja 2 Melur Orkid Kemboja
3.40 – 4.30	Closing Ceremony	Ballroom
4.30 – 4.45	Refreshment	

Parallel Sessions (PS) Schedule

Parallel Session 1

16 May 2023

11.00 am - 1.00 pm

Mawar 1 – Applied Mathematics

Chair: Dr. Mohd Anuar Jamaluddin

Time	ID	Presenter
11.00 – 11.20	41	Mohd Anuar Jamaluddin MHD Mixed Convection Flow of Hybrid Ferrofluid through Stagnation-Point over the Non-Linearly Moving Surface with Convective Boundary Condition, Viscous Dissipation and Joule Heating Effects
11.20 – 11.40	23	Wan Nura'In Nabilah Noranuar, Ahmad Qushairi Mohamad, Sharidan Shafie and Lim Yeou Jiann Heat and Mass Transfer on MHD Casson CNTs Nanofluid Flow in a Channel with Moving Plate via Porous Medium: Analytical Solution
11.40 – 12.00	25	Dian Adline Jalaluddin, Roslinda Nazar, Kohilavani Naganthran and Ishak Hashim Carreau Hybrid Nanofilm Flow over a Stretching Sheet with Suction/Injection Effect
12.00 – 12.40	76	Muhammad Ashhad Shahid Shahid Nawaz and Ishak Hashim Impact of multi-phase flow of hybrid nanofluid on mixed convection in square cavity with partially heated wall
12.20 – 12.40	8	Nur Atikah Adnan, Fazlina Aman and Ramasamy Kandasamy Nanoparticle Shapes on Heat Transfer Enhancement with Ag-SWCNTs in The Presence of Water, Ethylene Glycol and Engine Oil Hybrid Nanofluids

Mawar 2 – Pure Mathematics

Chair: Assoc. Prof. Dr. Roslan Bin Hasni @ Abdullah

Time	ID	Presenter
11.00 – 11.20	97	Roslan Hasni and Kooi Kuan Yoong Edge Irregular Reflexive Labeling in Graphs
11.20 – 11.40	17	Fozaiyah Alhubairah, Nor Mohd Ali and Ahmad Erfanian Cyclic Intersection Graph of Subgroups Coloring of Generalized Quaternion Groups
11.40 – 12.00	18	Maryam Alshammari, Hazzirah Mat Hassim, Nor Haniza Sarmin and Ahmad Erfanian The Intersection Power Cayley Graph of Cyclic Groups of order pq .
12.00 – 12.40	125	Athirah Zulkarnain, Nor Haniza Sarmin, Hazzirah Izzati Mat Hassim and Ahmad Erfanianghi The Prime Power Cayley Graph for Cylic Groups of Order pq
12.20 – 12.40	132	Nurfarah Zulkifli, Nor Muhainiah Mohd Ali and Muhammad Bello The Relative Coprime Graph for Some Dihedral Groups
12.40 – 1.00	30	Abubakar Sadiq Abdulkadir Eigenvalues and Stability of Ordinary differential equations 5

Seroja 2 – Data Science

Chair: Dr. Ahmed Hasan

Time	ID	Presenter
11.00 – 11.20	33	Ahmed Hasan, Mohd Aftar Abu Bakar and Noratiqah Mohd Ariff Clustering currency exchange rates using time series clustering Technique based on the autocorrelation-based Fuzzy C-means similarity measure
11.20 – 11.40	34	Fatin Nur Afiah Suris, Mohd Aftar Abu Bakar, Noratiqah Mohd Ariff and Mohd Shahrul Mohd Nadzir Clustering of Air Monitoring Stations in Malaysia based on PM10 Time Series Data by using k-Shape
11.40 – 12.00	52	Noratiqah Mohd Ariff, Mohd Aftar Abu Bakar, Mohd Shahrul Mohd Nadzir and Sor Weki Air Quality Analysis using Fuzzy K-Medoid Clustering
12.00 – 12.20	47	Siti Shaliza Mohd Khairi, Mohd Aftar Abu Bakar, Mohd Almie Alias and Sakhinah Abu Bakar Medical Image Denoising on Shearlet-domain using Different Thresholding
12.20 – 12.40	183	Mark Lexter De Lara and Mark Wilfred Borja Application of Persistent Homology Classification Algorithm on MNIST Fashion Image Database
12.40 – 1.00	127	Nur Qatrun Nadiyah Jamaludin, Nabilah Ruza, Aida-Widure Mustapha Mohd Mustapha, Suraya Aziz and Saiful Izzuan Hussain

		EfficientNetV2 CNN Fine-Tuning Modification Model for Breast Cancer Mass Detection in Mammograms
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Melur – Educational Mathematics

Chair: Assoc. Prof. Dr. Abdul Halim Abdullah

Time	ID	Presenter
11.00 – 11.20	32	Abdul Halim Abdullah How Do Malaysian and South Korean Secondary School Mathematics Curricula Evolve?
11.20 – 11.40	5	Sook Theng Pang, How Hui Liew and Siow Yen Chong Study on Software and Social network resources for Improving Malaysia's Mathematical Education after Covid-19 Pandemic
11.40 – 12.00	43	Hartini Ismail, Abdul Halim Abdullah and Najua Syuhada Ahmad Alhassora Investigating Year Two Student's Learning Misconceptions In Shape And Space Topic: A Case Study
12.00 – 12.40	44	Hartini Ismail, Abdul Halim Abdullah and Najua Syuhada Ahmad Alhassora Investigating The Effectiveness of Augmented Reality application for Shape and Space Topic
12.20 – 12.40	73	Ahmad Ainul Maulid, Md Aziz Mu'Azah, Shahrudin Muhammad Shahrizan, Abdullah Wan Mahani and Ishak Mohamad Izril Exploring the Relationship between Mathematics and Programming Performance in Higher Education: An Analysis of Educational Data
12.40 – 1.00	103	Iwan Pranoto Exploring the Potential of the Erlangen Program as a Framework for Mathematics Teacher Education in Indonesia

Orkid – Actuarial Science

Chair: Dr Munira Ismail

Time	ID	Presenter
11.00 – 11.20	128	Mohamad Hasif Azim and Saiful Hussain Evaluating the performance of the Deep Neural Network approach for mortality forecasting in the European population
11.20 – 11.40	100	Siti Wafiah Hanin Mohd Zulkifli, Humaida Banu Samsudin and Noriza Majid Particulate Matter (PM10) concentration-response towards respiratory diseases admissions during haze and non-haze period
11.40 – 12.00	45	Siti Nurasyikin Shamsuddin, Noriszura Ismail and Nur Firyal Roslan Development of Insurance Literacy Construct in Modeling Life Insurance Ownership Determinants in Malaysia: A Descriptive Analysis
12.00 – 12.40	136	Nur Syazwana Suhaimi and Siti Norafidah Mohd Ramli Adequacy Of Old Age Savings For Malaysian Employees: An Asset Allocation Model
12.20 – 12.40	188	Mohd Sabri Ismail, Mohd Salmi Md Noorani , Saiful Izzuan Hussain, Fatimah Abdul Razak, Zalina Mohd Ali, Munira Ismail Portfolio Optimization Using Persistent Homology

Kemboja – Quality & Productivity

Chair: Prof. Ts. Dr. Mohd Rashid Ab Hamid

Time	ID	Presenter
11.00 – 11.20	167	Mohd Rashid Ab Hamid Assessment of Empirical Latent Variable Modelling: Competing Model Strategy
11.20 – 11.40	61	Nur Margfirah Nordin and Zaidi Isa Why Break the Rules? Understanding Non-Compliance Risk Factors in Public Financial Management
11.40 – 12.00	66	Ruhaidi Azmi, Nur Riza Mohd Suradi, Zamira Hasanah Zamzuri and Siti Norafidah Mohd. Ramli Innovation Capability Through Idea Generation Process of Malaysian Public Sector
12.00 – 12.20	75	Mohammad Fairuz Mohd Nasir and Nur Riza Mohd Suradi IMPACT OF TALENT MANAGEMENT TOWARD ORGANIZATIONAL PERFORMANCE : THE ROLE OF ORGANIZATIONAL COMMITMENT AS MEDIATOR
12.20 – 12.40	96	Ruhaidi Azmi, Nur Riza Mohd Suradi, Zamira Hasanah Zamzuri and Siti Norafidah Mohd. Ramli The Construction of Malaysian Public Sector Innovation Capability Index
12.40 – 1.00	54	Syahrul Idzuan Mohamad, Nur Riza Mohd Suradi, Zamira Hasanah Zamzuri and Siti Norafidah Mohd Ramli The Influence of Talent Management on Public Service Competitiveness in Malaysia

Ballroom – Applied Mathematics II

Chair: Dr Hafizah Bahaludin

Time	ID	Presenter
11.00 – 11.20	179	Alyssa April Dellow, Fatimah Abdul Razak, Munira Ismail and Hafizah Bahaludin Exploring Correlations of Energy Companies on Bursa Malaysia during the COVID-19 Pandemic using Network Analysis
11.20 – 11.40	111	Alyssa April Dellow, Fatimah Abdul Razak, Munira Ismail and Hafizah Bahaludin Comparison of the 2008 Global Financial Crisis, 2015 Stock Market Crash and COVID-19 Pandemic: Impacts on the Consumer Products and Services Sector of Malaysia Using Pearson Correlation
11.40 – 12.00	104	Nurun Najwa Bahari, Nur Syaza Mohd Azzimi, Munira Ismail, Hafizah Bahaludin and Fatimah Abdul Razak Comparing the Behaviour of Malaysian Financial Sector Stocks of Pre and During the Coronavirus Outbreak Using Correlation
12.00 – 12.20	126	Fatimah Abdul Razak and Mohd Salmi Md Noorani Topological Data Analysis Experience in Malaysia: A Survey
12.20 – 12.40	190	Shazalina Mat Zin and Syatirah Mat Zin Numerical Analysis of 25 Years Olds Male and Female Voices via Mechanical Model of Vocal Cord using Cubic B-spline Collocation Method

Parallel Session 2
16 May 2023
2.45 pm - 4.45 pm

Mawar 1 – Applied Mathematics

Chair: Assoc. Prof. Dr Abdul Rahman Mohd Kasim

Time	ID	Presenter
2.45 – 3.05	83	Anisah Dasman, Abdul Rahman Mohd Kasim , Iskandar Waini and Najiyah Safwa Khashi'le Two-phase flow of Casson dusty Micropolar fluid over a stretching/shrinking sheet
3.05 – 3.25	184	Mohd Haziezan Hassan, Abdul Rahman Mohd Kasim , Tijjani Lawal Hassan, Noor Amalina Nisa Ariffin and Nursyamilah Arifin Comparative Study on Newtonian Fluid with and Wihout Dust Particles
3.25 – 3.45	180	Suguneswaran Puspanathan, Kohilavani Naganthran and Ishak Hashim Dual Solutions of Fluid Flow and Heat Transfer over a Rotating and Vertically Moving Disk
3.45 – 4.05	19	Rahimah Jusoh, Muhammad Khairul Anuar Mohamed and Mohd Hisyam Mohd Ariff Mathematical Analysis of Ag-TiO₂/Blood Hybrid Nanofluid with the Inclusion of Viscous Dissipation over a Permeable Surface
3.45 – 4.25	11	Nurul Asyiqin Mohd Fauzi, Mazlinda Ibrahim, Yann Seong Hoo, Abdul Kadir Jumaat and Lavdie Rada Joint Segmentation and Deformable Registration with the Presence of the Noise using Active Contour and Linear Curvature
4.25 – 4.45	84	Putri Nurdiyanah and Zuhaila Ismail Simulation of Tooth Movement of Incisor Teeth by Using COMSOL Multiphysics

Mawar 2 – Pure Mathematics

Chair: Dr. Syahida Che Dzul-Kefli

Time	ID	Presenter
2.45 – 3.05	182	Nor Syahmina Kamarudin and <u>Syahida Che Dzul-Kifli</u> Measurable Version of Spectral Decomposition Theorem for a Z^2 Action
3.05 – 3.25	12	<u>Iffah Nurlathifah Fikri</u> and Zabidin Salleh Common Fixed Point Results for Boyd-Wong and Meir-Keeler Contraction Mappings in F-Metric Spaces
3.25 – 3.45	38	Majid Neamah and Alawiah Ibrahim The Hadamard fractional integral via the extended Chebyshev functional and applications
3.45 – 4.05	55	<u>Omar Al Najar</u> and Maslina Darus Coefficient estimates for subclasses of bi-univalent functions related to Gegenbauer polynomials and an application of Bell distribution
4.05-4.25	6	Suzila Mohd Kasim Vertex Relation of A_4 Graph in Mathieu Groups
4.25 – 4.45	189	Nor Syahmina Kamarudin and Syahida Che Dzul-Kifli The Implication of Eventually Shadowing Property On a Z^d-action To The Equivalence of Chain Recurrent Set and Omega Limit Set

Seroja 2 – Statistics

Chair: Dr Norshahida Shaadan

Time	ID	Presenter
2.45 – 3.05	171	Ros Rasyiqah Rosslan and Norshahida Shaadan Exploring Magnitude and Shape Outliers of Tropospheric Diurnal Ozone O3 Using Functional Data Analysis at Several Locations in Selangor Malaysia
3.05 – 3.25	74	Nur Ain Al-Hameefatul Jamaliyatul, Nurkhairany Amyra Mokhtar, Basri Badyalina, Adzhar Rambli and Yong Zulina Zubairi Statistical Model of Melaka Wind Speed Data with Functional Relationship and Error Terms
3.25 – 3.45	173	Wan Zawiah Wan Zin and Nurfarahin Idrus STATISTICAL EVALUATION ON THE EFFECTIVNESS OF MOVEMENT CONTROL ORDER TO COMBAT COVID19 PANDEMIC IN MALAYSIA
3.45 – 4.05	110	Nurul Raudhah Zulkifli, Nazim Aimran, Sayang Mohd Deni and Azlin Sapri A Comparative Study of the Performance of Unweighted Least Squares and Regularized Unweighted Least Squares in Structural Equation Modeling
4.05 – 4.25	122	Pressylia Aluisina Putri Widyangga, Muhammad Fikry Al Farizi, Adma Novita Sari, Maelcardino Christopher Justin, M. Fariz Fadillah Mardianto and Alfi Nur Nitasari Classifying the Regencies and Cities in Indonesia Based on Poverty Indicators Using Hierarchycal Cluster Analysis
4.25 – 4.45	140	M. Fariz Fadillah Mardianto, Marcel Laverda Subiyanto, Antonio Nikolas Manuel Bonar Simamora and Chaerobby Fakhri Fauzaan Purwoko Simultaneous National Strategic Commodity Price Prediction to Accelerate Food Security in the Post-Pandemic Era

Melur – Educational Mathematics

Chair: Assoc. Prof. Dr. Mazlini Adnan

Time	ID	Presenter
2.45 – 3.05	117	<u>Mazlini Adnan</u> , Mohd Faizal Nizam Lee Abdullah, Laili Farhana Md Ibharim and Ahmad Hafiz Muhammad Development of a TACTIC Kit based on Game-Based Learning for Secondary Mathematics Students
3.05 – 3.25	178	Ya Qin, Siti Rahayu Mohd Hashim and Jumat Sulaiman Fuzzy comprehensive evaluation for student satisfaction in college mathematics classroom teaching quality
3.25 – 3.45	49	<u>Chandra Sinniah</u> , Abdul Halim Abdullah and Sharifah Osman The Effectiveness of GeoGebra-Assisted Non-Routine Problem-Based Learning on Students' Non-Routine Mathematical Problem Solving
3.45 – 4.05	50	Chandra Sinniah, Abdul Halim Abdullah and Sharifah Osman The Effectiveness of GeoGebra-Assisted Non-Routine Problem-Based Learning on Students' Mathematical Creativity
4.05 – 4.25	168	Umami Munirah Syuhada Mohamad Zan, Faradillah Iqmar Omar, Nor Azlili Hassan, Mawar Murni Yunus and Nur Hafidhzah Nor Hasim Validating the Instrument Measuring the Influence of Digital Constraints and Empowerment of Malaysian B40 Entrepreneurs

Orkid – Applied Mathematics II

Chair: Dr Faieza Samat

Time	ID	Presenter
2.45 – 3.05	51	Isma Norshahila Mohammad Shah, Eddie Shahril Ismail, Faieza Samat and Normahirah Nek Abd Rahman Analysis of Modified Feistel-based Lightweight Block Cipher for Internet of Things
3.05 – 3.25	72	Shahrizal Mohd Safri, Eddie Shahril Ismail, Normahirah Nek Abd Rahman, Faieza Samat and Isma Norshahila Mohammad Shah Development of User Identification Scheme based on Multiple Cryptographic Hard Problems
3.25 – 3.45	119	Faieza Samat and Eddie Shahril Ismail Stability of an Explicit Adapted Numerov Method for Second-order Ordinary Differential Equations
3.45 – 4.05	115	Lee Khai Chien, Roslinda Nazar and Norazak Senu Exponentially-Fitted Two-Derivative Runge-Kutta-Nystroöm Method for the Integration of Special Type of Second-Order Ordinary Differential Equations
4.05 – 4.25	106	Graygorry Brayone Ekal, Jackel Vui Lung Chew, Khadizah Ghazali and Jumat Sulaiman Numerical Solution Based On Wave Variable Transformation and KSOR Iterative Method For Solving Porous Medium Equations with Source Terms
4.25 – 4.45	141	Suzelawati Zenian Flat EEG Image Enhancement via Intuitionistic and Non-fuzzy Techniques

Kemboja – Operational Research

Chair: Dr. Ruzanna Mat Jusoh

Time	ID	Presenter
2.45 – 3.05	71	<u>Ruzanna Mat Jusoh</u> Estimating Network Fundamental Diagram Using Principal Component Analysis-Based Strategy: A Case Study of Urban Transport Networks
3.05 – 3.25	20	<u>Ivan Yeo</u> An Inventory Model with Remanufacturing for a Product with a Circular Economy Indicator
3.25 – 3.45	135	<u>Ghisella Asy Sifa, Nurin Faizun, Naimatul Lulua, M. Fariz Fadillah Mardianto and Dita Amelia</u> Modeling of Factors Influencing Stunting in Indonesia Based on Fourier Series Estimator
3.45 – 4.05	138	<u>M Fariz Fadillah Mardianto, Citra Imama, Diana Ulya, Brenda Bunga Prasenda, Helfira Lady Ari Pramesti and Zidni Ilmatun Nurrohmah</u> Modeling Rice Price in Indonesia using Support Vector Regression (SVR)
4.05 – 4.25	98	<u>Siti Hajar Mohd Ariff, Kamil Khalid, Muhamad Ghazali Kamardan and Suliadi Firdaus Sufahani</u> Simulation On Queueing At Outpatient Department Of Psychiatric And Mental Health Hospital In Southern Peninsular Malaysia
4.25 – 4.45	139	<u>Anggara Teguh Previan, Mohamad David Hermawan, Hadi Prayogi, Fajar Desy Clarisma and M. Fariz Fadillah Mardianto</u> The Influence of Environment, Social, and Governance on Investment Interest for Indonesia's Accelerating Economic Growth

Ballroom – Educational Mathematics II

Chair: Dr. Sukanya Ruagsuwan

Time	ID	Presenter
2.45 – 3.05	64	Sukanya Ruagsuwan, Wannaporn Junthopas and Thanyaporn Noiplab Factor Analysis of Learners Attitudes towards Statistics
3.05 – 3.25	79	Raoda Ismail Construct Validity of Mathematics High Order Thinking Skills Instrument with Cultural Context: Confirmatory Factor Analysis
3.25 – 3.45	80	Okky Riswandha Imawan Confirmatory Factor Analysis and Differential Item Functioning Analysis on Mathematical Literacy Instruments for Prospective Indonesian Elementary School Teachers
3.45 – 4.05	89	Ruzanna Ab Razak and Salmi Md Zahid Understanding the Relationship Between Math Anxiety and Math Achievement Among Business Students in Malaysia
4.05 – 4.25	164	Nurwirda Husna Abd Rani and Wan Mohd Aimran Wan Mohd Kamil An Investigation of Pre-Calculus Profficiency Among Physics Undergraduates at UKM

Parallel Session 3

17 May 2023

8.20 am – 9.40 pm

Mawar 1 – Applied Mathematics

Chair: Dr Khairul Anwar Mohamad Khazali

Time	ID	Presenter
8.20 – 8.40	133	Khairul Anwar Mohamad Khazali Systematic Analysis of Radioactive Emission of Mirror Clusters using the Relativistic Mean-Field Formalism
8.40 – 9.00	10	Siti Nur Iqmal Ibrahim and Aisyah Syahirah Sawal The Greeks for Equity Warrants with JSVSR Model
9.00 – 9.20	16	Anis Solehah Mohd Kamarudzaman and Md Yushalify Misro Developability Comparison of Enveloping Developable Quintic Trigonometric Bézier Surface
9.20 – 9.40	165	Busyra Latif, Samsul Ariffin Abdul Karim, Md Yushalify Misro and Ishak Hashim Modified Cubic B-Spline Method for System of Boundary Value Problems

Mawar 2 – Pure Mathematics

Chair: Prof. Dr. Maslina Darus

Time	ID	Presenter
8.20 – 8.40	114	Maslina Darus Differential operators: What is next?
8.40 – 9.00	13	Darren Ong Abstract Art Generated by Thue-Morse Autocorrelation Functions
9.00 – 9.20	109	Aliaa Burqan New Algebraic Insights to the Goldbach Conjecture
9.20 – 9.40	118	Ahmad Fadillah Embong Non-Associativity of Two-Dimensional b-Bistochastic-Volterra Genetic Algebras

Seroja 2 – Statistics

Chair: Assoc. Prof. Dr. Adriana Irawati Nur Ibrahim

Time	ID	Presenter & Title
8.20 – 8.40	63	Adriana Irawati Nur Ibrahim and Hui Yin Koay Application of Generalized Additive Models to Air-Pollution Related Disease
8.40 – 9.00	62	Mohd Sabri Ismail and Nurulkamal Masseran Dependence Modeling for the Characteristics of Unhealthy Air Pollution Events using Bivariate Copulas
9.00 – 9.20	57	Loh Jun Heng and Nurulkamal Masseran Time Series Analysis of Air Pollution Index in Malaysia
9.20 – 9.40	145	Muhammad Naeim Mohd Aris, Shalini Nagaratnam, Khairul Arifin Mohd Noh, Hanita Daud and Nahamizun Maamor Investigating the Predictive Performance of Gaussian Process Regression in Marine Controlled-Source Electromagnetic Modelling

Melur – Statistics II

Chair: Assoc. Prof. Dr. Rossita Mohamad Yunus

Time	ID	Presenter
8.20 – 8.40	94	Rossita Yunus A study on the Median Top-m Rank Spatial Outlier Detection Method
8.40 – 9.00	86	Nor Iza Anuar Razak, Zamira Hasanah Zamzuri and Siti Norafidah Ramli An Evaluation of Double Bootstrap Approaches in the Presence of Outliers
9.00 – 9.20	39	Laila Naji Ba Dakhn, Mohd Aftar Abu Bakar and Kamarulzaman Ibrahim Parametric and Semi-Parametric Skew Normal Linear Degradation Model to Estimate Time to Failure Distribution and its Percentiles
9.20 – 9.40	82	Wazirah Shah and Zamira Hasanah Zamzuri Underreporting of Road Traffic Accidents: A Bibliometric Analysis from Web of Science Database

Orkid – Applied Mathematics II

Chair: Dr. Mohd Najir Tokachil

Time	ID	Presenter
8.20 – 8.40	21	Mat Salim Selamat, Rahmah Shahril, Rosha Mohamed and Mohd Najir Tokachil A Multistage Banach Contraction Method for Approximate Riccati Differential Equation
8.40 – 9.00	151	Sana'A Nazmi Khataybeh and Ishak Hashim A new approach to approximate the solution for the systems of integro-differential equations Based on Bernstein Polynomials.
9.00 – 9.20	46	Shoura Ahmad Balatta and Ishak Hashim Oscillation of Higher-Order Half-Linear Differential Equations with Delay Terms
9.20 – 9.40	31	Ahmad Abubakar Umar and Hamisu Musa Convergence and Order of the Extended 2-point Super Class Block Backward Differentiation Formula with Off-step Points for Solving Stiff ODEs

Kemboja – Applied Mathematics III

Chair: Mr. Wei Sin Koh

Time	ID	Presenter
8.20 – 8.40	153	Wei Sin Koh, Saful Hafizah Jaaman, Jumat Sulaiman and Rokiah Rozita Ahmad Successive Overrelaxation Method for Arithmetic Asian Option Pricing
8.40 – 9.00	174	Farah Azaliney Mohd Amin and Saiful Hafizah Jaaman Analyzing the Impact of Distinguishing Coefficient Parameter in Grey Relational Analysis Model
9.00 – 9.20	144	Siti Nurleena Abu Mansor, Majid Khan Majahar Ali and Farah Aini Abdullah A Dynamic SEIQR Model for Hand, Foot, and Mouth Disease in Malaysia
9.20 – 9.40	155	Khaled Moaddy and Tala Al Mutairi Control and Switching Synchronization of Chaotic Finance Systems with Integer and Non-Integer Orders

Ballroom – Pure Mathematics II

Chair: Dr. Binyamin Yusoff

Time	ID	Presenter
8.20 – 8.40	187	<u>Binyamin Yusoff</u> , Adem Kilicman and Dian Pratama CIRCULAR Q-RUNG ORTHOPAIR FUZZY SETS
8.40 – 9.00	29	<u>Ruzakhon Kazimirova</u> , Gafurjan Ibragimov, Risman Mat Hasim and Mohamat Aidil Mohamat Johari Multi-Pursuer Evasion Differential Game in a Hilbert space
9.00 – 9.20	26	Gafurjan Ibragimov, Risman Mat Hasim, <u>Omongul Egamberganova</u> and Mohamat Aidil Mohamat Johari Multiple capture in a simple motion differential game of many pursuers and one evader.
9.20 – 9.40	137	Nurul Ain Mazlan, Hazzirah Izzati Mat Hassim, Nor Haniza Sarmin and Sanhan Muhammad Salih Khasraw The First and Second Zagreb Index of Zero Divisor Type Graph of Z_p and Z_{pq}.

Parallel Session 4
17 May 2023
11.15 am – 12.55pm

Mawar 1 – Applied Mathematics

Chair: Dr. Mohd Almie Alias

Time	ID	Presenter
11.15 – 11.35	175	Mohd Almie Alias and Nor Farah Wahidah Nor Khalid Initial Distribution of Heterogeneous Reacting and Diffusing Populations and Their Critical Times
11.35 – 11.55	131	Noorhuda Ahmad Toha and Roslinda Nazar Mathematical Modelling to Forecast The Population Projection of Stateless Children in Kampung Bangau-Bangau, Semporna, Sabah
11.55 – 12.15	67	Muhammad Imran Bin Sapini and Sakhinah Abu Bakar Identifying Key Players In Social Networks On Twitter During The Covid-19 Pandemic And Malaysia Movement Control Order: An Analysis Of Centrality Measures In Static And Temporal Snapshot Networks
12.15 – 12.35	99	Muhammad Fahmi, Norhayati Rosli and Noryanti Muhammad Epidemiological Parameter Estimation of the SIRD Model for COVID-19 Outbreak Using Markov Chain Monte Carlo Method.

Mawar 2 – Pure Mathematics

Chair: Dr. Nabeela Abualkishik

Time	ID	Presenter
11.15 – 11.35	152	Nabeela Abualkishik and Hasan Hdeib Pairwise Locally Paracompact Spaces And Pairwise Locally Nearly Paracompact Spaces
11.35 – 11.55	172	Ahmad Sulaiman Ahmad El-Faqeer, Zhen Chuan Ng and Shamani Supramaniam Harmonic Mappings with its Analytic Close-to-Convex Ozaki Functions
11.55 – 12.15	78	Sumyyah Al-Hijjawi, Abd Ghafur Ahmad and Shawkat Alkhazaleh Effective Neurosophic Soft Expert Set
12.15 – 12.35	181	Mohd Rashid Admon, Norazak Senu, Ali Ahmadian and Zanariah Abdul Majid An Advanced Scheme based on Artificial Intelligence Technique for Solving Nonlinear Riccati Systems

Seroja 2 – Data Science
Chair: Dr Nur Firyal Roslan

Time	ID	Presenter
11.15 – 11.35	40	Nur Firyal Roslan Exploring Political Leaders' Speeches Impact on State Expenditures
11.35 – 11.55	113	Noraini Moktar and Noraliza Abdul Wahab The role of investors uncertainty in investment decision process to firm value
11.55 – 12.15	123	Yanti Mustapha, Siti Haslina Md Harizan, Nurazree Mahmud and Mohd Faiz Hilmi Machine Learning Techniques For Clustering Student Online Learning Behavior
12.15 – 12.35	124	Yanti Mustapha, Shaifizat Mansor, Sazilah Mohd Saad and Mohd Faiz Hilmi Artificial Intelligence in Distance Education and Distance Learning: Bibliometric And Topic Modeling Analysis
12.35 – 12.55	107	Chuan Zun Liang, David Chong Teak Wei, Adam Shariff Adli Aminuddin, Fam Soo Fen and Tan Lit Ken A Comparative Study of Predicting Rice Production Utilizing Supervised Regression-based Machine Learning Model Under Big Data

Melur – Statistics

Chair: Assoc. Prof. Dr. Mohd Tahir Ismail

Time	ID	Presenter
11.15 – 11.35	42	Nurazlina Abdul Rashid, <u>Mohd Tahir Ismail</u> , Lubna Hamzalouh and Majid Khan Majahar Ali Intelligent Hybrid Model of STS-NARX for Prediction of Bitcoin Price
11.35 – 11.55	91	Nora Muda and Asyraf Nadia Mohd Yunus Approximation Sum of the Lognormal: Case Study of Stock Market
11.55 – 12.15	77	Yati Wahab and Hanita Hashim The Effect of Macroeconomic Variable on Muslim Tourism Demand for Malaysia and Selected OIC Countries
12.15 – 12.35	120	Naufal Ramadhan Al Akhwal Siregar, Steven Soewignjo, Alfredi Yoani, Abednego Sihombing, Martha Sayyida Hammami and M. Fariz Fadillah Mardianto The Modelling of Rupiah Exchange Rate Prediction Based using the Best Nonparametric Regression Estimator

Orkid – Applied Math II
Chair: Dr. Azhar Ahmad

Time	ID	Presenter
11.15 – 11.35	166	Azhar Ahmad, Amirah Azmi, Nur Nadiah Abd Hamid, Muhammad Abbas and Hanis Safirah Saiful Anuar Improved Order of Convergent of Cubic B-spline Collocation Method for the Nonlinear Schrödinger equation
11.35 – 11.55	134	Abdul Rahman Farhan Sabdin, Che Haziqah Che Hussin, Jumat Sulaiman and Arif Mandangan Reduced Differential Transform Method in Solving Nonlinear Schrodinger Equations
11.55 – 12.15	36	Herniza Md Tahir, Mohd Agos Salim Nasir, Sumarni Abu Bakar and Hafizudin Mohamad Nor Higher Order Taylor Series-Based Method for Solving Nonlinear Equations
12.15 – 12.35	9	Peng Cheng, Jumat Sulaiman, Khadizah Ghazali, Majid Khan Majahar Ali and Ming Ming Xu Newton-Explicit Group Solution With Lagrangian Multiplier Approach For Solving Large-Scale Nonlinear Constrained Optimization Problems
12.35 – 12.55	102	Rania Saadeh A New Analytical approach for Solving Nonlinear Volterra Integral Equations.

Kemboja – Statistics

Chair: Dr. Muhammad Hilmi Abdul Majid

Time	ID	Presenter
11.15 – 11.35	159	<u>Muhammad Hilmi Abdul Majid</u> , Kamarulzaman Ibrahim and Nurulkamal Masseran Three-Part Composite Pareto Modelling for Income Distribution in Malaysia
11.35 – 11.55	157	Wan Mohd Saufi Wan Ghazali, Zalina Mohd Ali and Zamira Hasanah Zamzuri A New Analytical Approach to Determine the Inequality of Employment Status of Elderly Based on Demographic Factors
11.55 – 12.15	56	Mahayaudin M. Mansor, Siti Meriam Zahari, Nurain Ibrahim, Mohammed Benmoumen and Andrew V. Metcalfe Applying Directionality as a Criterion in Systematic Trading for Buying and Selling Shares
12.15 – 12.35	130	Loshini Thiruchelvam, Nur Balqishanis Zainal Abidin, Nur Amalina Mat Jan, Hemaniswarri Dewi Dewadas and Ashvaany Egambaram Developing SERVPERF Model using Exploratory Factor Analysis (EFA) with focusing on Selection of Best Loading Value
12.35 – 12.55	162	<u>Emerzalina Emeraldi</u> and Siti Norafidah Mohd Ramli The Effect of Minimum Wage Policy on Malaysia's CPI and PPI: An Intervention Analysis

Ballroom – Actuarial Science

Chair: Dr. Rozita Ramli

Time	ID	Presenter
11.15 – 11.35		<u>Rozita Ramli and Jeyaraj Vadiveloo</u> Credibility-Blended GLM to Adjusting Expected Assumptions of Long-Term Care Incidence Rates
11.35 – 11.55	116	<u>Nurul Anis Ayuni Khairul Anuar, Noriza Majid and Humaida Banu Samsudin</u> Hospitalisation Caused by Respiratory Illness due to Air Pollution
11.55 – 12.15	158	<u>Sharifah Farah Syed Yusoff Alhabshi, Siti Norafidah Mohd Ramli and Zamira Hasanah Zamzuri</u> The Ruin Probability of a Copula-Dependent Risk Process with Weibull Interwaiting Time : A Monte Carlo Simulation
12.15 – 12.35	170	<u>Alia Nadira Rosle, Munira Ismail, Fatimah Abdul Razak and Hafizah Bahaludin</u> Predicting Financial Status of Healthcare and Property Sector in Malaysia
12.35 – 12.55	177	<u>Siti Norafidah Mohd Ramli and Fareena Elyashah Tajul Ariffin</u> Bankruptcy Prediction and Financial Statement Manipulation: AirAsia Berhad (2017-2021)

Parallel Session 5
17 May 2023
2.00 pm – 3.40 pm

Mawar 1 – Applied Mathematics
Chair: Dr. Kohilavani Naganthran

Time	ID	Presenter
2.00 – 2.20	70	Kohilavani Naganthran, Ishak Hashim, Roslinda Nazar and Elayaraja Aruchunan Carreau Liquid Film Flow with Thermocapillarity and General Surface Temperature
2.20 – 2.40	58	Nurul Amira Zainal, Roslinda Nazar and Ioan Pop Thermal Radiation Effect on Unsteady MHD Rear Stagnation Point in Al2O3-Cu/H2O Hybrid Nanofluid
2.40 – 3.00	59	Nurul Amira Zainal, Iskandar Waini, Roslinda Nazar and Ioan Pop Heat Generation/Absorption Effect on Al2O3-Cu/H2O Over a Stretching/Shrinking Wedge with MHD Flow
3.00 – 3.20	22	Nur Ilyana Kamis, Lim Yeou Jiann, Sharidan Shafie and Noraihan Afiqah Rawi The Magnetic Dipole Impact on the Flow of Nano-Ferro and Ferro Fluids over a Stretching Sheet
3.20 – 3.40	150	Norhaliza Abu Bakar and Rozaini Roslan The Effect of Sinuoidal Heating on Mixed Convection in an Inclined Cavity Filled with Hybrid Nanofluid in the Present of Magnetic Field

Mawar 2 – Statistics

Chair: Dr. Muhammad Aslam Mohd Safari

Time	ID	Presenter
2.00 – 2.20	48	<u>Muhammad Aslam Mohd Safari</u> and Nurulkamal Masseran Comparative Study of Five Different Estimators for the Power Law Exponent
2.20 – 2.40	68	Wannaporn Junthopas and Rattiyaporn Jarupak Investigation of Test Performance of the Modified Goldfeld-Quandt Test for Heteroscedasticity Problem
2.40 – 3.00	93	<u>Rohayu Sarani</u> , Zamira Hasanah Zamzuri and Siti Norafidah Ramli A Review of Statistical Methods used for Intervention Evaluation
3.00 – 3.20	105	<u>Razik Ridzuan Mohd Tajuddin</u> , Noriszura Ismail and Roslinda Nazar On One-Parameter Triple Size-Biased Poisson Distribution
3.20 – 3.40	154	Idari Ismail, Jayanthi Arasan, Mohd Shafie Mustafa and Muhammad Aslam Mohd Safari Inferential Procedures for a Bathtub Hazard Model in the Presence of Interval Censored Data

Seroja II – Data Science

Chair: Dr. Nor Hamizah Miswan

Time	ID	Presenter
2.00 – 2.20	129	<u>Nor Hamizah Miswan, Roslinda Mohd Nazar and Chee Seng Chan</u> Building Interpretable Predictive Model for Hospital Readmission
2.20 – 2.40	35	<u>Hazwani Halid, Mohd Aftar Abu Bakar and Noratiqah Mohd Ariff</u> Analyzing Optional Retirement in Royal Malaysia Police (PDRM) using Machine Learning Techniques
2.40 – 3.00	37	<u>Muhammed Haziq Bin Muhammed Nor, Mohd Aftar Abu Bakar, Noratiqah Mohd Ariff, Hasmirah Hassan and Siti Amira Nadia Ahmad Tajudin</u> Big Data Analytics Approaches For Treatment of Imbalance And Missing Values Problems on High Dimensionality Dataset
3.00 – 3.20	60	<u>Zaturrawiah Ali Omar, Zamira Hasanah Zamzuri, Noratiqah Mohd Ariff and Mohd Aftar Abu Bakar</u> Training Data Selection for Record Linkage Classification
3.20 – 3.40	92	<u>Noratiqah Mohd. Ariff, Mohd Aftar Abu Bakar, Nur Syuhada Yahya and Naqiah Mansor</u> Association Rule Mining of Household Expenditure Suvey in Malaysia by using Apriori Algorithm

Melur – Applied Mathematics II

Chair: Ts. Khairul Annuar Abdullah

Time	ID	Presenter
2.00 – 2.20	69	<u>Abdul Syukor Hazram</u> , Sakhinah Abu Bakar and Fatimah Abdul Razak Identifying the Important Proteins Through Persistent Homology of Aging Protein-Protein Interaction Network
2.20 – 2.40	142	<u>Norsyahidah Zulkarnain</u> , Muhammad Salihi Abdul Hadi, Nurul Farahain Mohammad and Ibrahim Shogar Modelling Transmission Dynamics of COVID-19 during Pre-Vaccination Period in Malaysia: A Predictive GUI-SEIRD Model using Streamlit
2.40 – 3.00	85	<u>Siti Raihan Halilan</u> and Sakhinah Abu Bakar Robustness of Aging Network Using Centrality Measures
3.00 – 3.20	81	<u>Khairul Annuar Abdullah</u> , Wan Azlan Wan Hassan and Riza Sulaiman Hybrid Neural Network – Evolutionary Algorithm for Predicting and Optimizing Inverse Kinematics of Manipulator Arm
3.20 – 3.40	185	Shazalina Mat Zin and Syatirah Mat Zin Numerical Analysis of One-Mass Mechanical Model of Vocal Cord using Normal and Pathological Voices through Cubic B-spline Collocation Method

Orkid – Applied Mathematics III

Chair: Dr. Siti Aisyah Tumiran

Time	ID	Presenter
2.00 – 2.20	163	<u>Siti Aisyah Tumiran</u> , Farah Nurul Ain Mohd Suffian Laurence, Suzelawati Zenian and Kawi Bidin Improved Edge Betweenness Algorithm for Catchment Classification in Sabah
2.20 – 2.40	161	Mei-Feng Liu and <u>Chung Han Yong</u> Large Deflection of Thermal-Magneto-Electro-Elastic (TMEE) Laminated Plates
2.40 – 3.00	186	Shar Nizam Sharif and Saiful Hafizah Jaaman Benford's Law and The Stock Market Deviation During COVID-19 Pandemic
3.00 – 3.20	149	<u>Rechard Lee</u> and Celine Wong Single-Image Motion Deblurring by Kernel Estimation
3.20 – 3.40	169	<u>Aml Shloof</u> A novel spectral method for solving fractal-fractional differential equations based on Hilfer fractal-fractional derivative

Kemboja – Quality and Productivity
Chair: Assoc. Prof. Dr. Zainol Mustafa

Time	ID	Presenter
2.00 – 2.20	191	Zainol Mustafa , Norkisme Zainal Abidin, Nur Riza Mohd Suradi, Wan Rosmanira Ismail, Siti Aisyah Safirah Mohd Harith, Mohd Aftar Abu Bakar, Nur Mohd Shukri bin Mohamad and Mohd Zaki Zakariah Level of importance and satisfaction on issues of concern to the society of Terengganu
2.20 – 2.40	65	Muhammad Danial Abdullah and Wan Rosmanira Ismail Efficiency and Capacity of Trawlers in West Coast Peninsular Malaysia
3.00 – 3.20	112	Zuraida Kamaruddin and Zaidi Isa Factors Affecting the Effectiveness of Laboratory and Workshop Risk Management Implementation
3.20 – 3.40	7	Qaisar Ali Malik, Muhammad Awais and Imran Bashir Dar Effect of Covid-19 on Supply Chain in the Health Sector

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