

Table 3: Analysis of variance (GPA)

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	1	1.06	1.06	16.42	<0.0001
Error	225	14.56	0.07		
Corrected Total	226	15.62			

Table 4: Model Parameters (GPA)

Source	Value	Standard error	t
Intercept	4.797	0.248	19.373
AGE	-0.046	0.011	-4.052
<i>Pr</i> > <i>t</i>	Lower bound (95%)	Upper bound (95%)	
<0.0001	4.309	5.285	
<0.0001	-0.068	-0.024	

From Table 4, the value of parameters of the slope of the line $\beta^2 = 4.797$, and y -intercept $\beta^1 = -0.046$. The equation of the prediction model of the GPA is $y = 4.797x - 0.046$. The model was then used to construct a prediction of the students' GPA collected from the surveys. The results are shown in Figure 3.

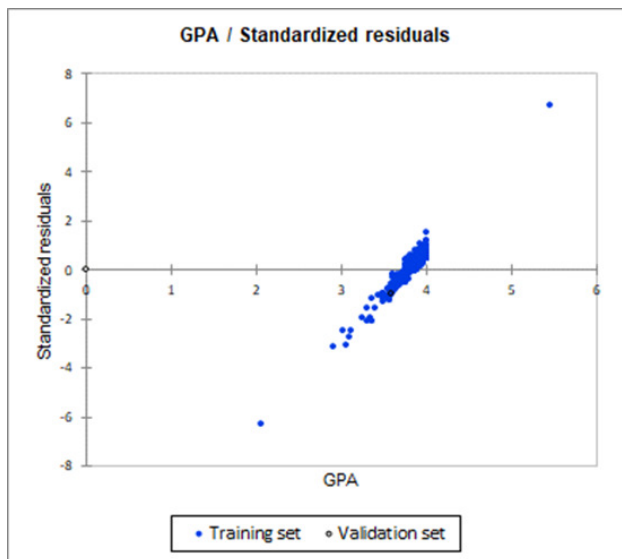


Fig. 3: Scatter plot shown of the actual GPA and standardized residuals

The scatter plot shown in Figure 3 explains the trend of student's GPA from their past results. This trend demonstrates that the GPA is higher throughout the year.

From the scatter plot in Figure 4, the undergraduate students' GPA had increased drastically since the scatter

plot cumulated at the right side of the graph. There is a slight trend that the undergraduate student's GPA will increase over time since the results show that most students either maintain or get a higher GPA for the upcoming semester. There is only a slight error for the prediction model; hence the prediction model is still reliable to predict the student's GPA.

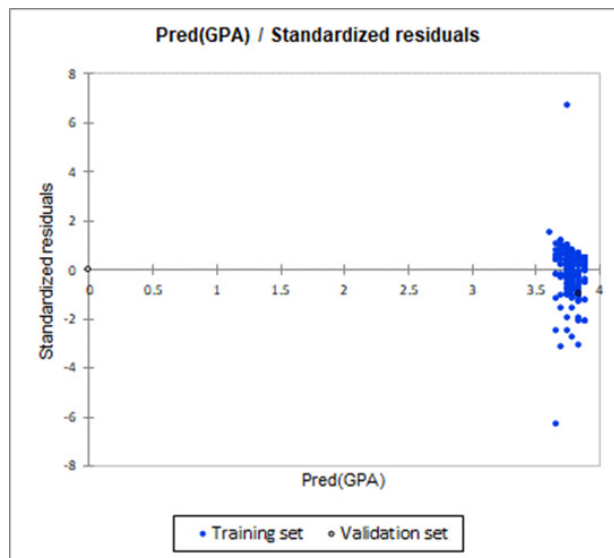


Fig. 4: Scatter plot shown of the prediction GPA and standardized residuals

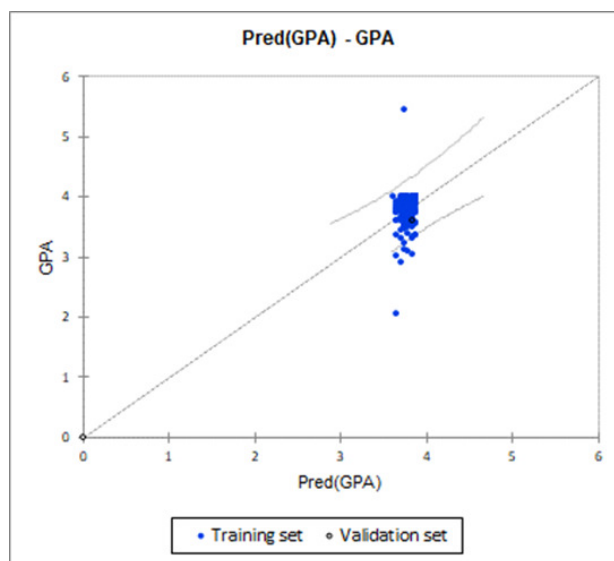


Fig. 5: Scatter plot shown of the error of actual GPA-prediction GPA

Based on the results, by using the linear regression model, the result is suitable for predicting the student's academic performance since it shows significant improvement of student's GPA through online teaching and learning activities during the MCO. From the data collected, the model could be constructed using the linear regression method by determining the variables for the equation. By referring to Figure 3, the linear re-

gression model for the prediction using predictor AGE showed that students' academic performance would increase through their upcoming semester. The graph is inclined to positive infinity and shows a significant increase in the student's academic performance. Figure 4 shows that the graph is skewed to the right and most students are predicted to have higher GPAs. It indicates that the students can obtain higher results in their upcoming semester although they have to learn through an online platform.

Certain reasons would cause an increase in students' GPA result even though they have to go through online teaching and learning approach during the MCO period. One of the reasons is that students feel safe and at ease during class because they have more time to prepare for themselves before starting their class. Most lecturers will have a synchronous class which means students need to attend the class using online platforms such as Google Meet, MOOC, Zoom and Microsoft Teams; or asynchronous classes that require them to watch videos prepared by their lecturers. Due to this, students have more courage to ask questions without worry or self-conscious about what their peers will think. They will be more motivated to gain more knowledge since they do not have to worry about their feelings of afraid to be judged by others. Besides, students could expand their knowledge on using the technology to help them learn and complete their tasks. Most of the lecturers did give tasks or assignments to the students to brush up on their knowledge. However, since the MCO period, students cannot move around and meet their group mates, thus students need to have other alternatives to complete the task given. Online group platforms such as Google Slides, Google Docs, and Powtoon can help students cooperate to complete their tasks. They will be more competent in completing the task and perform the submission on time, which leads to getting a good grade.

On the other hand, some students cannot keep up with online teaching and learning activities, resulting in a drop in their GPA. They could have a lack of motivation to go through the online teaching and learning processes. The lack of access to the internet can be one of the reasons students have a hard time attending their online class, completing the tasks given, which results in a course fail. For this reason, lecturers need to keep revising and improving their teaching and learning approach and prepare suitable material to help students engage with the course. Students also need to be more focused and ready to learn during online classes so that they will not be left behind.

Online teaching and learning activities will not affect a student's study badly; instead, it helps students improve their academic performance. Implementing an online teaching and learning approach will be a great way to ensure the continuity of teaching and learning activities of the undergraduate students during the MCO period.

V. CONCLUSION

The purpose of applying a statistical method is to improve students' academic performance by predicting their academic results to provide the necessary aid. Using the traditional way of the predicating method will only take a longer time since there are many complexities of the learning environment and a variety of learning tools that can limit the study. In this study, a linear regression model was implemented to project students' academic performance based on the current semester of their GPA. The student's current GPA (online learning) was compared with the previous GPA result (face-to-face learning) from the past semester. It can be concluded that online learning will not affect a student's academic performance since majorities of them gain benefits from it which increases the student's academic performance. Conclusively, this linear regression model can be applied as a generic tool to predict a student's academic performance.

ACKNOWLEDGMENT

This research was conducted under the Fundamental Research Grants Scheme (FRGS/1/2019/STG06/UPSI/02/4) offered by the Ministry of Education of Malaysia.

REFERENCES

- [1] WORLD HEALTH ORGANIZATION: *Novel Coronavirus (2019-nCoV) Advice for the Public*, <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public> (2020).
- [2] MINISTRY OF HEALTH MALAYSIA: *Situasi Semasa Pandemik Covid-19 Di Malaysia*, <http://covid-19.moh.gov.my/>.
- [3] M.S. SAMSUDIN, A. AZID, N. L. A. RANI, K. M. K. K. YUSOF, S. M. SHAHARUDIN, K. YUNUS, M. A. RAZIK, M. H. SIDIK, N. M. ROZAR: *Evidence of Recovery from the Restriction Movement Order by Mann-Kendall during the COVID-19 Pandemic in Malaysia*, *Journal of Sustainability Science and Management*, **16** (2020), 55-69.
- [4] M. F. M. FUAD, S. M. SHAHARUDIN, S. ISMAIL, N. A. M. SAMSUDIN, M. F. ZULFIKRI: *Comparison of singular spectrum analysis forecasting algorithms for student's academic performance during COVID-19 outbreak*, *International Journal of Advanced Technology and Engineering Exploration*, **8**(74) (2021), 178 – 189.
- [5] A. SHAHZAD, R. HASSAN, A. Y. AREMU, A. HUSSAIN, R. N. LODHI: *Effects of COVID-19 in E-learning on higher education institution students: the group comparison between male and female*, *Quality & Quantity*, (2020).
- [6] L. MISHRA, T. GUPTA, A. SHREE: *Online teaching-learning in higher education during lockdown period of COVID-19 pandemic*, *International Journal of Educational Research Open*, **1** (2020), 100012.

- [7] S. MAITY, T. N. SAHU, N. SEN: *Panoramic view of digital education in COVID-19: A new explored avenue*, Review of Education, (2020).
- [8] A. P. AGUILERA-HERMIDA: *College students' use and acceptance of emergency online learning due to COVID-19*, International Journal of Educational Research Open, **1** (2020), 100011.
- [9] S. M. SHAHARUDIN, S. ISMAIL, M. L. TAN, N. S. MOHAMED, N. A. F. SULAIMAN: *Predictive Modelling of Covid-19 Cases in Malaysia based on Recurrent Forecasting-Singular Spectrum Analysis Approach*, International Journal of Advanced Trends in Computer Science and Engineering, **9**(1.4) (2020), 175 – 183.
- [10] N. A. F. SULAIMAN, S. M. SHAHARUDIN, N. H. ZAIN-
UDDIN, S. A. M. NAJIB: *Improving Support Vector Machine Rainfall Classification Accuracy based on Kernel Parameters Optimization for Statistical Downscaling Approach*, International Journal of Advanced Trends in Computer Science and Engineering, **9**(1.4) (2020), 652 – 657.
- [11] M. N. R. AYÁN, M. T. C. GARCÍA: *Prediction of University Students' Academic Achievement by Linear and Logistic Models*, The Spanish Journal of Psychology, **11**(1) (2008), 275 – 288.
- [12] R. R. RAJALAXMI, P. NATESAN, N. KRISHNAMOORTHY, S. PONNI: *Regression Model for Predicting Engineering Students Academic Performance*, International Journal of Recent Technology and Engineering (IJRTE), **7**(6S3) (2019), 71 – 75.
- [13] P. M. ARSAD, N. BUNYAMIN, J. A. MANAN: *Prediction of engineering students' academic performance using Artificial Neural Network and Linear Regression: A comparison*, Proceeding of the 2013 IEEE 5th Conference on Engineering Education (ICEED), (2013), 43 – 48.
- [14] S. J. H. YANG, O. H. T. LU, A. Y. Q. HUANG, J. C. H. HUANG, H. OGATA, A. J. Q. LIN: *Predicting Students' Academic Performance Using Multiple Linear Regression and Principal Component Analysis*, Journal of Information Processing, **26** (2018), 170 – 176.
- [15] P. K. SRIMANI, M. M. PATIL: *Regression Model for Edu-data in Technical Education System: A Linear Approach*, ICT and Critical Infrastructure: Proceedings of the 48th Annual Convention of Computer Society of India- Vol II, (2014), 785 – 793.

Creative Commons Attribution License 4.0 (Attribution 4.0 International , CC BY 4.0)

This article is published under the terms of the Creative Commons Attribution License 4.0

https://creativecommons.org/licenses/by/4.0/deed.en_US