EAI Endorsed Transactions
on e-Learning

Research Article EAI.EU

Analysis, Prediction and Maintenance of Teaching learning process based on empathize Students' View of attending Online/Regular Class

Vithya Ganesan[1,*], V. Govindarajan[2] and Pachipala Yellamma[3], Naren.J[4]

[1]Professor, Koneru Lakshmaiah Education Foundation, Green Fields, Vaddeswaram, Guntur District-522502, Andhra Pradesh, India, vithyamtech@gmail.com

[2]Assoc Professor, St.Joseph's Institute of Technology,Chennai,119,govicse15@gmail.com

[3]Assoc Professor, Koneru Lakshmaiah Education Foundation, Green Fields, Vaddeswaram, Guntur District-522502, Andhra Pradesh, India, pachipala.yamuna@gmail.com

[4]Research Scholar, Tamil Nadu, India. naren.jeeva3@gmail.com

Abstract

Learning models have been widely used in predicting diseases, disorders, behaviour aspects in human beings etc. The current research gives an analytical study on predicting University students' behaviour with various Machine Learning approaches. Research shows that Machine Learning approaches outwit the strategies especially in Student behaviour analysis. An analytical study on various learning approaches and its application in Behaviour Analysis is vividly presented in the paper. The study would give an understanding on how various learning approaches could be applied in Student Behaviour Analysis that includes academic performance, behavioural study with reference to courses, Online teaching modes etc. The paper also encompasses comparison with various Machine Learning approaches in student behavioural prediction.

Keywords: Adult learning, Data science applications in education, Distance education and online learning, Media in education, Pedagogical issues, Teaching/learning strategies, Student Behaviour Prediction

Received on 04 October 2020, accepted on 16 December 2020, published on 12 January 2021

doi: 10.4108/eai.12-1-2021.168090

*Corresponding author. Email: vithyamtech@gmail.com

1. Introduction

Deep Learning, an emerging research area has its usage in wide variety of applications starting from Health care to many other including Education. It is a subset in Machine learning in which model mimics the brain through the implementation of neural networks. Deep Learning encompasses Deep Neural networks (DNN), Recurrent Neural Networks (RNN), Convolutional Neural Networks (CNN) and Q Learning. Recurrent Neural Networks is a network which is used for handling time series data. It is a type of Artificial Neural Network where each unit is connected in a sequence and a directed graph is formed. The connections between each unit are in the form of a sequence. Each element performs the same task hence it is a Recurrent Neural network. Behaviour analysis on students is a general study done to check their academic performance. Automation of student activities in a University analyses and predicts students' performance and makes the relationship between them and academic activities [1]. Behavioural study also is the study of the mood with which an individual reacts with reference to content [2]. Similarly, online courses have led to drop-out of candidates through literature survey it is very evident [3]. Classroom atmosphere is also responsible for students' behaviour

which is predicted through their behaviour signals [4]. The situation during COVID 19 is that all classes which were happening at Universities have been made online which bridges several gaps between direct classes and online courses [5].

Current analysis of the behaviour is of utmost importance in today's scenario for several reasons and hence the paper focuses on the same Section II represents Student Behaviour Analysis Study, Section II elucidates the Deep Learning application in Behavioural Analysis, Section III contains results and discussion and finally concludes with Section IV Conclusion and future work.

2. Student Behavioural Analysis Study

Student behaviour analysis before and during COVID 19 being the proposed work helps to identify the attention levels of students. Here an exhaustive literature survey on student behaviour analysis has been carried out.

Famram Ali Khan, et.al elucidated the understanding of teachers on students in an online learning environment with reference to their affective states, learning styles, student learning preferences. [6] Xiang et.al described that students' academic performance is related to other behaviour factors especially the way internet is being used. [7] Hafed et.al analysed that students' behaviour could be identified with their involvement in social media like Facebook in which data was collected during the learning session. [8] Sujit Kumar Gupta et.al elucidated the study of students' behaviour through a face detection method for analysing the content of videos. [9] Yang et.al proposed that with the students' in-classroom behaviour helps in evaluating the efficiency of teaching which teachers do at class. The evaluation is done by detecting students' faces, head raising or downing faces, the head orientations of the teacher, the extraction of the audio features of the teachers' speech. [10].

2.1. Machine Learning in Behavioural Analysis

Machine Learning is widely used in the study of students' behavioural analysis. The analysis done on students includes models which can be applied on secondary school students to seek admission in Universities where the relationship between cognitive and psychological variables are taken into consideration for depicting the performance of secondary school students in academics by using Artificial Neural networks approach. [11],[14] Analysis could be done on various factors that would influence academic performance like marks in the degrees obtained, home environment, Study learning habits, hardworking nature, academic interaction, stress level, level of friendship with group members and level of mental relaxation using artificial neural networks. [12],[13].

So, Feature selection method with more optimal feature subset which gives higher accuracy in prediction is required in analysis[15][16] specifically to identify lack of sitting tolerance, lack of attention, learning disability[17][18].

3. Architectural Framework

Figure 1 shows the architectural model of behavioural data analytics.

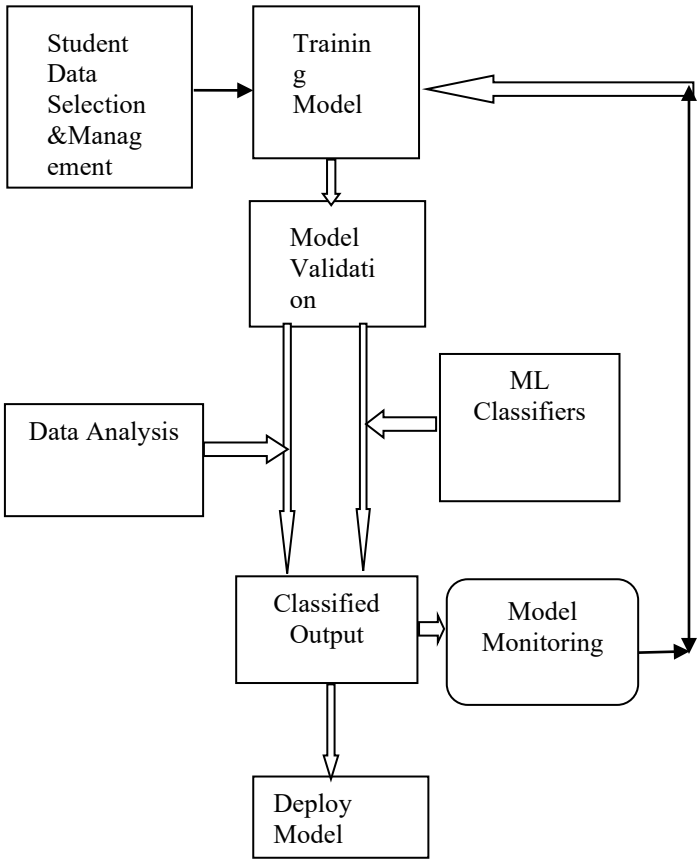

Figure 1. Architectural Framework Model

3.1. Pre-processing

Data Pre-processing is a process of making a raw data into an understandable format. There are various ways in which data can be pre-processed. Five step process to analysis the Teaching learning process either online or Regular classes

1. Empathize students thought, understand their learning habit, and discover students hidden talents.
2. Define the strategies of Teaching learning process needs.
3. Evaluate /ideate the concepts.
4. Develop a model/prototype design for learning process.
5. Test the results by feedback or validation.

The following sections explain the design process in teaching learning methodology.

3.1.1 Empathize students thought, understand their learning habit, and discover students hidden talents.

It is by observe, interview and collecting questionnaires from students. Data is collected by the following.

I.Flooding the questionnaires

II.Simple observation

III.Shadowing

I. Flooding the questionnaires

The following are the questionnaire asked in the Google form:

https://docs.google.com/forms/d/e/1FAIpQLSe-39GyeC7T4PCFajLFCNL0XV0nCxpXj2iNAnaKOZYSRev1gw/viewform?vc=0&c=0&w=1

1. Reasons to support regular theory classes (offline) at College/University with options as More Understanding, User friendly doubt clearance, More faculty interaction, Peer group discussion.
2. Reason for your comfortability in regular theory (offline) classes with options as Socialization, Time Bounded work, Counselling and Mentoring, Way of Learning
3. Suggestion for Online Practical Class teaching as Post Material Sharing, Experiment demo, Error checking and correction, Discussion forums and FAQs, Program Repository, Not Possible
4. Reasons for Comfortability at online classes with option as Understanding, Time Bounded work, Not Using Gadgets, Way of Learning
5. Name the activity/hobby you take part/do apart from Academics as Sports/Games, Cultural, Social Activities like NSS
6. Percentage of time Spent on activity/hobby apart from academic work before COVID 19 with options as 75 – 100, 50 – 75, 25 – 50, 0 – 25
7. Percentage of time Spent on activity/hobby apart from academic work during COVID 19 with options as 75 – 100, 50 – 75, 25 – 50, 0 – 25
8. Percentage of time spent on academic work done during COVID 19 with options as 75 – 100, 50 – 75, 25 – 50, 0 – 25
9. Preferred Mode of Study for the year 2021with options Regular direct classroom teaching, Online, Flip Classes, Part - Time

II. Simple observation:

Become one of them or work alongside with leaners and mechanical observation like eye tracking to improve the teaching learning process.

III. **Shadowing**:

Watch or keep track on leaners learning habits.

3.1.2 Define the strategies of Teaching learning process needs.

Online class strategies of Teaching learning process needs:

Online consciousness live status, Recording of Live Class, creating a timetable & conducting Multiple session concurrently, Administration of Quality of classes with various reports for management, Muting student's mic & allowing one by one, Raising hand

Regular Class strategies of Teaching learning process needs:

Continuous Evaluation, Home Assignment, surprise quiz, Tutorial, Hackathon, Field Study review, prototype review, Group discussion, industry connection program, global certification, promote to poster presentation, Leader board ranking for global challenges, Capstone project, paper publication, presentation, exercise

Flipped Class: It is a hybrid class, combination of online and regular class.

3.1.3 Evaluate /Ideate the concepts.

Online class: Hands-on of Techniques for Interactive Online Sessions

1. Idea Spinner
2. Cross Word
3. Polling
4. Cubing
5. Four Quadrants
6. Whip Around
7. Q&A Platform

Regular Class: Promote poster presentations, Leader board ranking for global challenges, Capstone project, paper publication, presentation, exercise.

3.1.4. Develop a model / prototype design for learning process.

Table 1. Feedback analysis Report

Preliminary Feedback Analysis Report				
sl.	**Feedback Received**	**Person Responsible**	**Action taken**	**Remark**
1	An advance intimation of course activity timeline is needed to avoid last minute confusion regarding registration	Class handler	shared through Mail, Social media, Cell phone	Faculty mentors should sensitize the same to students
2	A particular topic which can be explained in 1 session is dragged for 3 sessions. Time is not optimized properly. Also, the pace of delivering content is slow, as a results learner gets bored	Class handler	Ensure proper engagement of students through the tasks and enhance the use of other online tool support	Faculty mentors should motivate the students on the tasks assigned

3.1.5 Test the results by feedback or validation

	Percentage of time Spent on activity/hobby apart from academic work before COVID 19	Percentage of time Spent on activity/hobby apart from academic work during COVID 19	Percentage of time spent on academic work done before COVID 19	Percentage of time spent on academic work done during COVID 19
count	222.000000	222.000000	222.000000	222.000000
mean	47.459459	51.891892	64.945946	49.801802
std	24.243985	22.507656	20.245702	24.132297
min	0.000000	10.000000	12.000000	9.000000
25%	26.000000	30.000000	60.000000	29.000000
50%	46.000000	60.000000	70.000000	48.000000
75%	70.000000	70.000000	80.000000	70.000000
max	99.000000	99.000000	99.000000	99.000000

Figure 2. Data analysis of student activity

Table 1 explains the feedback analysis report. Figure 2 shows the data analysis of student activity. Figure 3. Shows the Multicollinearity of student data analysis.

	Percentage of time Spent on activity/hobby apart from academic work before COVID 19	Percentage of time Spent on activity/hobby apart from academic work during COVID 19	Percentage of time spent on academic work done before COVID 19	Percentage of time spent on academic work done during COVID 19
Percentage of time Spent on activity/hobby apart from academic work before COVID 19	1.000000	0.163690	-0.037433	-0.019906
Percentage of time Spent on activity/hobby apart from academic work during COVID 19	0.163690	1.000000	0.172281	0.045021
Percentage of time spent on academic work done before COVID 19	-0.037433	0.172281	1.000000	0.204405
Percentage of time spent on academic work done during COVID 19	-0.019906	0.045021	0.204405	1.000000

Figure 3. Multicollinearity of student data analysis

4. Results and discussion

Figure 4. shows the Confusion Matrix of student behaviour data, Figure 5,6 shows the time spent during COVID 19 and Figure 7,8 shows the time spent on before pandemic.

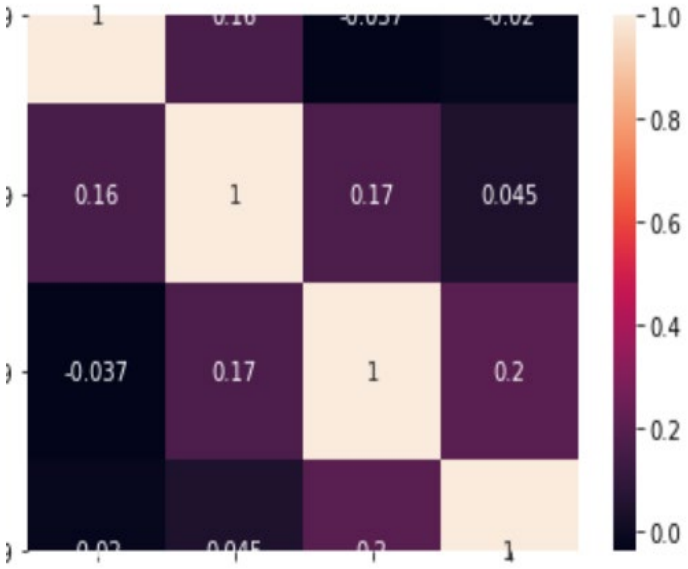

Figure 4. Confusion Matrix of student behaviour data

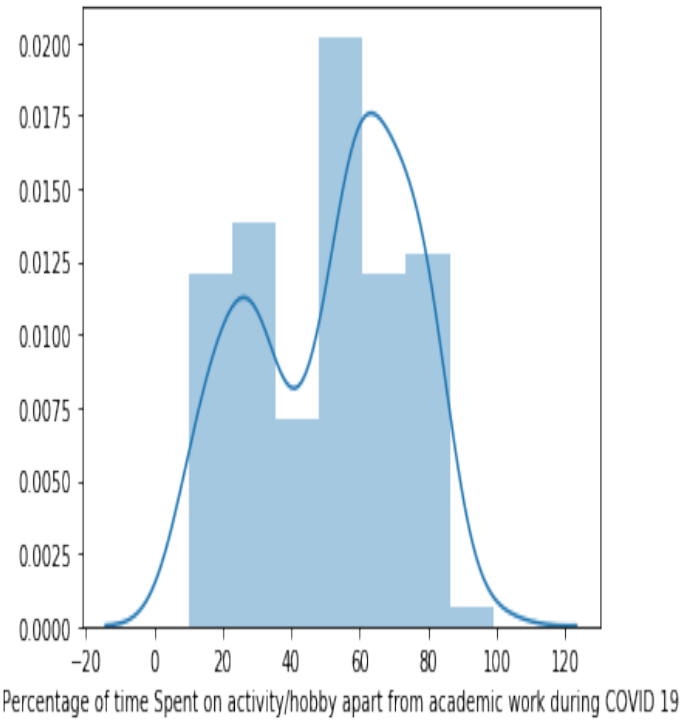

Figure 5. Time spent on activity during COVID 19

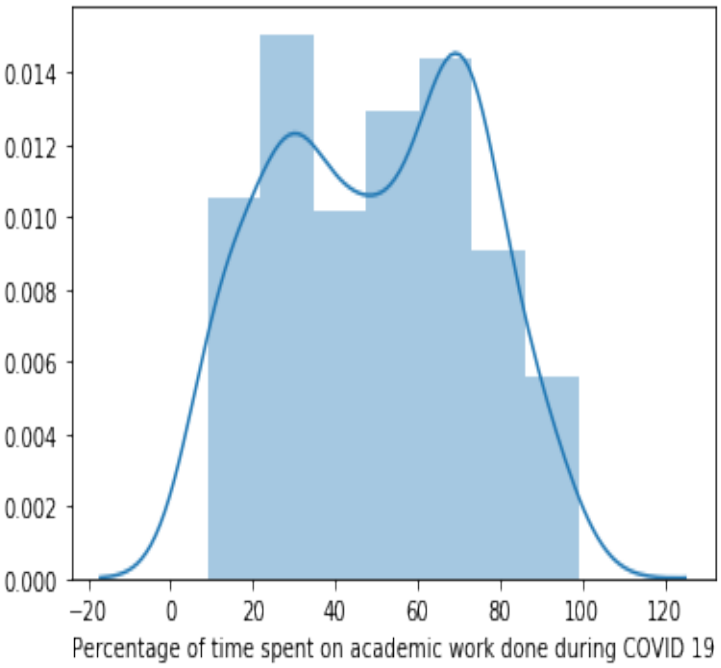

Figure 6. Time spent on academic during COVID 19.

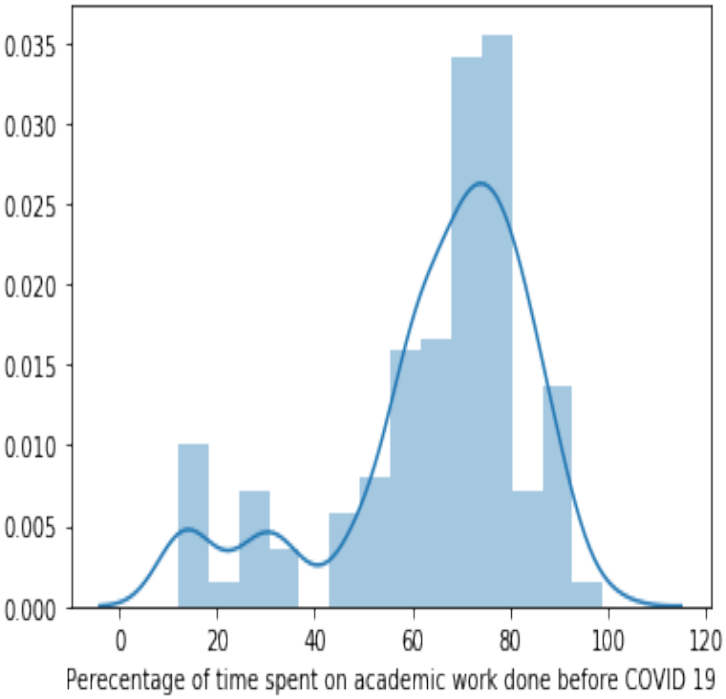

Figure 7. Time spent on academic before COVID 19

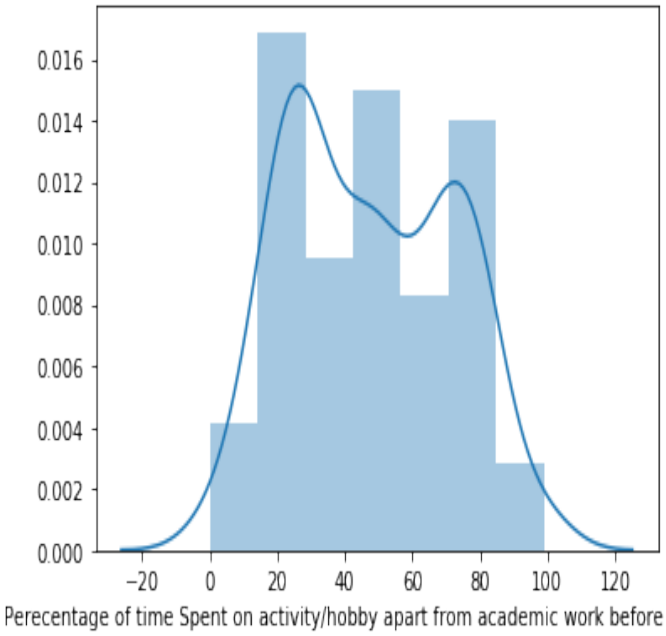

Figure 8. Time spent on activity before COVID 19.

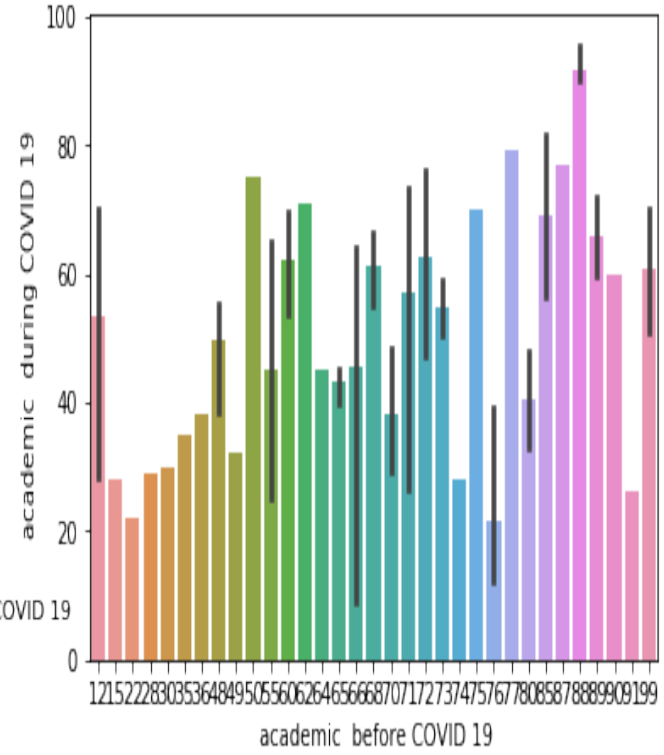

Figure 10. Academic before vs during COVID 19'

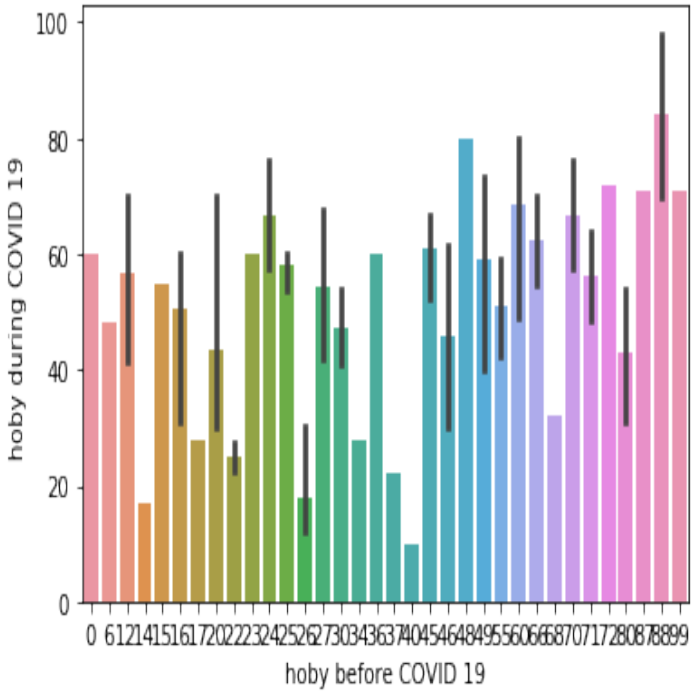

Figure 9. Hobby before vs during COVID 19

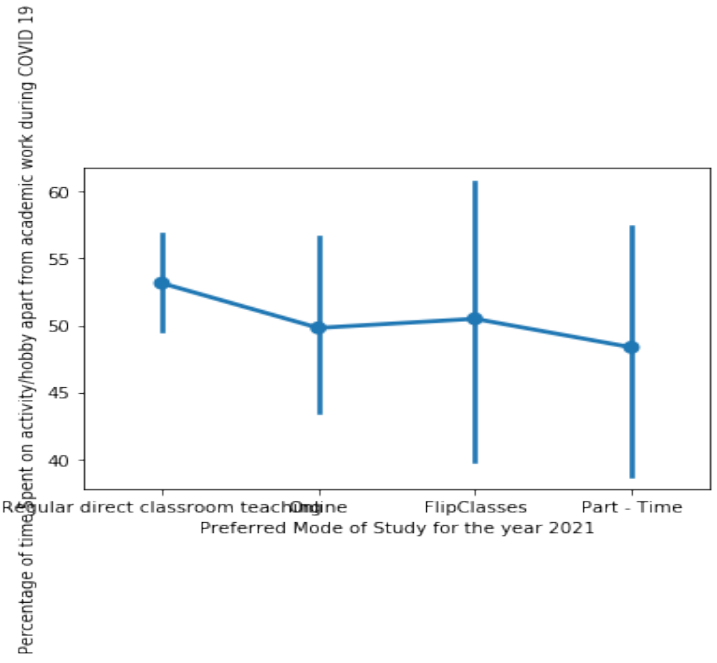

Figure 11. Preferred Mode of Study for the year 2021

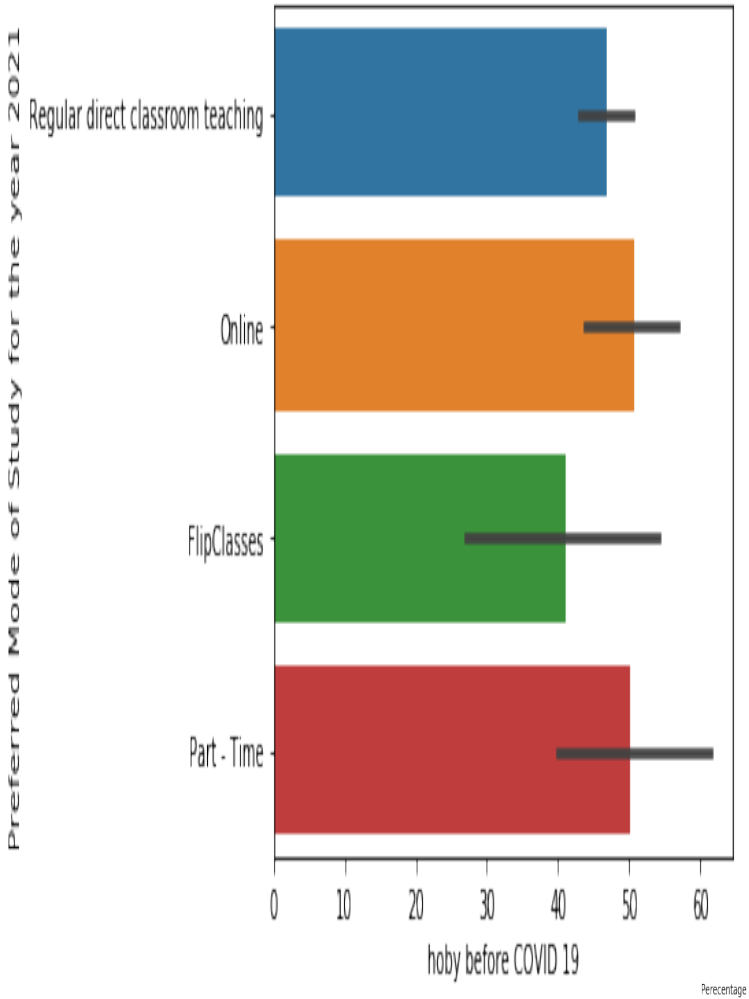

Figure 12. Mode of Study for the year 2021

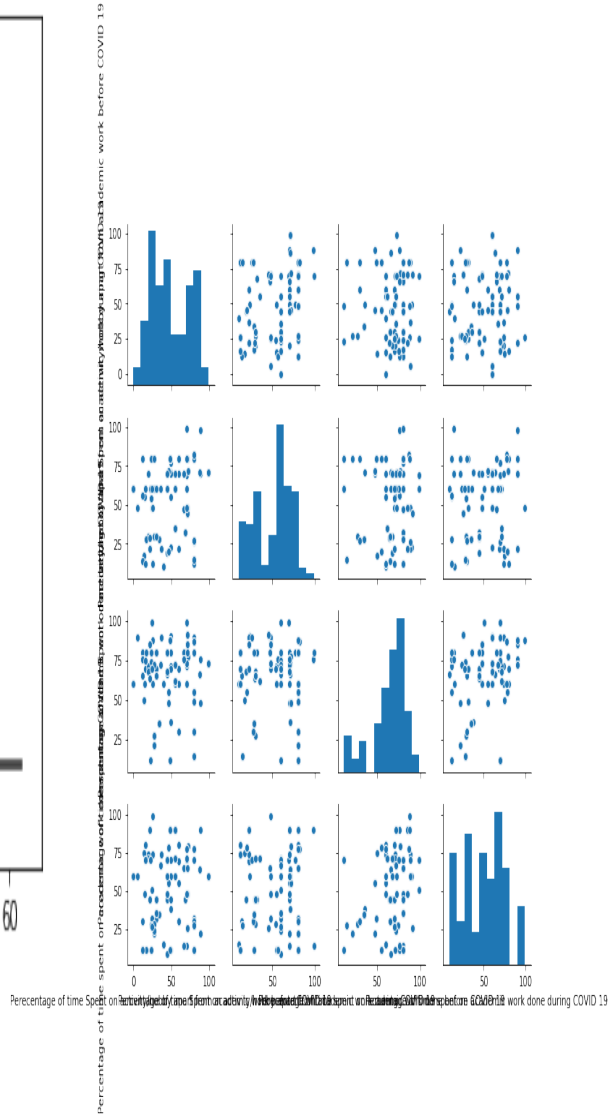

Figure 13. Layout for Teaching learning process

Figure 9,10 shows the academic activity before and during COVID19 pandemic periods. Figure 11,12 shows the mode of study for the year 2021.

Figure 13 shows the layout for teaching and learning process and Figure 14 shows the teaching learning process based on student's view of attending.

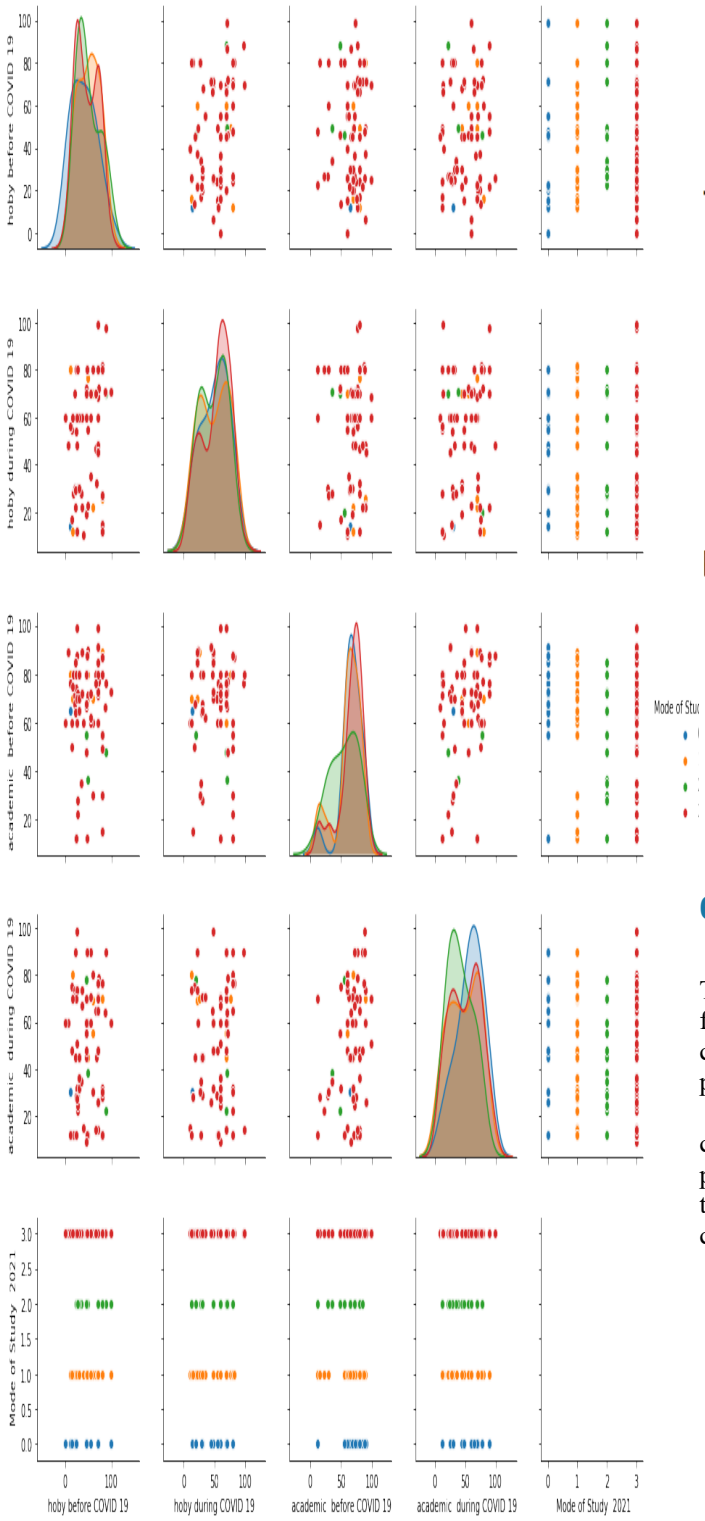

Figure 14. Teaching learning process based on Students' View of Attending

Table 2. Classification report of the model

The Classification Report of this Model

	precision	recall	f1-score	support
FlipClasses	0.00	0.00	0.00	5
Online	0.00	0.00	0.00	5
Part - Time	0.00	0.00	0.00	2
Regular direct classroom teaching	0.74	0.97	0.84	33
accuracy			0.71	45
macro avg	0.19	0.24	0.21	45
weighted avg	0.55	0.71	0.62	45

6. Conclusion

The demographic shows the insight of students thought, feelings, likes, Attitude, fear, habit, hobby, influence, and constraints. Machine Learning classifiers with a high-performance accuracy for training and evaluation.

From the set of data, most of them likes regular classroom is their preferred Mode of Study for the year 2021. It is shown by the real data analysis and waiting for to attend regular classes.

References

[1] Rastrollo-Guerrero, J. L., Gómez-Pulido, J. A., & Durán-Domínguez, A. (2020). Analyzing and predicting students' performance by means of machine learning: A review. *Applied Sciences (Switzerland)*, *10*(3). https://doi.org/10.3390/app10031042

[2] Sultana, J., Usha Rani, M., & Farquad, M. A. H. (2019). Student's performance prediction using deep learning and data mining methods. *International Journal of Recent Technology and Engineering*, *8*(1 Special Issue 4), 1018–1021.

[3] Heinsfeld, A. S., Franco, A. R., Craddock, R. C., Buchweitz, A., &Meneguzzi, F. (2018). Identification of autism spectrum disorder using deep learning and the ABIDE dataset. *NeuroImage: Clinical*, *17*, 16-23.

[4] Ibrahim, S., Djemal, R., & Alsuwailem, A. (2017). Electroencephalographies (EEG) signal processing for epilepsy and autism spectrum disorder diagnosis. *Biocybernetics and Biomedical Engineering*, 1-11.

[5] Subbaraju, V., Sundaram, S., Narasimhan, S., & Suresh, M. B. (2015). Accurate detection of autism spectrum disorder from structural MRI using extended metacognitive radial basis function network. *Expert Systems with Applications*, *42*(22), 8775-8790.

[6] Trambaiolli, L. R., BiazoliJr, C. E., Balardin, J. B., Hoexter, M. Q., & Sato, J. R. (2017). The relevance of feature selection methods to the classification of obsessive-compulsive disorder based on volumetric measures. *Journal of Affective Disorders*, *222*, 49-56.

[7] Erguzel, T. T., Ozekes, S., Sayar, G. H., Tan, O., &Tarhan, N. (2015). A hybrid artificial intelligence method to classify trichotillomania and obsessive-compulsive disorder. *Neurocomputing*, *161*, 220-228.

[8] Trambaiolli, L. R., Spolaôr, N., Lorena, A. C., Anghinah, R., & Sato, J. R. (2017). Feature selection before EEG classification supports the diagnosis of Alzheimer's disease. *Clinical Neurophysiology*, *128*(10), 2058-2067.

[9] Schouten, T. M., Koini, M., de Vos, F., Seiler, S., de Rooij, M., Lechner, A., ...&Rombouts, S. A. (2017). Individual classification of Alzheimer's disease with diffusion magnetic resonance imaging. *NeuroImage*, *152*, 476-481.

[10] Suk, H. I., Lee, S. W., Shen, D., &Alzheimer's disease Neuroimaging Initiative. (2017). Deep ensemble learning of sparse regression models for brain disease diagnosis. *Medical image analysis*, *37*, 101-113.

[11] Sotoodeh, M. S., Arabameri, E., Panahibakhsh, M., Kheiroddin, F., Mirdoozandeh, H., &Ghanizadeh, A. (2017). Effectiveness of yoga training program on the severity of autism. *Complementary Therapies in Clinical Practice*, *28*, 47-53.

[12] Cramer, H., Anheyer, D., Lauche, R., &Dobos, G. (2017). A systematic review of yoga for major depressive disorder. *Journal of Affective Disorders*.

[13] DeCaro, D. S., & Brown, J. L. C. (2016). Laughter Yoga, Adults Living With Parkinson′ s Disease, and Caregivers: A Pilot Study. *Explore: The Journal of Science and Healing*, *12*(3), 196-199.

[14] Chaitra N., Dr. P. A. Vijaya (2016). Pattern Classification of Autistic Individuals using Brain Imaging Data: A Review, International Journal of Advanced Research in Computer Science and Software Engineering 6(6), 114–119.

[15] Lung Chuin Cheong, RubitaSudirman and SitiSurayahussin, (2015) Feature Extraction of EEG Signal using Wavelet transform for Autism Classification, 10(19), *2016*(Special Issue 2), S237–S250.

[16] Tejeswinee, K., Shomona, G. J., &Athilakshmi, R. (2017). Feature Selection Techniques for Prediction of Neuro-Degenerative Disorders: A Case-Study with Alzheimer's And Parkinson's Disease. *Procedia Computer Science*, *115*, 188-194.

[17] Mooventhan, A., &Nivethitha, L. (2017). Evidence based effects of yoga in neurological disorders. *Journal of Clinical Neuroscience*.

[18] Narasingharao, K., Pradhan, B., &NAvANeethAM, J. (2016). Sleep disorder, gastrointestinal problems and behaviour problems seen in autism spectrum disorder children and yoga as therapy: a descriptive review. *Journal of clinical and diagnostic research: JCDR*, *10*(11), VE01.