Analysis, Prediction and Maintenance of Teaching learning process byEmpathize Students' View

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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

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].

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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.

The understanding of teachers on students in an online learning environment with reference to their affective states, learning styles, student learning preferences is important to follow padegogy way [6].The students' academic performance is related to other behaviour factors especially the way internet is being used[7].Students' behaviour could be identified with their involvement in social media like Facebook in which data was collected during the learning session[8].Students' behaviour through a face detection method for analysing the content of videos[9].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].

3Machine Learning in the study of 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][13]. 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 using artificial neural networks[12][14].

4Architectural Framework

4.1 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

Figure 1. explain the architectural framework of learning model to portrait the teaching learning process.

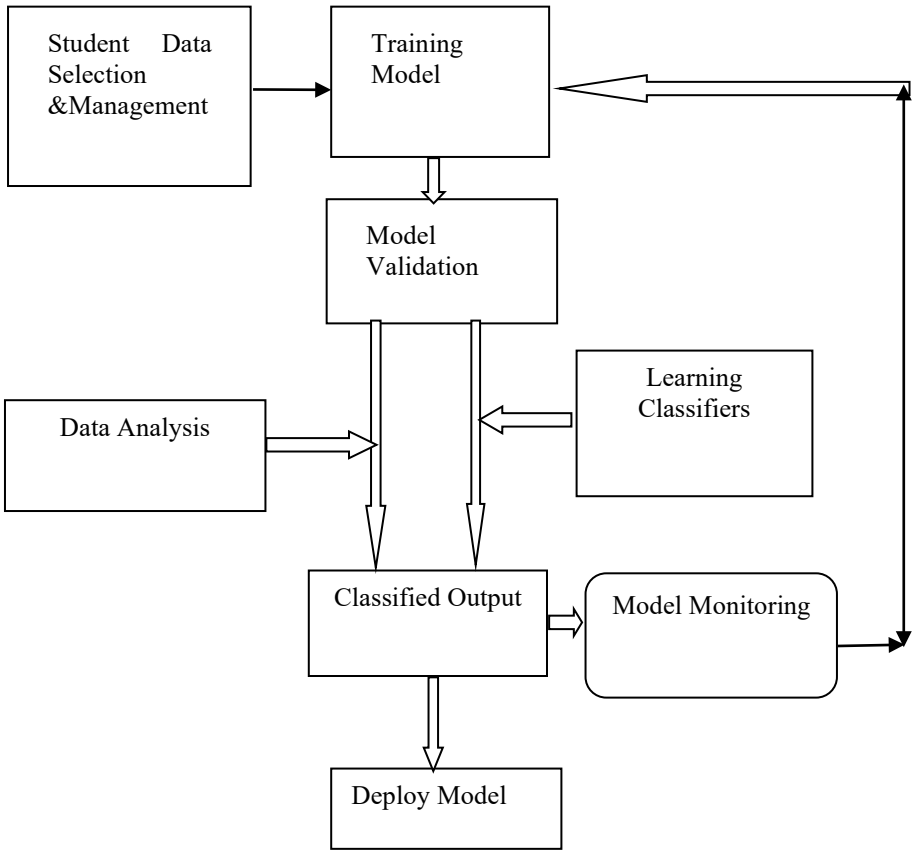

Fig. 1. Architectural Framework of Learning Model

4.1.1Empathize 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

- 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.
- Reason for your comfortability in regular theory (offline) classes with options as Socialization, Time Bounded work, Counselling and Mentoring, Way of Learning
- Suggestion for Online Practical Class teaching as Post Material Sharing, Experiment demo, Error checking and correction, Discussion forums and FAQs, Program Repository, Not Possible
- Reasons for Comfortability at online classes with option as Understanding, Time Bounded work, Not Using Gadgets, Way of Learning
- Name the activity/hobby you take part/do apart from Academics as Sports/Games, Cultural, Social Activities like NSS
- 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
- 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
- Percentage of time spent on academic work done during COVID 19 with options as 75 – 100, 50 – 75, 25 – 50, 0 – 25
- 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

4.1.2Define 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, Leaderboard ranking for global challenges, Capstone project, paper publication, presentation, exercise

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

4.1.3 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, Leaderboard ranking for global challenges, Capstone project, paper publication, presentation, exercise

4.1.4Develop a model / prototype design for learning process

The sample feedback analysis report is tabulated in the following Table 1

Table 1. Feedback analysis Report

Preliminary Feedback Analysis Report				
S.No	**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 another online tool support	Faculty mentors should motivate the students on the tasks assigned

4.1.5Test the results by feedback or validation

Percentage of time Spent on activity/hobby apart from academic work before COVID 19 , time Spent on activity/hobby apart from academic work during COVID, time spent on academic work done during COVID 19, Preferred Mode of Study for the year 2021with options Regular direct classroom teaching, Online, Flip Classes, Part – Time data are analyzed by mean ,quartile, minimum, maximum for identifying the student activity is analyzed in **Figure 2.**

	Perecentage 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	Perecentage 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	24.243965	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

Fig.2. Data analysis of student activity

Multicollinearity of student data analysis is shown in the following fig 3

	Perecentage 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	Perecentage of time spent on academic work done before COVID 19	Percentage of time spent on academic work done during COVID 19
Perecentage 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
Perecentage 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

Fig .3. Multicollinearity of student data analysis

5Results and discussion

Confusion Matrix of student behaivour data is shown in**Figure 4.**

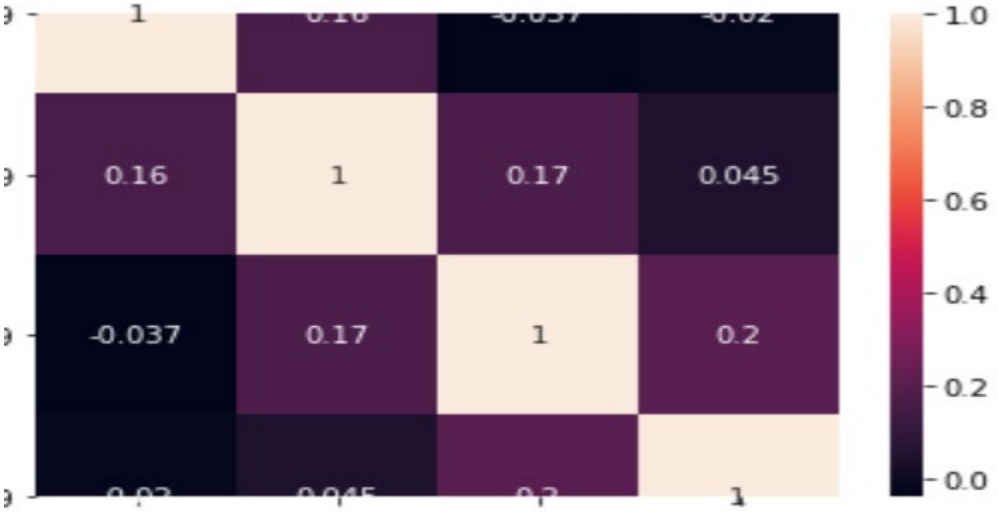

Fig. 4. Confusion Matrix of student behaivour data

Time Spent on activity/hobby apart from academic work during COVID 19 is shown in **Figure 5** and time spent on academic work done during COVID 19 is shown in **Figure 6.**

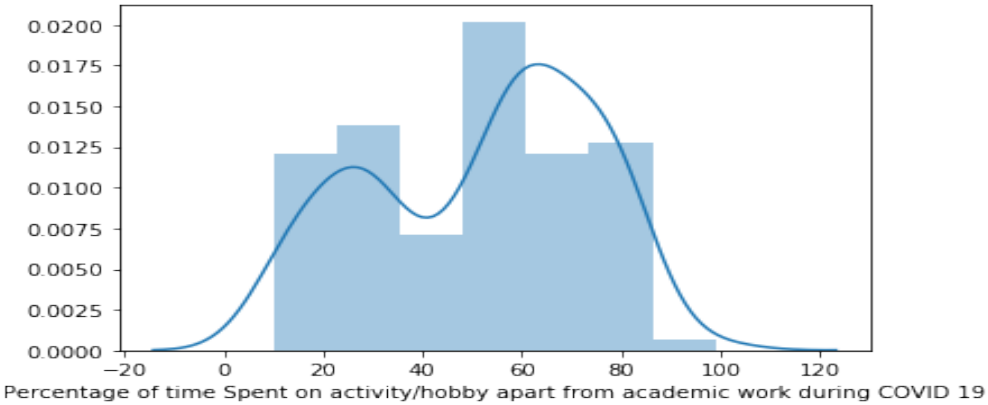

Fig.5. Time Spent on activity/hobby apart from academic work during COVID 19

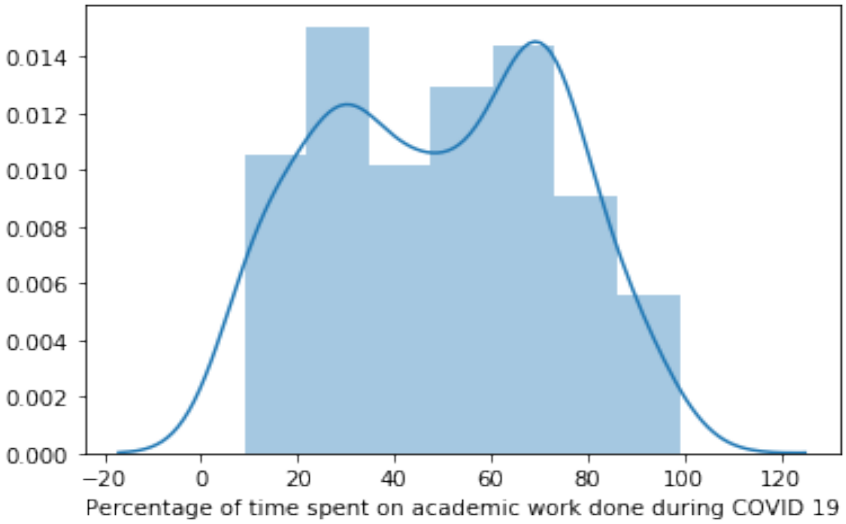

Fig 6. Time spent on academic work done during COVID 19

Time Spent on activity/hobby apart from academic work before COVID 19 is shown in **Figure 7** and Time spent on academic work done before COVID 19 is shown in **Figure 8**

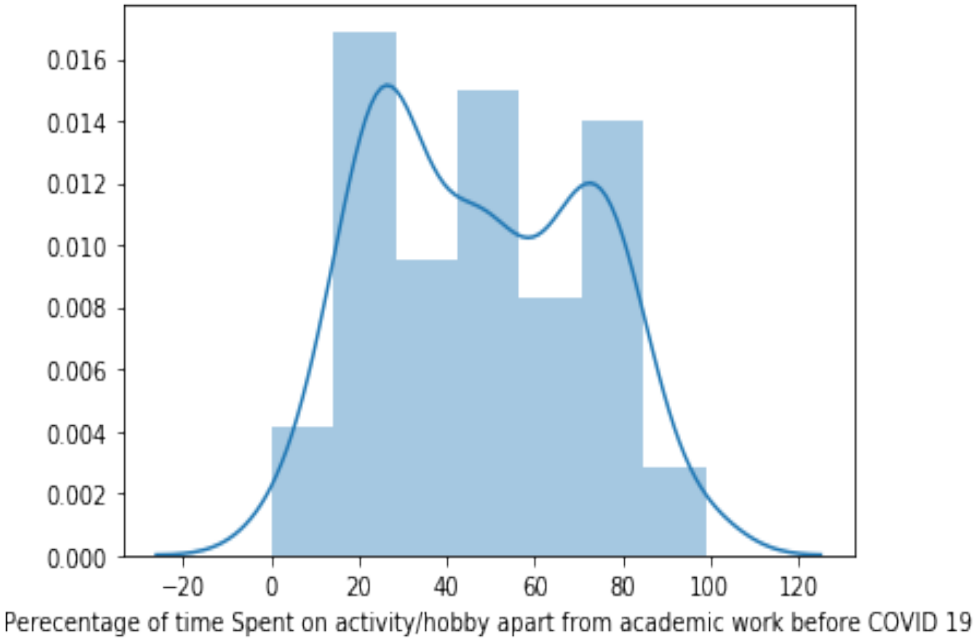

Fig.7.Time Spent on activity/hobby apart from academic work before COVID 19

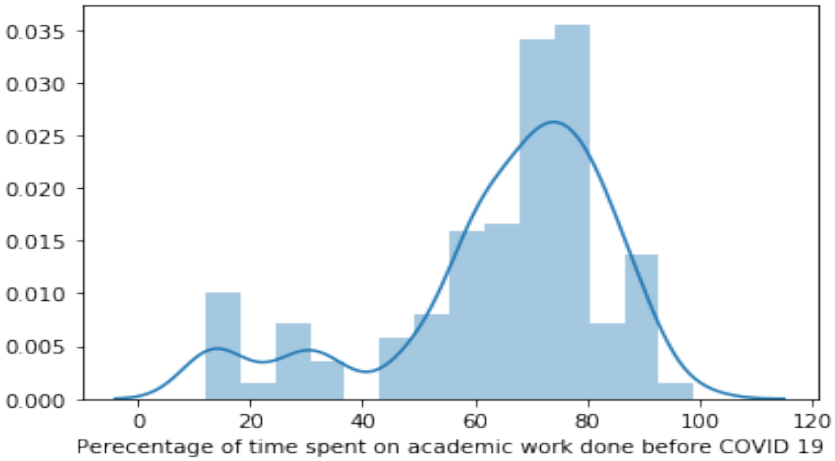

Fig 8. Time spent on academic work done before COVID 19

Hobby before COVID 19'vs 'hobby during COVID 19' is shown in **Figure. 9** and Academic before COVID 19' vs ' academic during COVID 19 is shown in **Figure 10**

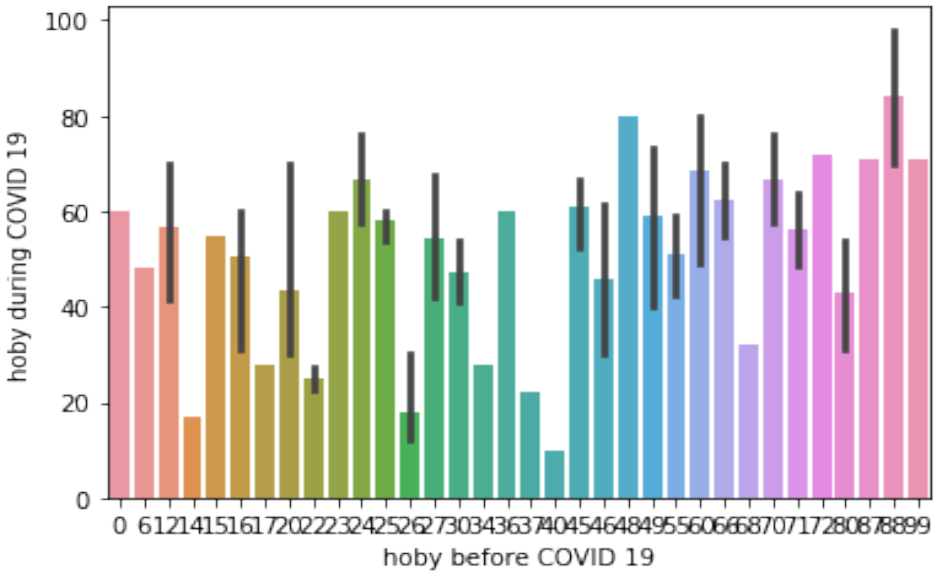

Fig 9. Hobby before COVID 19'vs 'hobby during COVID 19'

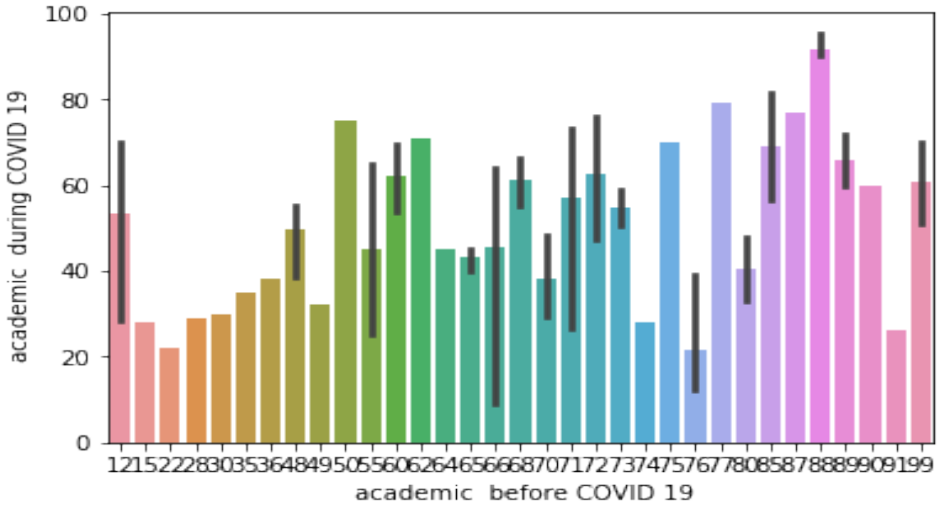

Fig 10.Academic before COVID 19' vs ' academic during COVID 19

point plot graph for Preferred Mode of Study for the year 2021 is represented in **Figure 11** and Preferred Mode of Study for the year 2021 is shown in **Figure 12**

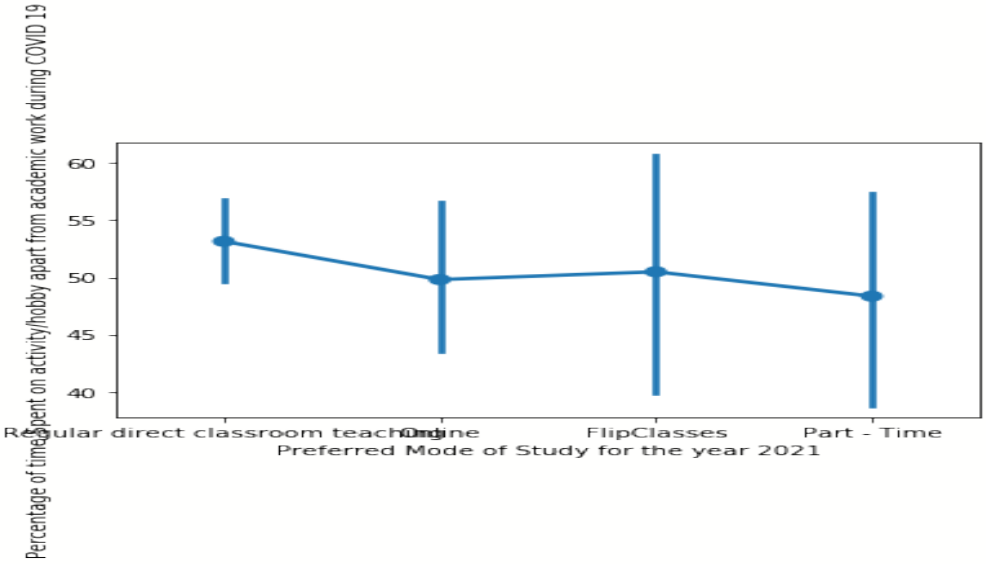

Fig.11 Point plot graph for Preferred Mode of Study for the year 2021

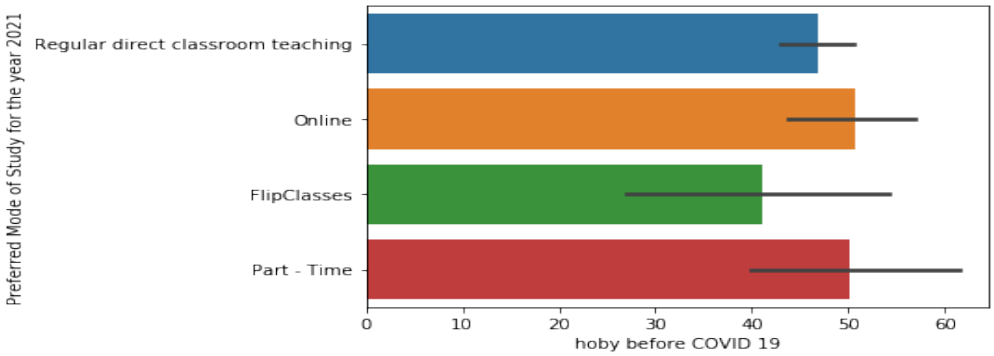

Fig 12. Preferred Mode of Study for the year 2021

Layout design for Teaching learning process is shown in **Figure 13** and Teaching learning process based on Students' View of Attending is shown in **Figure 14**. Classification report of the model is tabulated in Table 2.

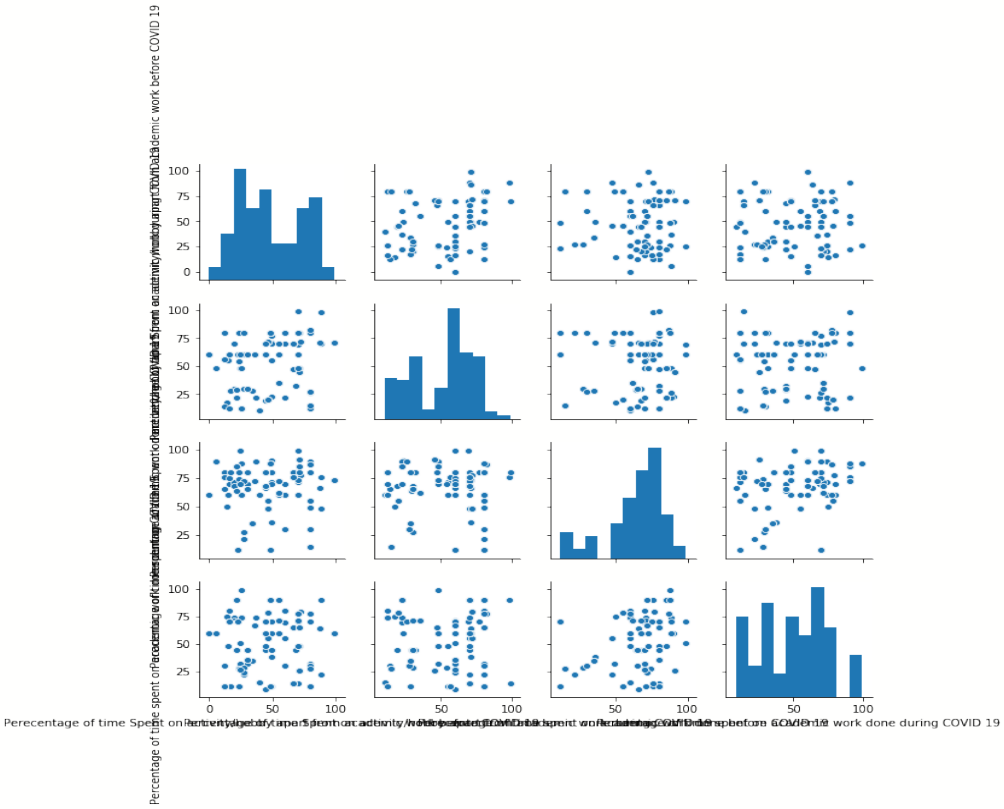

Fig 13. Layout design for Teaching learning process

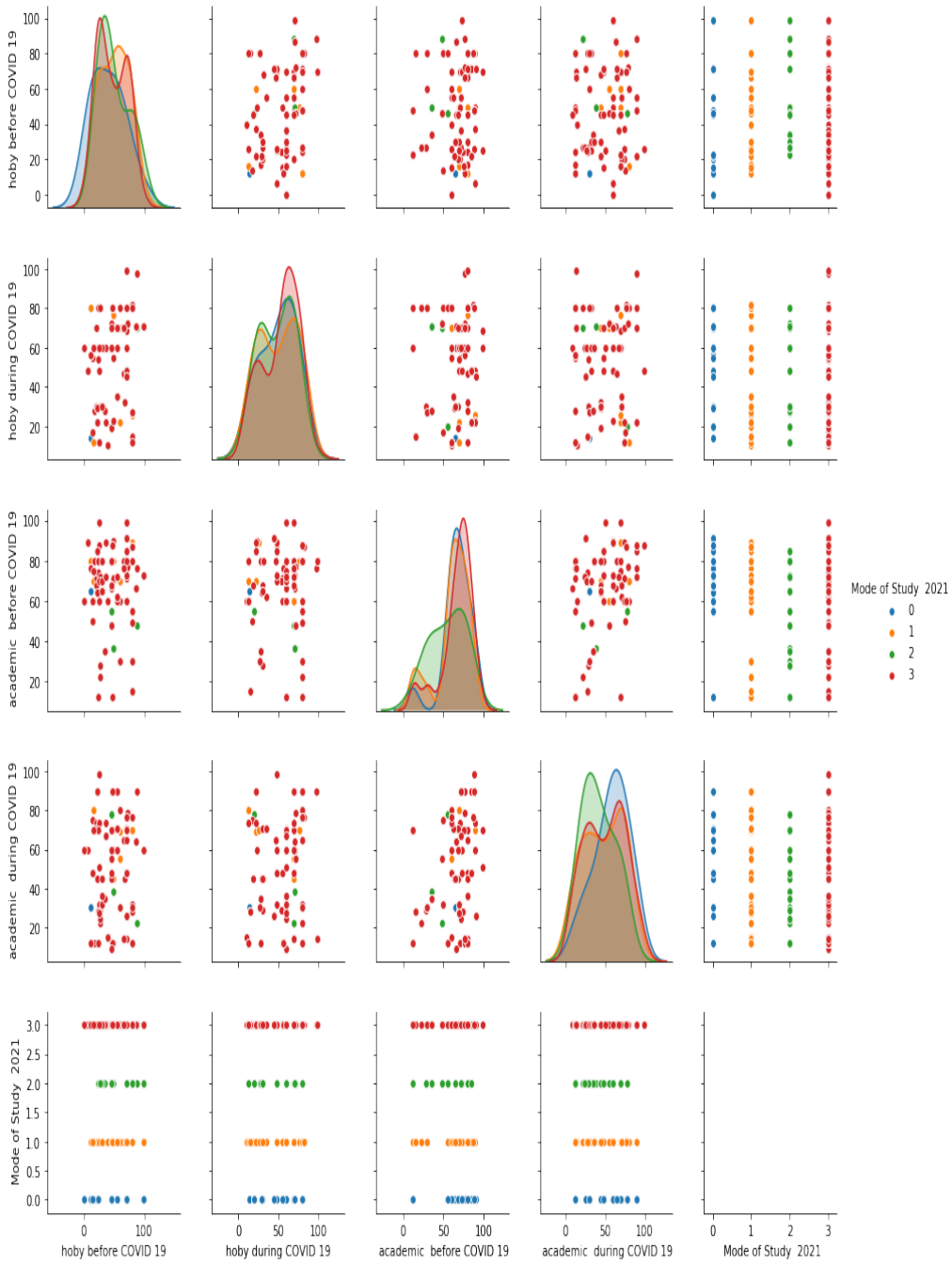

Fig 14. Teaching learning process based on Students' View of Attending

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

6Conclusion

This demographic article 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.

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