THE POSSIBLE CRUCIAL IMPACT OF COVID-19 OUTBREAK ON WORLDWIDE EDUCATION SYSTEM: PREDICTIVE MODEL THROUGH DATA MINING METHOD

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Abstract: The outbreak of COVID-19 as a global pandemic has affected several walks of life including the education sector in a global scale. With the seizure of the standard approach of physical classes, internet-based alternative approach of teaching-learning strategy has been employed to continue the academic curriculum. This work is based on the study of the student feedback from the internet-based education policy. In this paper we have presented an approach to analyse the feedback by calculating the modularity of the responses as an optimisation of data mining techniques. Further we have presented the modularity graphs for each of the question used in the survey individually as a strategy analyse the responses from the students about their feedback and opinion regarding the implementation of alternative teaching-learning approach, that may be considered as a useful tool to analyse the student satisfaction level index.

Keywords: COVID-19; education sector, data mining, modularity, student, student satisfaction level.

Introduction:

The impact of the global pandemic COVID-19 has severely affected various walks of our lives worldwide. One of the most challenging aspects of them was to maintain the academic curriculum of the global student community. With the increasing rate of the patients and overflowing hospitals, the struggle to live somehow in many cases surpassed the need to maintain the academic calendar. As Bhutan closed down the standard physical mode of teaching-learning method on March6, 2020, most of the nations implemented the same to their education sectors. Many of the schools, colleges and universities were locked down and then the need to implement an alternative aspect to continue the curriculum became necessary. With the provision of internet-based teaching-learning strategy, the continuity of the academics was maintained. There as well students and educators around the globe faced several challenges. This work primarily focuses on the outcome of the implementation of the internet-based education during the trying times of COVID-19 pandemic. Primarily we have

analysed and studied the existing works on this field to understand the areas that have been or being covered now to study the impact of the pandemic on the global academics. Furthermore, experimentally we have proposed a method to analyse the outcome of the new implemented alternative method of teaching-learning experience. With the help of a dataset, we have made an effort to analyse the student satisfaction level index by calculating the modularity for the students of higher education sector.

Background Study:

The teaching-learning experience for the students and the educators are to some extent is dependant upon the psychological mindset of the implementation strategy of teaching. The standard approach and mindset for both the parties in this case is the physical conduct of the classes. Ms. Toshika Pareek, Dr. Kiran Soni[1] in their work have very efficiently portrayed the impact of the seizure of that standard approach. Complete lockdown of the educational institute has severely damaged the learning as well as teaching mindset of the students and the educators.

On the other hand, Marko Teräs et.al [2] in their work have presented the dire situation of the educational institutes with respect to the disruption of the academic calendar and curriculum. Complete closure of the institutes led to the disruption of the regular examination schedules, class work curriculum and lesson plans. With the disruption the in the regular curriculum around 1.6 billion learners over 200 countries were seriously affected. As the alternative approach of internet-based education was adapted several challenges came up to be managed. Broadly they can categorised in to the following,

1. Accessibility
2. Affordability
3. Flexibility
4. Learning pedagogy
5. Life-long learning
6. Educational policy.

On the bright side, Hanan E. Abdelkader et.al [3] in their work have proposed a very unique approach to analyse the student satisfaction level, by implementing data mining approach. From the dataset collected from the students as a survey they first implemented the feature selection approach to further classify the data using standard data mining techniques of data optimisation. They have used k-nearest neighbour and support vector machine to analyse the credentials to produce the different cardinalities with respect to prediction accuracy. Their work managed to reduce the feature size to 80% with prediction accuracy up to 100%.

Methodology:

As a standard definition we know data mining as a technique to sort and analyse a set of data to identify a pattern considering the inter-relationships that exist within the dataset [4]. The work focuses on the study of the feedback from the students in order to analyse the impact of COVID-19 on their academic curriculum. The objective of the work can be efficiently done by the implementation of the standard techniques of data mining. As the work is primarily based on the experimental approach of the proposed algorithm, the considered dataset is not a firsthand data. A dataset of 500 entries based on a survey run in the university of Bangladesh has been taken to implement the proposed algorithm [5]. From the set of data, a set of networks is generated on the basis of the questionnaire and the attributes of the dataset. The work individually has analysed the questions provided during the survey for all the students. The students belong to three broad sections namely Arts, Law and Business.

The modularity of the dataset is calculated individually for every question, which has given us the idea of the students' opinion for individual cases, that the questions have covered. The modularity calculation for the dataset plays the prime role in the complete process as it provides an apt optimisation for the set and allows us to study the community structures that can be derived from the dataset. The modularity for each of the questions will be calculated through the standard method as,

$$Q = \frac{1}{2m}\sum_{ij}(A_{ij} - \gamma\frac{k_i k_j}{2m})\delta(c_i, c_j)$$

Where A is the adjacency matrix of the graph, m is the number of edges, k_i is the degree of i, γ is the resolution parameter and value of $\delta(c_i, c_j)$ depends on the existence of any edge between i and j [6][7].

Result and Discussion:

The questions on which the survey was run are,

1. What was your expectation about the University as related to quality of resources?
2. What was your expectation about the University as related to quality of learning environment?
3. To what extent your expectation was met?
4. What are the best aspects of the program?
5. In your opinion, the best aspect of the program is what?
6. In your opinion, the next best aspect of the program is what?
7. What aspects of the program could be improved?
8. Do you feel that the quality of education improved at EU over the last year?
9. Do you feel that the image of the University improved over the last year?

That led us to 9 different readings to
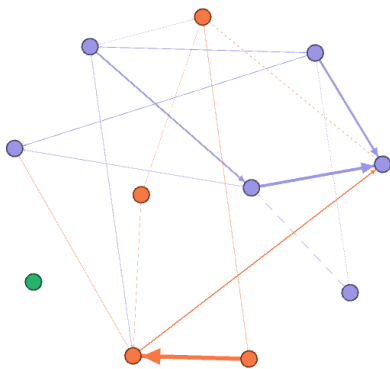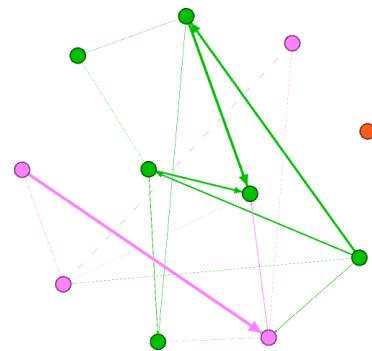

Fig1: Modularity graph for Q.1 (G1)   Fig2: Modularity graph for Q.2 (G2)

study the student opinion. The result for each of the questions are as follows:
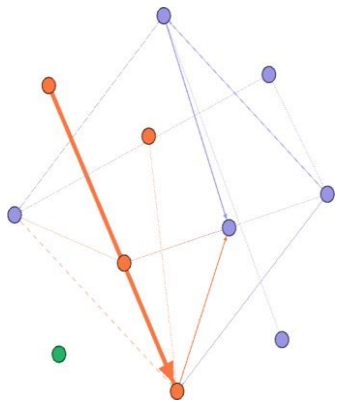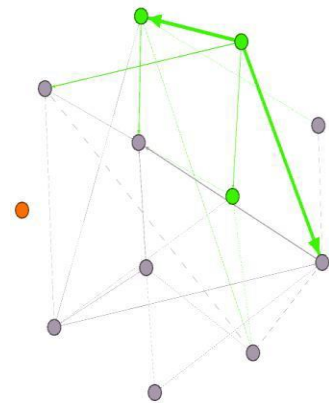
Fig5: Modularity graph for Q.5 (G5)
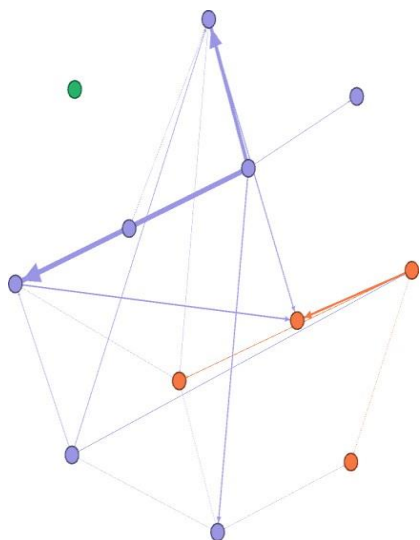

Fig6: Modularity graph for Q.6 (G6)

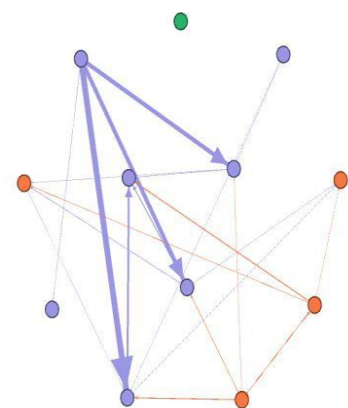*Fig3: Modularity graph for Q.3 (G3)*
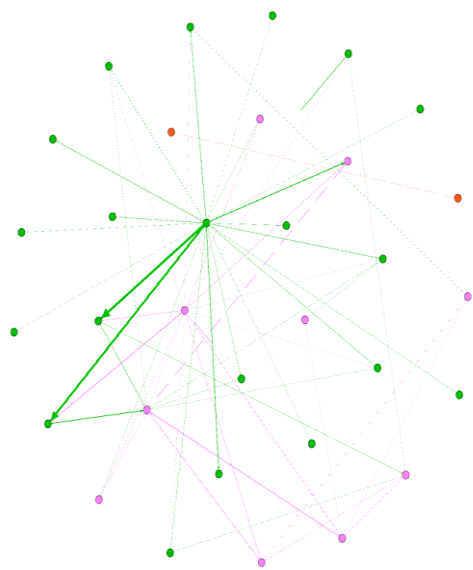

Fig4: Modularity graph for Q.4 (G4)
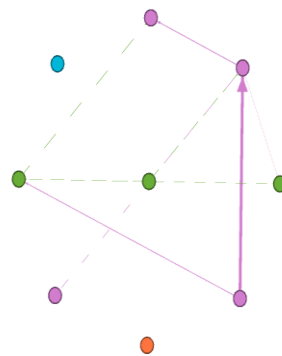
Fig7: Modularity graph for Q.7 (G7)

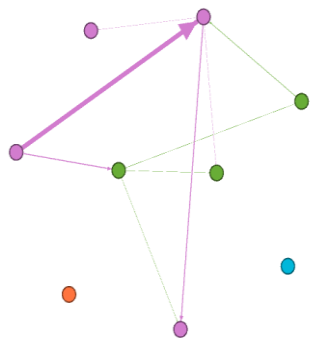*Fig8: Modularity graph for Q.8 (G8)*

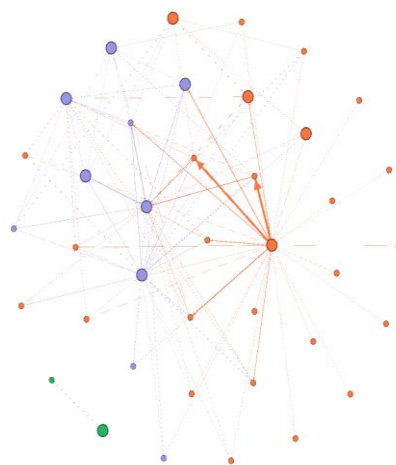*Fig9: Modularity graph for Q.9 (G9)*

Fig10: Resultant Graph (G10)

The modularity of the generated graphs are as follows,

Graph Index	Modularity	Modularity with Resolution	No. Of Communities
G1	0.321	0.321	3
G2	0.321	0.321	3
G3	0.176	0.176	3
G4	0.054	0.054	3
G5	0.275	0.275	3
G6	0.036	0.036	3
G7	0.186	0.186	3
G8	0.018	0.018	4
G9	0.03	0.03	4
G10	0.164	0.164	3

Conclusion & Future Scope:
The work as executed following strictly experimental approach, as future work, the proposed algorithm can be implemented on first hand data set. With bigger data set and wider variety of questions included in the questionnaire the following outcomes are expected:
1. Better analysis of student satisfaction level [8]
2. Better analysis of the damage caused by the pandemic
3. A support in taking the decision to make future strategies to implement on the education sector
4. Density of student interaction index.

With the implementation of the alternative approach of teaching-learning strategy it has become necessary to monitor the student satisfaction level constantly in order to understand the learning experience of the students. We hope to find the drawbacks of the new approach as well, that can be overcome in coming days for the smooth conduct of the education sector.

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