Implementation of Data Mining Technique with amalgamation of Artificial Intelligence in National Education System

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Abstract: *Education data is one of the huge datasets in a country, these data can be analyzed for producing effective measure on the field of education and also to improvise the lack in this field. Since education is the biggest backbone for a country, various country has started to analysis their academics data and even started to introduce the artificial intelligence-based education in their curriculum. In such way of introducing the artificial intelligence they bring new ways of understanding on academics and redesign the course or to form new appraisal on the curriculum. These data are been mined by various algorithms and steps, by the amalgamation of data mining technique and artificial intelligence methods. The technology advancement is to be involved in the academic's data in order to predict the future nature of education levels in thecountry.*

Keywords: Educational Data Mining, Artificial Intelligence, Instructor task, Managerial Sector, National Education Policy

1. INTRODUCTION

Indian Education system has got a new reform after the new education policy. Though there is a change after 34 years in the education policy, the levels of education would rise to a new extent by adopting artificial intelligence in all levels of the education system. The accomplishment of data mining and artificial intelligence in the education dataset would bring, more understanding and different ways of handling of the education dataset thus helping in finding new informative data and solutions. These data are effectively handled by amalgamation of data mining with artificial intelligence techniques and algorithm for the betterment of student education levels and managerial decisions. The artificial intelligence-based education will be the future of education system. This paper focus on the data and processing in education sector from different aspects and

also states the measures to attain the quality and changes in the education levels by using the concepts of data mining with artificial intelligence. The paper covers modules like question bank analysis, instructor subject allocation based on their area of interest, portion coverage, student strength analysis, instructor performance analysis, attendance automation and analysis, time table creation. To face these challenges different algorithm and methods like randomized, linear regression, and few other condition statements are used. The paper also states the future work and automation technique that in turn results in smarter educationenvironment.

2. OBJECTIVE

The main objectives of this work are:

- To provide dynamic generation of question paper forexams.
- To formulate recommendation of instructor allocation in respectivesubject.
- To track the portion completion analysis of the subject.
- To identify student strength andweakness.
- To evaluate the attendance of thestudent.
- To explore generation oftimetable.

3. LITERATURESURVEY

The New Education Policy (NEP) of India has been framed to bring improvements from school education to doctoral education level. Though the country policy has planned to bring new changes in the education system, still the adoption of new techniques in handling the education data and the implementation of artificial intelligence-based education has to be improved. In data mining, the education data are analyzed into different section as classification, regression, clustering, and correlation analysis [1]. It uses different algorithm to identify the different pattern in the educational data. To obtain knowledgeandtoidentifythepatternsinthedata

different e- learning system is needed [5]. Such mining of educational data is done to gain deeper understanding of student performance, learning behavior, and the levels of student involvement in the studies [1]. The AI based education helps in better problem solving, predicting, and grading etc. The adoption of VR based learning can enhance the student understanding towards the subject and gamification process can build interest towards education for students [2]. In management sector the assessment with AI can help in obtaining recursive feedback for improvement in instructor, system transparency guiding in measuring all course, mastery learning with customize learning plans etc. [6]. Thus, AI help both the student and management by having a smarter learning and working experience [2].

Md. Imdadul Hoque1, et.al [3] proposed a data mining approach to predict the student result in prior and identify their lack in the subjects. They conclude that the experiment shows true positive in getting the different class like average, good, very good, excellent. They also state this approach help the students to concentrate more on the studies since they are aware of their lack thus, in turn it helps in better academicresults.

Manpreet Kaur, et.al [4] research to generate time table. Within the research process the author optimize and display the timetable into three views as class wise for students, instructor timetable, and classroom timetable. The author conclude that the automatic generated timetable is satisfactory when compared to manual generation involving allchallenges

Mohammad Noor Injadat a, et.al [5] proposed data mining technique in prediction of student performance by analyzing two different data sets in the course period. The collection of data is done by LMS which include grade and event datasets. The systematic ensemble learning was proposed based on gini index and statistical to find the student who needs help by e- learning environment.

Oyelade, et.al [7] proposed the student performance analysis by k-means algorithm, the school data is taken as sample and the students are clustered based on the marks obtained. They are clustered to group as excellent, very good, good, very fair, fair, poor.

J.S.Appleby, et.al [8] proposed the research on timetable generation for the school where different attributes are considered as the subject for the class, number of period, staff allocation etc. Various conditions are placed in the timetable generation like class room availability check, period count check, consecutive availability of period check etc.

4. IMPLEMENTATION

The purpose of this research is to predict, cluster, and classify the educational data by using the technique of data mining with amalgamation of artificial intelligence. The process of data mining helps in finding the different correlation of the data thus bringing more understanding towards the data, and the implementation of artificial

intelligence brings future prediction; IoT based classroom, personalized education etc. Thus, theresearchhas few modules that can reduce the time of the managerial sector and instructortask.

4.1 Question PaperGeneration

Examination has become one of the great sources to evaluate a student understanding to a subject and to grade the student to the next level. In such a situation instructor being involved in all the task of the institution and, preparing a new set of question each time is another tedious work for the instructor. This issue can be sorted out by generating a new set of question paper each time by a python coding with the input of the entire question in the respective subject. In collecting the dataset for question paper generation, a subject was chosen and the question from each lesson are picked and taken as sample. A file of 200 question is been selected as sample in this paper. This dataset is analyzed using randomized algorithm and it selected a set of new question each time when it is beenexecuted.
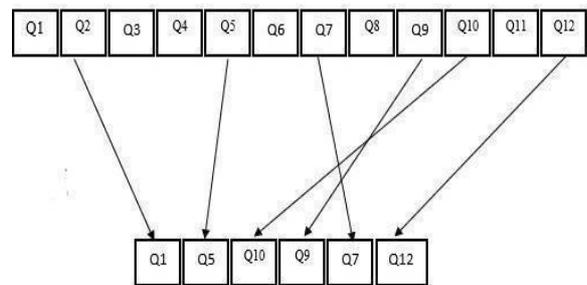

Figure1: RandomGenerationofChoiceofQuestion

4.2 Instructor Allocation Based on their Area of Interest

In the education managerial sector each time after the selection process of an instructor is completed, in the beginning of the academic year the allocation of instructor to their respective subject is a tedious process. To overcome this lack after an instructor is selected by the panel his/her details are registered to the file, a sample of

100 instructor resumes where taken and their area of interest and name where taken as input. This data can be processed by integer location-based selection and sub filter in the beginning of each academic year they can be allotted as per their area of interest. This can be attained by executing the steps of selective filters on the given data and the selected instructor for each subject can be allotted. In this way the allocation of instructor based on their area of interest or to the subject in which they are well versed areselected.

4.3 Portion CompletionAnalysis

Every academic year due to various reasons some instructor is rushing out in the completion of portion, though there are

ways like manual log book to make a note of each day event the completion of portion at the right time is still a difficult task to keep track with. To overcome this difficulty the data of completion of syllabus forpast20yearsarebeentaken,keepingthesedataas sample data and with conditional statement the proper proceeding of syllabus pattern is found. After finding the pattern, by the mining process the best pattern of completion is kept as termly check for the instructor in the portion coverage. Thus, the instructor makes an entry of every month completion and the termly check is analyzed in every interval of time. An intimation message is given to the instructor after the entry is made, this intimation is checked using the condition statement whether the instructor portion coverage matches to the best pattern. If the instructor proceeding in the syllabus is equal to the best pattern, the instructor is informed with a message as the proceeding is in the proper speed of portion coverage. If suppose the instructor is behind or too fast in the portion coverage, it is also intimated by themessage.
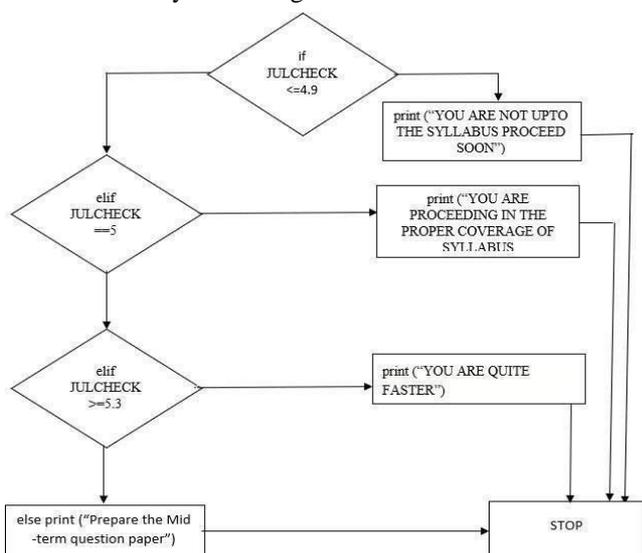

Figure2: BlockDiagramofPortionCoverageTask

4.4 Student StrengthAnalysis

Institution and instructor are facing an issue of making cent percent results. Though students nowadays are smarter, they are been easily influenced by the social media, mobile, and other few habits, all these factors disturb the student education. Thus, an instructor is also a mentor in school and college guiding up the students in a proper path and even finding out and helping them to overcome their difficulties both is studies and day-to-day activities. In targeting towards the cent percent result in students various research are been done using the student academic data.

The student data are analyzed by different algorithm and tools to obtain better result. These data like class test marks, assignment mark, and other related questionnaires are taken as input from user response and analyzed to predict the semester result [3]. These data are also used in obtaining individual and overall performance prediction in student they are graded as 70 and above Excellent, 60-69 Very Good, 50-59 Good ,45-49 Very Fair, 40-45 Fair

Below and 45 Poor [7].

In this paper various factor that affects the student result are been analyzed and taken as input and different attributes of the student information are also collected.

Table1: Social Media/Mobile usage value

Social Media/MobileUsage	Description
1	<2
2	2 to 4
3	4 to 6
4	>6

Thus, these collections of data such as the previous test mark, the factor of influenzas, attendance and their social media / mobile usage of 160 students are taken as sample. The attributes of study time, attendance, mobile usage is given values of 1 to 4 to the rating of the student in the respective attribute, revision mark is given as 11 to 19 in the marksobtained.

Table2: Attributes of Student Strength Analysis

Attributes	Description	Possible Values
School	School Name	Name of the school
Roll Number	Student Roll Number	1,2,3…
Standard	Class of the student	X, XI, XII
Sex	Student Gender	M/F
Study Time	Student hours of studying	1,2,3,4
Attendance	Student attendance to school	1,2,3,4
Social Media / Mobile Usage	Mobile usage of the student	1,2,3,4

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R1	Revision 1 mark of student	11,12,13…19
R2	Revision 2 mark of student	11,12,13…19
R3	Revision 3 mark of student	11,12,13…19

Table 3: R1, R2 mark values

Result Value	Description (in marks)
19	90 and above
18	80-89
17	70-79
16	60-69
15	50-59
14	40-49
13	35-40
12	20-34
11	Less than 20

Table4: Attendance Value

Attendance Value	Description (in days)
1	<3
2	3 to 6
3	7 to 10
4	>10

These data are analyzed by linear regression, thus helps in the prediction of their future result. Further with student mark the student who are excellent, good, weak are analyzed, the data is also helpful in finding the subject with the highest failure and the subject with low failure. To obtain this knowledge dataset is taken where the sample of 60 student mark with their respective score in all the subject are taken and these data are analyzed by operators and sub filter and they are categorized. This analysis helps in future navigation of the child education and also helps is tracking out the instructor performance of everyyear.

4.5 Attendance Automation

Though few of the task in the education has been automated but still the daily attendance is kept manual in most of the Indian education institution. Manual calculation of attendance is a monthly task for an instructor and after a few continues absence of the student the intimation is given to their parents. By attendance automation the attendance entry can be digitalized and complete attendance of the student can be collected thus by filter the total days a studenthas taken leave is analyzed. This analysis is done to find the student who lack in attendance, and to find those who are irregular to the institution, by this analysis we would know the irregular students in prior than been manually calculated every month oryear.

4.6 TimetableGeneration

Timetable generation is one of the biggest concerns of every instructor both in school and colleges. Time table preparation has to be in a perfect format since it is the factor of scheduling the rest of the academic's days. By the proper scheduling of the timetable, it brings a coordination between the students and instructor and even frames the arrangement of labs and classrooms as per the needs of the students. There are different forms in creating the timetable like classroom timetable, faculty timetable, lab timetable etc. In class wise timetable the instructor assigned for the subject, labs, venue are the factors involved while in faculty timetable, the class, the name of the instructor load, venue are the factors [4]. In class wise timetable the common factor involved are the number of working days, number of periods in the week, allocation of the different class, subject for each class, total period in the day, allocation of the instructor to the subject etc. [8]. In this paper the preparation of the class wise timetable is done. The set of all the subject are been initially entered and the working days of the institution has been fixed from Monday to Friday and the data are entered as input, there are condition where a certain subject can have only five class in a week , if during the entry of the data , if the entry is made the sixth time a message gets intimated stating the subject has been already entered so we can make another subject as entry in such a way the subject are entered and finally the schedule is made and the output is given as a csv file. In such way the preparation of the timetable for college and school are way easier than manually framing the timetable eachtime.

5.RESULT &DISCUSSION

The coalescence of data mining and artificial intelligence is to improvise the education system. A study has been conducted to measure the implementation of data mining and artificial intelligence in the task of the instructor and managerial sector. Thus, help in making the task easier and also improvising the educationfield.

5.1 Question PaperGeneration

The question paper generation is done by randomized algorithm, and thus result in new set of question that are randomly generated each time. This method can be useful even for a class test where just 10 question have to be generated from a set of lesson. This model can also be useful in entrance exam or any validation exam where different question paper for each student can be generated using this method. This method can also be more useful in times where there is situation to prepare a new question paper in a short period.

Step1: Select a subject and prepare the question list in excel.

Step2: Read the csv file in python code.

Step3: Using randomized algorithm select the required number of questions.

Step4: Required question are generated randomly

	question no	question
0	1	What is data Mining ?
1	2	Explain the differences between Knowledge disc...
2	3	Explain different data mining tasks.
3	4	What are the application areas of data Mining?
4	5	What is the relation between data warehousing ...
...	...	...
117	118	Describe data Warehouse architecture.
118	119	what are three major areas in the data warehou...
119	120	what are the similarities and differences bet...
120	121	What is subject area in data warehouse? What ...
121	122	why OLAP is required in data warehouse?

122 rows × 3 columns

Figure3 Questioninthesubject

	question no	question
38	39	With a neat sketch explain the architecture o...
43	44	Give an account on data mining Query language.
66	67	What is the purpose of Apriori Algorithm?
97	98	Why is the entity-relationship modelling tech...
89	90	Explain mining Multi-dimensional Boolean asso...
74	75	List out the differences between OLTP and OLAP.
117	118	Describe data Warehouse architecture.
9	10	What are the limitations of data Mining?
55	56	What are the advantages and disadvantages of d...
120	121	What is subject area in data warehouse? What ...

Figure4RandomlyGeneratedQuestion

5.2 Instructor Allocation Based on their Area of Interest

The proposal of this model is to allot the perfect instructor to the respective subjects of their area of interest. By this method the data is been effectively handled and using the integer location-based selection and sub filter the staff of each subject are segregated. This method of allotting the instructor can be used in government related placement of instructors after the competitive exams, and also during allotting of instructor in paper correction during semester or public exam. This method of handling helps in quick selection of instructor for the appropriatesubject

	STAFFNAME	ENGLISH	SCIENCE	FRENCH	HINDI	TAMIL	SOCAIL	MATHS	CSC
0	Aaradhya	0	1	0	0	0	0	0	0
1	Adah	0	1	0	0	0	0	0	0
2	Adhira	0	1	0	0	0	0	0	0
3	Alisha	1	1	0	0	0	0	0	0
4	Amoli	0	0	0	0	1	0	0	0
...	...	...	...	...	...	...	...	...	...
70	Tanvi	0	0	1	0	0	0	0	0
71	Viti	0	0	0	1	0	0	0	0
72	Zara	0	0	0	0	0	0	1	0
73	Zen	0	0	0	0	0	0	1	0
74	Ziya	0	0	0	0	0	0	1	0

75 rows × 9 columns

Figure5 ScreenshotofDatasetofStaffName&AreaofInterest

	STAFFNAME	SCIENCE
0	Aaradhya	1
1	Adah	1
2	Adhira	1
3	Alisha	1
5	Anaisha	1
8	Anushka	1
10	Avni	1
16	Hiya	1
19	Ishana	1
22	Jash	1
25	Kabir	1
29	Kashvi	1
33	Krisha	1
38	Manan	1
42	Mishka	1
47	Nehrika	1
51	Pahal	1
55	Prisha	1

Figure6 StaffListofScience

Step1: Collect the data of staff name and their area of interest.

Step2: Choose the subject for which, staff has to be allocated.

Step3: Using integer location-based selection create the code for the selected subject.

Step4: Using sub filter neglect the other subject list displaying in the output.

5.3 Portion CompletionAnalysis

The proper completion of syllabus helps the student to understand the subject better. Thus, framing the pattern of syllabus coverage in the scheduled time is the objective of this model. In analyzing the 20 years of portion coverage by conditional statement the best pattern isfound.

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```
Result dataframe :
    YEAR MAY JUNE JULY AUG ... NOV DEC FH JULCHECK SEPCHECK DEC CHECK
1   2001 3.0  2.0  3.0 4.0 ... 3.5    1.0      5.0     12.0        23
5   2005 3.0  2.0  3.0 4.0 ... 3.0    1.0      5.0     12.0        23
7   2007 3.0  2.0  3.0 4.0 ... 3.0    1.0      5.0     12.0        23
9   2009 2.0  3.0  3.5 3.5 ... 4.0    1.0      5.0     12.0        23
11  2011 3.0  2.0  3.0 4.0 ... 3.0    1.0      5.0     12.0        23
18  2018 3.0  2.0  3.0 4.0 ... 3.0    1.0      5.0     12.0        23
```

Figure7 BestPatternofSyllabusCompletion

After identifying the best pattern, the next academic year data are entered. The julcheck, sepcheck, deccheck are given condition based on the best pattern results and as the instructor enters the month completion, the data is checked with the condition and three possible messages are given to the instructor regarding the proceeding in thesyllabus.

```
ENTER the academic year2020
ENTER MAY MONTH COMPLETION3
ENTER JUNE MONTH COMPLETION2
Portion covered in MAY & JUNE MONTH 5.0
YOU ARE PROCEEDING THE PROPER COVERAGE OF SYLLABUS
Prepare the Mid term Question Paper
ENTER JULY MONTH COMPLETION3
ENTER AUGUST MONTH COMPLETION4
Portion covered in MAY & JUNE MONTH 12.0
Prepare Quarely Question Paper
YOU ARE PROCEEDING THE PROPER COVERAGE OF SYLLABUS
ENTER SEP MONTH COMPLETION3
ENTER OCT MONTH COMPLETION 3
```

Figure 8 Message intimation of Proper Completion

```
ENTER the academic year2020
ENTER MAY MONTH COMPLETION3
ENTER JUNE MONTH COMPLETION2
Portion covered in MAY & JUNE MONTH 5.0
YOU ARE PROCEEDING THE PROPER COVERAGE OF SYLLABUS
Prepare the Mid Term Question Paper
ENTER JULY MONTH COMPLETION3
ENTER AUGUST MONTH COMPLETION3
Portion covered in JULY & AUGUST MONTH 11.0
YOU ARE NOT UPTO THE SYLLABUS PROCEED SOON
Prepare the QUATERLY Question Paper
ENTER SEP MONTH COMPLETION3.5
ENTER OCT MONTH COMPLETION 3.5
```

Figure9 MessageintimationofLackinSyllabusComp
letion

Step1: Collect the previous year's portion completion pattern.

Step2: Find the best pattern by conditional statements.
Step3: From the best pattern create the termly check.
Step4: Enter the completion of the syllabus each month and with conditional statement termly check is executed.
Step5: Message is popped as per to their completition of syllabus.

There are three case in which message are popped

Case1: If the syllabus completion is found to be lack, a message is popped stating "You are not up to the syllabus proceed soon".

Case2: If the syllabus completion is found to be proper, a message is popped stating "You are proceeding the proper coverage of syllabus".

Case3: If the syllabus completion is found to be too fast or quick, a message is popped stating "You are rushing up kindly proceed slowly".

Thus, the proper completion of syllabus helps the students to understand the complete syllabus in correct interval of timing making it easier for both the instructor and the student to have better understanding in the completion of the syllabus. It also helps the student to prepare for the exam easier as the completion of syllabus is as per the schedule and they could even have time for revision of the subject.

5.4 Student StrengthAnalysis
The prediction in academic data is the trending data analysis nowadays. The prediction of student mark in final exam can help in prior guidance to the students who lackin the grading. In this module 160 student marks are taken as sample and their final results are evaluated by linear regression and the model attains 97% accuracy by the 80% train and 20% test data.

```
17.840137215471017 [17 17 4 3 1] 18
14.014400037404368 [13 14 1 3 3] 14
18.959449676741027 [18 19 4 1 2] 19
16.096054087141166 [15 16 2 1 3] 16
16.04163085113022 [15 16 1 2 1] 16
14.794358595828925 [14 15 2 3 4] 15
15.702276948284766 [15 15 2 4 1] 15
17.849807575061664 [17 18 4 2 3] 18
14.205561936317991 [13 14 1 1 4] 14
17.98654623796434 [17 18 3 1 2] 18
17.206587679539783 [16 17 2 1 1] 17
18.960341167460278 [18 19 4 2 1] 19
16.740165473382298 [16 17 4 3 4] 17
16.097837068579672 [15 16 2 3 1] 16
16.740165473382298 [16 17 4 3 4] 17
18.043643946133045 [17 18 4 3 1] 18
```

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Figure10 ResultPrediction

Step1: Collect the student data of student mark, study time, attendance, social media / mobile usage, class, roll number etc.

Step2: 80% of the data are given as train data and 20% as test data.

Step3: Using the linear regression algorithm the test data output is attained by predicting the final result with the marks of r1, r2.

In analyzing the student mark for finding the students who lack in the exam the dataset which contain the mark of 60 students in all subject like English, Tamil, Maths, Science, Social in particular exam are taken as sample and the results are evaluated. The students who failed in exam are extracted. This model saves time of the instructor by analyzing all subject data at once instead of manually checking each subject one by one.

```
The student who lack in Maths,English subjects :
   studentname english tamil maths science social total average
24     Joseph     35     42    38     40      58    213   42.6
39     Mayra      35     49    32     40      46    202   40.4
40     Mehar      34     40    31     40      48    193   38.6
(3, 8)
```

	studentname	english	maths
24	Joseph	35	38
39	Mayra	35	32
40	Mehar	34	31

Figure11 ListofStudentswholackinEnglish&Maths

5.5Attendance Automation

The attendance automation is one of the usual tasks of the instructor, the attendance of the students is manually marked and at the end of the month, it is been calculated. This module is designed in replacing the manual attendance by computerized form and instead of manual calculation, count function is used to find the student leave count on the month. Thus, help in saving the time of the instructor by quickcalculation.

Step1: Attendance of the month is collected

Step2: From the entire list the individual student is selected by labelbased.

Step3: The total absence of the student in entire month is calculated using count function.

```
studentname          Amoli
day1                   1
day2                   1
day3                   0
day4                   1
day5                   1
day8                   0
day9                   1
day10                  1
day11                  1
day12                  1
day15                  1
day16                  1
day17                  1
day18                  0
day19                  1
day22                  1
day23                  1
day24                  1
day25                  1
day26                  1
day29                  1
day30                  0
```

```
Enter the student name Amoli
Total leave taken by the student in October  4
```

Figure12 AttendanceofStudent

5.6TimetableGeneration

Every instructor in the beginning of the academic year is in the trouble of preparing a perfect timetable. Even though after the manual timetable are prepared it is been altered many times to attain the perfect timetable. Thus, this model helps in preparing the timetable easier and quick. The instructor availability can be noted in prior and the subject input can be given in such a manner so the timetable is generated. This can be further be enhanced by adding the instructor name and also placing condition for the instructor as each instructor should have three to four class in aday.

Step1: Code the start and end time of the institution. Step2: Code the working days of the institution.

Step3: Code the maximum hours each subject can be allotted.

Step4: Get input of the subject name one by one. Step5: Message is popped if the entry of the subject is exceeding the allotted count.

Step6: Breaktime added if time reaches 10.30 am

Step7: Print time table is ready.

	A	B	C	D	E	F
1	Hours	monday	tuesday	wednesday	thursday	friday
2	8.3h-9.3h	Os	Java	Ai	Dm	Java
3	9.3h-10.3h	Is	Dm	Ai	Dm	Dm
4	10.3h-11.3h	Break time	Break time	Break time	Break time	Break time
5	11.3h-12.3h	Dm	Dcn	Java	Java	Ai
6	12.3h-13.3h	Dcn	Ip	It	Java	Ip

Figure13 TimetableGeneration

6. CONCLUSION AND FUTURE SCOPE

The role of education plays a major part in the country's development. The quality feed of education can raise the country literacy levels in turn results in economic growth of the country. The quality and advancement in education can be improved by the implementation of artificial intelligence technique, and also the mining of the education data can bring new understanding and knowledge towards thedatasets.

In this paper the models are developed to reduce the task time of the managerial sector and to predict the student strength analysis. The question paper generation helps in quick generating of the question paper. It can even be enhanced by adding the count of times the question is been printed thus placing few conditions can improve the model avoiding repeated random generating and also helps to find the number of times the question is printed in the past period.

The tracking of portion completion analysis, can be further enhanced by converting this model into an application where the completion of syllabus can be viewed by the parents, institution officials. Thus, it can help to institution to check whether the instructor is completing the syllabus properly at any time rather than manual log book checking.

In identifying the student strength analysis, the model helps in prior identification of student who lack in getting pass mark in final exam thus helps in proper guidance to the student but it can further be enhanced by collecting the dataset with few other factors that affects the student grading. In this paper, it deals with three factors but it can be further improved to bring more accurateresults.

In formulating the attendance automation, the model can further be enhanced by checking the student presence till one hour after the institution begin and even after one hour in the absence of the student the message can be automated to their parents stating they are absent on the respective day to the institution. Thus, the amalgamation of artificial intelligence and data mining in the education dataset helps in smarter learning environment and also it reduces the task of the managerialsectors.

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