INTELLIGENT SYSTEM FOR CHOCIE BASED CREDIT SYSTEM

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CERTIFICATE

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LIST OF ABBREVIATIONS AND SYMBOLS

CBCS	Choice Based Credit System
CBCSS	Choice Based Credit Semester System
UGC	University Grants Commission
NEP	New Education Policy
MCQ	Multiple Choice Questions
UG	Under Graduate
PG	Post Graduate
AI	Artificial Intelligence
HEIs	Indian Higher Education Institutions
AIU	Association of Indian Universities
TEL	Technology Enhanced Learning
SVMs	Support Vector Machine System
SGPA	Semester Grade Point Average
CGPA	Cumulative Grade Point Average
DSE	Discipline Specific Elective
GE	Generic Elective
ANN	Artificial Neural Networks
EDM	Educational Data Mining
O	Outstanding
F	Fail (Poor)
BN	Bayesian Network
DT	Decision Tree
SPSS	Statistical Package for the Social Sciences

ABSTRACT

The Choice based credit system (CBCS), gives a learning stage wherein the understudy or information searcher has the adaptability to pick their course from a rundown of elective, center and delicate aptitude courses. This is an understudy driven way to deal with learning or securing advanced education. The customary arrangement of Higher Education didn't give a lot of extension to understudies. The course and substance was predefined, repetitive and was not cutting-edge. For understudies to apply their insight base later in their workplace, business or life; the regular separated courses needed contemporary suitability.

Choice Based Credit System opens pathways for learning open doors as well as show learning objectives and goals. CBCS follows a credit framework which is connected to course parts offered to understudies. A credit framework for advanced education estimates different boundaries like understudy execution, results, business enterprise aptitudes, contact hours, development and innovativeness abilities, and so forth. This CBCS framework is an activity of University Grants Commission (UGC); which upgrades and advances instructive progression of existing regular advanced education models. This works proposes a unique and intelligent CBCS system by using the machine learning classifiers and by using the concept of Data mining.

In the field of academics, data mining can be very useful in discovering valuable information which can be used for profiling students based on their academic record. It tends to be useful for course heads and teachers for examining the use data and understudies' exercises during course to get a concise thought of an understudy's learning. Perception data and statics are the two primary strategies that have been utilized for this assignment. Factual investigation of instructive information can give us data like where understudies enter and leave, the most significant pages understudies peruse, what number of number of downloads of e-learning assets, what number of number of various sort of pages perused and aggregate sum of time for perusing of these various pages.

This work has incorporated Naïve Byes and Decision tree classifier models and had also developed a frame for CBCS students to make their insightful decisions. Moreover, the proposed work has also focussed on data selection, and data mining and then it has been tested for accuracy, validation, and verification.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Choice based credit system (CBCS), is the place the understudies i.e. students can pick the endorsed courses, as the center, and elective or delicate ability courses, from a scope of alternatives, as opposed to just devour what the educational program offers. They can learn at their own pace and the evaluations are reviewed dependent on a credit framework. It gives a chance to understudies to have a selection of courses or subjects inside a program looking like a smorgasbord, against the for the most part fixed arrangement of subjects currently being offered (aside from the restricted selection of electives in proficient degrees and postgraduate projects) with the adaptability to finish the program by procuring the necessary number of credits at a pace chose by the understudies.

The choice-based credit system not just offers openings and roads to learn center subjects yet in addition investigate extra roads of learning past the center subjects for comprehensive turn of events. The UGC has arranged mainline and concentrated model schedules for undergrad programs and made it accessible to the colleges to encourage the execution of CBCS. Training is a light that shows the humanity the correct course to flood. The motivation behind training isn't simply making an understudy proficient yet includes reason thinking. It is a motor for the development and progress of any general public. It bestows information, aptitude and teaches esteems, but at the same time is liable for building human capital which breeds, drives and sets mechanical advancement and financial development and endurance. The establishments, connections and standards that rise up out of advanced education are instrumental in affecting the nature of society's cooperations, which support monetary, political and social turn of events.

The propelled training scene is encountering a basic change on account of innovations. We are seeing changes in the way propelled training is told andin the way

wherein the understudies learn. While the customary setting of the assembly hall will keep on organizing the bedrock of cutting edge instruction systems, it will be improved by the coordination of new devices and showing strategies, and it will be enhanced by various more. The advanced education framework in India has a demonstrated history of greatness. The current advanced education educational program doesn't confer the vital abilities that would make the understudies employable sufficiently. One has to think what is lacking in the present system. The major reasons may be traditional system is “Teacher centric” where teacher never asks, “Why am I teaching this, what will students do after this exposure?”

There is an absence of interdisciplinary methodology just as there is an almost no degree for esteem based courses to be educated. The assessment techniques are to a great extent dependent on memory review forms or rote learning. Our higher education system is struggling with many problems like high student teacher ratio, poor infrastructure, and outdated syllabus and so on. The best way to solve the problems of higher education is that industrial houses should come forward and interact with colleges about their requirements. Industries should also participate in updating the syllabus in colleges and universities to cater to their needs which will result in a student equipped to handle industry level standards [**5**].

The present framework isn't compelling enough in meeting/enabling understudies to think or matters/issues autonomously. The answer for such an issue is, that the understudy be given a decision to examine numerous subjects and have practical experience in interdisciplinary subjects. The need of great importance is patching up the arrangement of advanced education through scholarly and authoritative changes through another arrangement of 'Choice based credit framework (CBCS)'. CBCS is the answer for the change of instruction framework from the conventional 'instructor situated training' to an 'understudy focused training'. CBCS quickly fits into the rising financial condition, and could adequately react to the instructive and word related yearnings of the up and coming ages. Considering this,

foundations of advanced education in India are happy to contribute on assets to acquaint CBCS with their educational syllabus [**2**].

This arrangement of CBCS is appropriate for all the state, focal, and other perceived colleges. Since the changes are attempted by UGC, all the UGC perceived colleges and organizations are to jump aboard with it. Be that as it may, since one of the most significant components to be investigated with respect to this is about the portability of understudies among the colleges, many would just believe these progressions to be incorporated. Likewise, a couple of the rumoured colleges are as of now offering such offices for their students. It is still too soon to state whether CBCS will be effective or not. The UGC has consistently started measures to get effectiveness and greatness the Higher Education System of India. The sum total of what we have are the data that there are numerous techniques, trailed by various colleges the nation over with regards to appraisal, assessment and evaluating framework [27]. Along these lines, CBCS would ideally bind together those techniques and present comprehensiveness in training. Additionally, the quality principles will ascend as there are decisions offered and the colleges and establishments will be compelled to give more excellent instruction so as to endure. The educationists and academicians need to check out the current situation and introspect to change the colleges to address the present-day difficulties.

There are number of drivers of progress in advanced education today, including innovation, globalization, evolving socioeconomics, Economy, changing boss needs, expanded interest for responsibility, changing understudy's desires, etc. The effect of any of these drivers is noteworthy and altogether is extraordinary. It important to keep it clear that the current structure offers an incredibly firm model, which is lacking to satisfy the interests and wants of the understudies. It is essential for the school to satisfy move with the events

and offer ventures to consider the varying needs of the understudies according to their learning limit and pace of learning [4].

1.2 CONCEPT OF CBCS SYSTEM

Choice Based Credit System was viewed as the benchmark for our scholastic establishments against the global level organizations. India has received the Choice Based Credit System on the suggestion of the Knowledge Commission just according to the Eleventh Five Year plan so as to achieve quality and groundbreaking change in Indian advanced education. The Choice Based Credit System targets acquainting multidisciplinary approach with advanced education empowering an understudy to have solid hold over various subjects from a wide scope of elective subjects [20]. This is an instrument for setting up consistency inside and over the higher instructive organizations both at national and worldwide degree of training conveyance framework.

This system not just offers openings and roads to learn center subjects yet in addition investigating extra roads of inclining past the center subjects for all encompassing advancement of a person. It provides opportunities to students to pursue core subjects as well as soft courses of other departments simultaneously. The courses offered to students are of three types viz fundamental, elective and core. The fundamental / foundation courses may be compulsory fundamental and elective fundamental. The content of such courses are knowledge based and mandatory for all disciplines. While as elective fundamental courses are value based and are aimed at man-making education. Moreover Dissertation/ Project has been incorporated in CBCS at undergraduate and post graduate level which is designed to acquire special / advanced information. In fathoming/breaking down/investigating a genuine circumstance. This might be given to understudies in lieu of a control explicit elective part,

for example, supplemental examination/project study to a venture work and is purely on the choice of the students **[9].**

New Education Policy (NEP) in our nation to bring out correction in Indian instruction framework. College Grant Commission (UGC) has concocted the Choice Based Credit System (CBCS) program in which the understudies have a decision to choose from the guaranteed courses, which are alluded as center, elective or minor aptitude courses and they can learn at their own movement and the incorporate appraisal is evaluated dependent on a credit framework. The essential idea is to investigate the requirements of the understudies in order to stay up with the latest with improvement of advanced education in India and abroad. CBCS intends to rethink the educational program staying up with the advancement and globalization on training [3]. CBCS permits students a simple method of portability of move of credits earned by learners. The significance of CBCS framework are-move in center from the instructor driven to youngster driven learning, understudy may acknowledge the same number of credits, CBCS permits students to pick between disciplinary and intra-disciplinary courses and expertise arranged territories. It offers adaptability for understudies to learn at various occasions and establishments to finish one course. Be that as it may, CBCS has hard to appraise the specific imprints and remaining burden of educators may vary.

- The understudy has a choice to pick entomb/multi-disciplinary courses excessively Based on the IQ level of individual understudy; a tutor guides understudies to choose courses.
- It advances bunch work, examination and network association.
- It offers possibilities to the student to acquire confirmation through a stroll in/exit approach.
- Provides understudies with more prominent adaptability in selection of courses
- Students can pick courses at essential or propelled level.

- Learners gain work situated abilities.
- Students progress at their own beat.
- Highly inspired understudies find the opportunity to increase additional credits.

The Indian Higher Education Institutions have been moving from the customary yearly framework to semester framework. Quality education plays an important role in enhancing knowledge, developing skills, building confidence, and creating a positive impact on students' life. It empowers students to grow not just professionally, but also lays a solid foundation of personal growth. To ensure quality education, higher education institutions must focus on developing a balance between - imparting education & promoting skill development by providing flexibility to explore various fields. Presently huge numbers of the organizations have just presented the decision based credit framework. The semester framework quickens the instructing learning process and empowers vertical and even versatility in learning.

The credit-based semester framework gives adaptability in structuring educational program and relegating credits dependent on the course substance and long stretches of instructing. The decision based credit framework gives a "cafeteria" type approach in which their preferred understudies can take courses, learn at their own pace, experience extra courses and secure more than the necessary attributes, and receive an interdisciplinary way to deal with learning. It is attractive that the HEIs move to CBCS and actualize the evaluating system. In figure 1.1, Choice based credit system have subject to the different sections given below.

Fig 1.1 Choice Based Credit System Domain

1.2.1 Choice Based

Choice based credit system (CBCS), gives a learning stage wherein the understudy or information searcher has the adaptability to pick their course from a rundown of elective, center and delicate aptitude courses. This is an understudy driven way to deal with learning or obtaining advanced education. The traditional arrangement of Higher Education didn't give a lot of degree to understudies. The course and substance was predefined, repetitive and was not cutting-edge. For understudies to apply their insight base later in their workplace, business or life; the customary segregated courses needed contemporary appropriateness. Choice Based Credit System opens pathways for learning open doors as well as show learning objectives and goals. CBCS follows a credit framework which is joined to course

segments offered to understudies. A credit framework for advanced education estimates different boundaries like understudy execution, results, business abilities, contact hours, development and imagination gifts, and so forth.

1.2.2 Grading Based

Initially, scoring framework supports mechanical repetition getting the hang of transforming understudies into a decent memoriser instead of a decent analyser. Like the Vedas says such students resemble "jackasses conveying sacks of sandalwood on their back, who can just feel the heap however never its qualities." Grading framework is required to acquire some change this mentality. Reviewing comprises the center of CBCS, as it attempts to decrease the emotional component in appraisal/assessment and there by forestalls any disservice to the understudy. Evaluation is a list of the presentation of an understudy in a specific course. It is the change of scaled imprints made sure about by an understudy in a course. Evaluation point is the Weightage assigned to each review contingent upon the scope of imprints granted in a course.

1.2.3 Semester

CBCS has ended the traditional annual system of assessing students on subjective basis by including semester system. Annual course of the student is partitioned into two semesters based on which his appraisal is finished. An understudy's advancement is determined based on the credits taken from the course as opposed to an opportunity to finish the course. Every semester includes 15–18 weeks of scholastic preparing and appraisal which is equivalent to 90 days of educating. There is adaptability in making the educational program and relegating credits dependent on the course substance and long periods of instructing or teaching.

This framework means a move in center from showing based framework to learning instruction framework as the remaining task at hand depends on the speculation of time in learning [8]. A understudy can practice the alternative to choose his/her own pace of learning-moderate, ordinary or quickened plan and succession his/her decision of work, figure out how to confront difficulties through term work/venture work/and may wander out to procure additional information/capability through extra offices. In CBCS an understudy is given a scholastically rich, profoundly adaptable learning framework mixed with bountiful arrangement for aptitude practice and action direction that he/she could learn inside and out without yielding his/her innovativeness. CBCS updates instructive and word related goal of the up and coming age. The incredible favorable position is that the learning procedure is made ceaseless and the assessment procedure isn't just made nonstop yet in addition made student driven and is intended to perceive the ability and ability of an understudy.

1.2.4 Credit

CBCS allows a student to earn his/her own credits at his own pace. Each course in CBCS is credit based hence the student is supposed to earn particular credit from the course to fulfill the demand of his/her CGPA. At the point when an understudy passes a solitary course in a semester, he/she doesn't need to rehash that course later. CBCS encourages understudies to procure credits as indicated by their own pace by taking any measure of time. If, in a semester, an understudy becomes sick or can't adapt to the scholarly burden, he/she can choose to consider a less number of courses, winning less credits. This adaptability to learn at one's own pace is significant in this day and age, particularly in India “increasingly liberalised economy, where more youth are seeking work experience at an earlier age, and then going back to school to specialise in their area of study **[6].** CBCS upgrades educational and occupational aspiration of the upcoming generation. The great advantage is that the learning process is made continuous and the evaluation process is not only made continuous

but also made learner-centric and is designed to recognize the capability and talent of a student.

1.2.5 Assessment

This is an integral part of CBCS. A continuous assessment system in semester system (also known as internal assessment/comprehensive assessment) is spread through the duration of course and is done by the teacher teaching the course. The assessment is done through various means including: Written tests, MCQ based quizzes, Presentations, Projects, Field visits, Seminars, Group discussions/activities etc. The continuous assessment provides a feedback on teaching learning process **[7].** The feedback after being analysed is passed on to the concerned for implementation and subsequent improvement. Formative and Summative assessment are two ways to evaluate a student's learning and has great importance in any examination system. There is a continuous evaluation of the student not only by the teachers but also by the student himself through assignments, open book exams along with semester end examinations.

1.3 IMPORTANCE OF CBCS IN HIGHER EDUCATION

Higher education is imparted largely through Universities and Colleges. Majority of universities and colleges, particularly central universities, have adapted semester system to make higher education more compatible. However, present Indian education system producing graduates who are lacking in knowledge, skills, values, confidence and academic efficiency as a whole. The current pathetic conditions of Indian higher education system calls the necessary reformation and transformation of higher education system by introducing and devising innovations, and also by developing learner centre approach as well as globally claimed evaluation system. Most of the Indian Universities and Colleges have been following marks or percentage based evaluation system, which is acting as a barrier for students‟

versatility and not letting them to move from establishments to another to look for after the perfect subjects or courses. This shows there should be a versatile game plan of guidance with the objective that understudies could look for after different nature of master and non-capable courses according to their choice and needed. That why, after a drawn out conversation among the educationists and authorities of concerned fields, University Grant Commission (UGC) has chosen it required to be completed choice based credit system(CBCS) in all the student (UG) and postgraduate (PG) courses under the XI plan of Higher Education. Revealed in their assessment that various schools/independent associations have recently realized the comparable; Mumbai University made it important in 2011. By 2013, the entire UG and PG programs became credit-based [5]. The essential goals of introducing such activities by UGC are: Need for changes in cutting edge instruction; updated learning openings; ability to arrange learners‟ scholarly needs and desires; inter-university flexibility of understudies; improvement in nature of preparing and significance; more imperative versatility to complete the course; standardization and resemblance of informative ventures over the nation. The decision based credit framework in advanced education chips away at the basic rule of the decision being in understudies' grasp. Schools give subject alternatives to understudies. Understudies can pick subjects as per their inclinations and credits required for that specific semester.

1.3.1 Challenges for CBCS

- For any new framework, typically there will be a solid protection from change from each quarter of the scholarly world.
- Accepting grade focuses in subject rather than imprints and letter grade rather than exact total marks is troublesome because of the way that assignment of individual positioning is beyond the realm of imagination by simply alluding grade focuses and letter grades.

- Opportunity to take credits outside the center branch of knowledge may weaken the profundity in core area of studies.
- Students may confront issue in picking the subjects because of their naive approach in foreseeing future interest.

For the foundations, the quantity of understudies in a give class isn't consistent because of the way that understudies can take any subject in any school for a given course.

- ✓ The outstanding burden of an employee may change during various semesters of a year.
- ✓ The school is constrained to give great foundation, best workforce, and enormous number of elective at low expenses to draw in more understudies for a given course.
- ✓ It is tedious and costly if an understudy takes various subjects in various universities during an equivalent timeframe.
- ✓ Students can't remain in an inn of a specific school because of their investigation in various universities.
- ✓ Students need to pay school expense for various universities for their subjects taken with the goal that the entire of the charges paid will be reliably higher than the cost paid to an specific college.

The Indian Higher Education Institutions (HEI‘s) are transforming from the traditional course structure to Choice Based Credit System (CBCS) alongside prologue to semester framework from the start year itself. The semester framework helps in quickening the instructing learning process and empowers vertical and level versatility in learning. The credit based semester framework gives adaptability in structuring educational program and appointing credits dependent on the course substance and long periods of instructing. The decision based credit framework gives a cafeteria type approach in which their preferred

understudies can take courses, learn at their own pace, experience extra courses and get more than the necessary attributes, and embrace an interdisciplinary way to deal with learning. The CBCS is an adaptable arrangement of learning and gives decision to understudies to choose from the endorsed elective courses [10]. A course characterizes learning targets and learning results and contains addresses/instructional exercises/research facility work/field work/venture work/thorough Examination/classes/tasks/elective appraisal apparatuses/introductions/self-study and so on or a mix of a portion of these.

1.4 IMPORTANCE OF MULTIPLE CHOICE FOR CHOICE BASED CREDIT SYSTEM

This is the ideal opportunity for us all to joint and welcome the extraordinary execution of Choice Based Credit System in Higher Education. Proficient schools in clinical and innovative colleges additionally need to present decision based credit framework through appropriating humanities into the principle educational program. For instance, an establishment course of two months is being proposed for MBBS understudies who will take correspondence, Bio-clinical examination and verse, theory, all fused into the preparation with the goal that the understudies don't simply become technocrats however they ought to get others conscious, that is the entire thought. The CBCS framework is the answer for this kind of change from the customary educator situated instruction to an understudy focused training **[11].**

1.4.1 Bureau ration of Education:

With the implementation of CBCS, comes uniformity of curriculum and evaluation system, this requires all the institutes of higher education to function under the UGC. This includes central universities as well as public universities. This further implies loss of autonomy of many universities. Though this looks like a major step towards equalizing

education throughout the country, this might not go down easily with many universities as sudden loss of power means massive changes in the functioning, administration and management of the institutions **[12].** This is an issue that needs to be looked into seriously, discussed and debated to find a solution away between complete loss of autonomy and complete bureaucratization.

1.4.2 Mobility and lack of Infrastructure:

The lack of infrastructure stings the Indian education system at its heart. The higher education institutions are found not to have enough infrastructures to accommodate their own students. With this lack, how can they be expected to accommodate students from other institutions? How is student mobility, the most important aspect of CBCS, possible without infrastructure? This problem can be solved by systematic and proper planning and designing of the curriculum **[13].** Once the curriculum is well designed then, the concept of 'school complex' can be applied to universities.

1.4.3 Comparability of subjects

Under CBCS, the students have the choice to choose subjects of their own interest. But CBCS lacks in providing a guideline of choosing compatible subjects to provide holistic knowledge and development. It does not make sense for a student who has enrolled for Masters in Chemistry, to take up an elective in dramatics. The elective should be such as to give a complete knowledge of chemistry or provide field experience on chemistry or something related, so that the individual develops wholesome knowledge.

1.4.4 Lack of Depth Learning

With the freedom to choose from a wide array of related and unrelated subjects , students may enrol into diverse subjects, in the race to earn credits and acquire a degree

within shortest period of time , which will result in them being , Jack of All Subjects , Master of None. Therefore, there is a need of a proper guideline, or an academic counselling system to help students choose apt subjects for their proper growth.

1.4.5 Negative Attitude toward popular subjects

If a student has to choose one subject as elective, for instance, between computer proficiency and religious theology, the majority of the students will choose computer proficiency and neglect not so popular subject – religious theology. As a consequence, there will be overcrowding of students in few elective subjects every year, while others will wither away with time. this again reiterates the importance of providing a guideline to students which also mentions the importance of each subject from academic and professional point of view.

1.4.6 Work Load and Competency of the Teacher

The teachers, under CBCS will have to be continuously involved in preparing lectures for the different works, maintain records of the students and evaluate and assess students, their projects and their continuous growth. Therefore, with the implementation of Continuous and Comprehensive evaluation (CCE), under CBCS, the teachers will be continuously under excessive pressure, which will leave them with no time for personal professional development. Quality of teachers has always been an area of concern in any sector of education **[14].** For proper implementation of CBCS, the teachers need to have competency to execute the task with ease, to adapt to the new culture of education, to be quick with assessments, to handle the pressure of workload and to continue with one's professional development.

1.4.7 Student-Teacher Relation and Indiscipline

CBCS is bound to affect the traditional and the idealistic student – teacher relationship, that India is so soaked in. With semesterzation , the teachers and the students are in the hurry to complete the syllabus ,which has already mechanized the student –teacher relationship. Now with the implementation of CBCS, the students will be continuously moving from one institution to another to earn credits, that will further lessen the time the student and teacher get to bond. This will further erode classroom communication of its importance in the emotional development of an individual. India, as a country still struggles with the problem of malpractice in education **[15].** CBCS gives students complete freedom not only to choose subject of their choice but also to study at their own pace. As the proverb goes, too much of anything is bad, here, too the same applies. CBCS will have issues of low attendance; keeping track of an individual's course will be difficult (this will allow opportunists to take advantage). Under CBCS, the responsibility of evaluation lies in the hands of few teachers this will promote subjectivity in evaluation. Corruption, malpractice and bribing will flourish. To cope with this problem, UGC will have to come up with an evaluation system (for example, coding question papers, answer scripts, examines and the examiners) that neither allows the examinee nor the examiner to reveal their identity.

1.4.8 Difference in Value Orientation of Institutions

India is a diverse country not only geographically but also demographically. Therefore, there exists diversity in education as well. Each institution has its own philosophical identity with a unique aim towards education. Some promote the cause of peace while others stand for women empowerment .Difference in philosophy leads to difference in value orientation of the institutions, which further underlines the functioning of the institutions. The difference in value can become an issue of concern when students move

from one institution to another to earn credits. Moreover, the students will be required to adjust and acclimatize to different values constantly. Here, it is to be noticed that, the value of hidden curriculum loses its importance in the development of the complete personality of the students.

1.5 BENEFITS OF CHOICE BASED CREDIT SYSTEM

There are various advantages of decision based acknowledge framework when looked at for the regular framework. CBCS, overall acknowledged scholarly framework has more noteworthy adaptability contrasted and the ordinary method of instructing (teaching) and learning process. In a perfect decision based credit framework, the understudy has the opportunity to pick number of courses offered in a semester. Indeed, even the courses can be picked. Aside from the mandatory elective courses offered in a semester, there are parcel of electives offered in the subjects like humanities, arithmetic, sciences, expressions, the board, and so on. Indeed, even a designing understudy can enroll for those courses. The preferred position is that the understudy can pick the course of his/her enthusiasm as indicated by his capacity of learning.

1.5.1 Courses & Subjects

CBCS is not subject based, its course based. The reason is that subject is viewed in a broad sense and courses in a little more specific sense. Example – Biology is a subject and Molecular Biology can be a course. Physics is a subject and Quantum Physics is a course. It designed so because, there are students interested in Photonics, but not in Quantum Physics or Astronomy. This means, in credit system, few courses will be listed under a subject and the curriculum will mention the number of credits required from that particular subject. So, the student can choose the courses to satisfy the credit requirement. Same happens with all

the subjects. For example, if it is mandatory to earn 24 credits in Mathematics according to the curriculum, the student has to choose courses from the Mathematics to earn 24 credits.

1.5.2 Registration

Registration is mandatory to attend a course in credit system. Unlike the conventional system, Registration process is devised to know the number of students registered for a course. The reason is that any student can register for any course provided the course mentor permits to do so and the prerequisite condition is fulfilled. Registration may be rejected by the course instructor or the course mentor or the academic body based on certain policies. One reason can be the number of students. Another reason is that you can register for a course only if you have successfully completed the basic course on the same subject in the lower semester.

1.5.3 Prerequisites

The courses taught in the first year are mostly fundamental courses in various subjects. These fundamental courses are prerequisites for the courses to be registered in the higher semesters. Once you advance to higher semesters, you will find that in order to register for a course, you should have completed its prerequisite. For example, a pass in Basic Mathematics is mandatory to register for a course in Linear Algebra or Probability & Queuing Theory.

1.5.4 Elective courses

Elective courses are basically specialized courses offered under a subject area. For example, Wireless Communication can be an elective course. Elective courses are offered in the higher semester. Elective courses help the student to streamline his studies in a specific area. One of the important benefits is that while going for higher education, choosing the area based on the elective course would really help to get deeper knowledge in the area.

1.5.5 Continuous evaluation:

The name has everything. In a continuous evaluation system, the student is the king. He can score at least 50% of the marks for a course, during the semester itself. This means, 50% of the marks is for the continuous evaluation. This continuous evaluation is held by conducing periodical / unit tests or asking students to write home assignments, open book examination, quizzes, etc. It is essentially the teacher who decides on it. It depends more or less on the nature of the course. If the course is more theory oriented, home assignments are one ways in which the teachers evaluate the students.

1.5.6 Student benefits in a credit system:

Compared with the conventional system of yearly examination, this helps the student to write the examination, score the maximum marks during the semester itself. You know the marks scored at any given point of time during the semester. An average student can plan accordingly. For example, let us assume that out of 100 marks for a course, 50 marks is for the continuous evaluation and remaining 50 marks for the final examination conducted at the end of the semester. You can score 40 marks out of 100 during the semester itself, before the final examination. Studies can be managed accordingly for the final examination.

1.6 RESEARCH OBJECTIVE

- To study the overall perception of on students towards CBCS.
- To study the perception of perception of towards CBCS among the type of teaching to program.
- To explore the underlying factors towards perception of students towards CBCS through factor analysis.

- To comparative study of algorithms on CBCS data sets.

1.6 THESIS ORGANIZATION

In Chapter- 2, the literature related to the problem is discussed. **In Chapter 3,** some methodology and research steps with various parameters. **In Chapter 4**, Closed formulas and Models are presented. Optimum solutions and numerical examples are presented as well. **In Chapter 5,** presents conclusions and suggestions made for future research.

1.6 SUMMARY

The idea of CBCS and Semester framework in advanced education in India has been the result of the constraints of the long existing British presented arrangement of training which came about into over creation of jobless youth, indiscipline in the scholastic condition, low inspiration and a large group of different miss-matches. CBCS and semester framework is a takeoff from the conventional "test driven" training framework to a more proactive and need based system‟ that targets creating understudies with" information, expertise, mentality and worth" so essential for having a significant existence and adding to country building. Its powerful execution anyway calls for hierarchical help, both human and physical, and absolute dedication and duty of the considerable number of partners. The education system in India has progressed leaps and bounds. There have been new polices, strategies and rules implemented to make the system more student- centric and career oriented. One such plan was the introduction of the choice based credit system (CBCS) by the University Grants Commission (UGC). However, the system has yet to be implemented across several institutions, and its adaptation will pose many challenges to the institutions in terms of increasing the infrastructural requirements and switching entirely from non CBCS to CBCS.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The higher education sector of India is a competitive academic environment where quality is the immediate need of the hour. To ensure quality in the higher education system, the curriculum should have a professional approach to incorporate the best practices to equip the students with expertise and a scope of adaptable abilities that will assist them with playing a compelling job in the general public. With this point, The University Grants Commission (UGC) of India, under the XIth, has presented Choice Based Credit System (CBCS) in advanced education for graduate, post graduate, confirmation and declaration courses. CBCS is where understudies appreciate the decision to choose any subject or course of interest from the prescribed courses. It is a system that promises to bring in holistic development of an individual by providing flexible and multi-disciplinary learning experience.

This change in the curriculum of higher education, however has faced a lot of criticism from educationists, policy makers, teachers and students from across the country as they find CBCS to be impractical in the Indian education scenario. Many of the higher education institutions of India are still in the pursuit to resist the implementation of the CBCS while others have welcomed the same, seeing it as an avenue for internationalizing the Indian system of education. The objective of the following chapter is to critically review literature on Choice Based Credit System in India. Based on the analysis of the review, locates the urgent problems of the Choice Based Credit System implementation in higher education institutions of India.

The UGC believes that the choice based credit system gives adaptability in planning educational program and allocating credits dependent on the course substance and hour of instructing. The decision based credit framework gives a chance to the understudies to pick

courses from the recommended courses involving center, elective and open elective courses .The CBCS gives a cafeteria type approach in which their preferred understudies can take courses, learn at their own pace, experience extra courses and obtained more than the necessary attributes, and receive an interdisciplinary way to deal with learning. The courses will be assessed on the evaluating framework, which is viewed as superior to the ordinary imprints framework. It is important to acquaint the reviewing framework with make the consistency among every single specialized organization of India.

Sanghi (2010) describes the CBCS as a 'fair system', where students progress in the academic programme not in terms of time but in terms of courses and CBCS is all about flexibility as it allows students to learn at their own pace; allows students to study in the sequence they prefer ; allows students to specialize in a topic and then seek internships in the same; provides mobility to students in choosing topics , institutes and programmes ; promotes interdisciplinary and multidisciplinary courses tailored to students needs and interests; provides teachers opportunities to improvise ;permits universities to collaborate via academic programmes ; permits to invite experts from the industry to participate in the education process; and encourages professionals to opt for a part time postgraduate programme to enhance knowledge.

Chaubey (2015)proposed that the CBCS " the mother of learner centric educational reforms as CBCS respects learner autonomy, facilitates Lerner mobility, provides cross cultural learning environment, helps achieve transparency and compatibility between institutions and upgrades educational and occupational aspirations of the upcoming generation. However, CBCS in India has certain practical limitations like shortage of teachers and infrastructures, more workload for students and teachers, promotes partial knowledge, no system of betterment of evaluation, lacks clarity. CBCS aided with modern ICT, has high

probability to operate efficiently and effectively elevate students, institutions and higher education.

Hasan & Parvezv (2015) extensively discuss the pros and cons of CBCS. They find the percentage based evaluation system as a barrier for students' mobility, making the higher education system rigid. They strongly believe that CBCS has makes education learner cantered, promotes an interdisciplinary and interdisciplinary approach, boosts development of professional skills, encourages multifaceted development of personality, mandates uniformity in evaluation and encourages a system of teaching learning. They , however , also realize that implementation of CBCS suffers from certain issues like increase workload on the teachers , lack of infrastructure , maintenance of student records , compatibility of the chapter , lack of content mastery among the students and subjectivity in evaluation .

The academic reform in the university and college education system

The 11th Five Year plan of India proposed various measures for insightful changes in cutting edge training. The National Knowledge Commission in its report to the nation in 2008-2009 on cutting edge training and Yashpal Committee Report in 2009 recommended fixing up of cutting edge instruction through academic and administrative changes. Keeping in observe the challenges of the changed events and make the propelled training in Indian Universities great with the schools in made nations, the UGC (eleventh course of action, March 2009) and later on the Association of Indian Universities (AIU) worried on the accompanying suggestions.

2.1.1 Semester System

Instructive or educational framework everywhere throughout the world has never been steady throughout the year. Through progression and introduction to new ideas, educationists explore potential outcomes to show messages in different plausible habits. As per **B. Saharish (2009**), there are innumerable recommendation/proposition for changes and changes in educational system and there are unbounded number of savvy considerations and assessment results. The goal isn't just to pick one of them yet rather it is to have comprehensive air and approach inside which to bring to movement various thoughtful gestures known to us. Presentation of semester framework can be supposed to be the result of these examinations.

A semester framework is a scholastic term. It is division of a scholastic year, the time during which a school holds classes. It additionally may be relevant in the schools and colleges. Generally, a semester framework isolates the year in two sections or terms. Now and again, it may be trimester or quarter semester. Truly, semester implies half year time span. In India this half year framework is by and large followed. In schools we discover the year isolated in the middle of two (frequently three) significant assessments in and around the get-aways. The focal colleges in India have been long after this from a long while. At present, the greater part of under alumni schools have been acquainted with the semester framework.

In this system, the understudies get more favourable position since appraisals are held inside months (what is mulled over will remain by and by in their brain). The plan load also will be less. Understudies get more chances to improve as well. Since evaluations go in close region to a few months understudy trouble in like manner will be less in a semester system. There were various troubles to be looked by the under graduated class schools in setting up the understudies for the semester structure. The semester structure is an incredibly proactive

system as it attracts both the workforce and the understudies during the time in academic activity. While, in the yearly system once the understudy enters the school he feels free and considers thinking simply during the test time. Semester structure incorporates understudies more during the time just as reduces appraisal inconvenience. The semester system is the need of hour and an incredibly convincing one.

2.1.2Choice Based Credit System

Choice-based credit system (CBCS) has a few novel highlights: Enhanced learning openings, capacity to coordinate understudies' educational needs and yearnings, between organization adaptability of understudies (following the culmination of a semester), part-finishing of a scholarly program in the foundation of enrolment and part-fulfilment in a particular (and perceived) establishment, improvement in instructive quality and greatness, adaptability for working understudies to finish the program over an all-encompassing time frame, normalization and likeness of instructive projects the nation over, and so on. The CBCS inescapably fits into the developing financial milieu, and could viably react to the instructive and word related yearnings of the up and coming ages. [12] In perspective on this, establishments of advanced education in India would do well to put through and assets into presenting CBCS. Helped by present day correspondence and data innovation, CBCS has a high likelihood to be operational proficiently and viably – hoisting understudies, organizations and advanced education framework in the nation to more up to date statures. It may be included that countless colleges and organizations in the nation are as of now having their undergrad and post – graduate 'papers' partitioned into units and sub-units. In turning on to CBCS, the undertaking of such organizations would be moderately simple.

2.1.3 Curriculum Development

Educational program advancement can be characterized as a sort of bit by bit process used to make positive upgrades in the courses offered in advanced education. The world changes, approaches and profiles create and new points of view on examination and callings impacts the educational plans. Inventive showing procedures and systems, for example, groundbreaking learning or mixed learning, are continually being formulated so as to improve the understudy learning experience. Therefore, a foundation must have an arrangement set up for recognizing these movements and afterward have the option to execute them in the educational plans. Educational plan advancement includes the execution of various sorts of instructional procedures and hierarchical techniques that are centered around accomplishing ideal understudy improvement and understudy learning results. Current educational plan types can be stalled into two general classifications: the item model and the procedure model. The item model is results-arranged. Assessments are the ideal objective, with the consideration lying more on the finished thing instead of on the learning system. The method model is revolves around how learning makes over some unclear time span. These two models ought to be viewed as when working up an instructive program.

2.1.4 Examination Reforms

Aithal, Sreeramana et al (2016), proposed the foundations of advanced education are needing an imbuement of another model of training so as to keep the instructive program in pace with changing condition which fuses advancement gathering, changing industry need, changing want of understudies and changing wants for society. It is ordinary that two models and two structures of cutting edge training will get importance in this advancing condition. The two models of cutting edge training which will be noteworthy in future days are (1) Conventional study hall based guidance model and (2) Technology reinforced online

ubiquitous preparing model. The two propelled training systems which are required to be appealing to the understudies are Choice Based Credit structure and Competency based Credit structure.

Aithal P.S. et al (2015), featured that India's propelled instruction structure is seen as the most testing the extent that entrance, worth and significance, reorientation of activities by laying emphasis on quality, characteristics and ethics alongside the examination of associations for their accreditation. In organization part it is the third greatest on the planet.

Tony Feghali et al (2011), proposed the Student instructing is a basic part regarding a fruitful scholarly encounter. It includes assignments where employees assist understudies with finishing the prerequisites important to graduate. It additionally requires extensive anticipating the piece of the two understudies and guides. Scholarly counsellors are presented to an assortment of chances, improvements, issues, and decisions as innovation turns out to be more predominant on college grounds.

Different colleges and foundations around the globe utilize robotized prompting frameworks. They are useful and helpful for the two guides and advisees in that they add to helping with settling on better-educated choices and improved administrations. Acquainting innovation with the prompting procedure targets utilizing tedious undertakings on programming and devoting time to helping an understudy plan his/her instruction guide.

Stefan A. D. Popenici et al (2017), proposed that the utilization of man-made reasoning in instructing and learning in advanced education. It examines instructive ramifications of rising innovations in transit understudies learn and how establishments educate and develop. Late innovative headways and the speeding up receiving new advancements in advanced education are investigated so as to anticipate the future idea of

advanced education in our current reality where man-made reasoning is a piece of the texture of our colleges. .

Santu Biswas (2018), Highlighted that the “Choice Based Credit System is a proven, advanced mode of learning in higher education which facilitates a student to have some freedom in selecting his/her own choices in the curriculum for completing any Degree program”. UGC has thought of the Choice Based Credit System (CBCS) program in which the understudies have a decision to look over the recommended courses, which are alluded as center, elective or delicate expertise courses and they can learn at their own pace and the whole appraisal is reviewed dependent on a credit framework. The essential thought is to investigate the requirements of the understudies in order to stay up with the latest with improvement of advanced education in India. CBCS permits understudy a simple method of portability to different instructive establishments spread over the world alongside the office of move of credits earned by understudies. There is absence of an 'Interdisciplinary methodology' and disregard for 'esteem based courses'. The answer for such an issue is give a decision to understudies to contemplate various subjects and have practical experience in interdisciplinary zones. In this manner the University Grants Commission (UGC) has started a few stages to remember development and improvement for course-educational programs, presentation different kinds of assessment, assessment and appraisal framework.

Mushtaq Hussain, et al (2018), this examination is to foresee the challenges that understudies will experience in a resulting computerized structure course meeting. We investigated the information logged by an innovation improved learning (TEL) framework called advanced gadgets instruction and plan suite (DEEDS) utilizing AI calculations. The AI calculations incorporated a fake neural systems (ANNs), bolster vector machines (SVMs), strategic relapse, Naïve Bayes classifiers and choice trees.

The DEEDS framework permits understudies to illuminate advanced plan practices with various degrees of trouble while logging input information. The instructive preferences of e-learning incorporate internet educating and course conveyance, which don't require physical study halls for understudies. Contrasted with customary methods of learning, e-learning is more affordable, and a bigger number of understudies can enlist for online courses. Be that as it may, in e-learning, there is no immediate correspondence among understudies and educators. In this manner, e-learning represents a few difficulties. To start with, it is hard for teachers to survey the adequacy of a course. Second, the dropout pace of understudies in e-learning courses is a lot higher than that in customary methods of learning. Third, surveying understudy's exhibition is troublesome. Fourth foreseeing in danger understudies in new courses is likewise troublesome.

Ashish Kumar Chaubey (2015), Proposed that the higher education is that part of education system which facilitates the human needs physical as well as spiritual in its different product form. Most of them are obtained by new researches indifferent aspect of education and knowledge like new curriculum, advancement in teaching methods, new trends of evaluation system, new administration system and so on. The idealists lay emphasis on ideals, values, spiritualities and so on, but realist on the vocational education. The naturalists emphasize science related curriculum and scientific methods while pragmatists on utility based curriculum and scientific methods. This indicates that there is no common and holistic view. There is a system which provides opportunities holistic development containing allof the curriculum and methods and that is choice based credit system (CBCS). It creates an all-rounder specialist to the learner.

CBCS is the mother of student driven instructive changes. An understudy is furnished with a scholastically rich, exceptionally adaptable learning framework with an imperative arrangement for aptitude practice and movement direction that the student could learn inside

and out without relinquishing his imagination. An understudy appreciates an exceptional advantage that his assessment would be as far as evaluations, registered through a more logical and a coherent procedure of standardization which assimilates the benefits of relative weighing of the exhibitions against assessing in a flat out manner. Interestingly, the learning procedure is made constant and the assessment procedure isn't just made nonstop yet additionally made understudy driven and is intended to perceive the ability and ability of an understudy. CBCS is a procedure of development of instructive changes that would yield the outcome in ensuing years and after a couple of patterns of its implementation.

Dutta, I. (2013), Highlighted that the choice-based credit system (CBCS) has many extraordinary highlights as cutting edge learning openings, capacity to coordinate understudies' academic and non-academic needs and goals, between organization adaptability of understudies, part-finishing of a scholarly program in the foundation of enrollment and part-consummation in a specific establishment, improvement in instructive quality and greatness, adaptability for working understudies to finish the program over an all-encompassing timeframe, normalization and similarity of instructive projects the nation over, and so on.

The CBCS unavoidably fits into the rising financial circumstances, and could adequately react to the instructive and word related yearnings of the forthcoming ages. Establishments of advanced education in India would do well to put through and assets into presenting CBCS. Supported by present day correspondence and data innovation, CBCS has a high likelihood to be worked proficiently and viably - raising understudies, organizations and advanced education.

Indian Education Review (2015) reported that there are challenges in the University Grants Commission's (UGC) recommendations for the implementation of Choice- Based Credit Semester System (CBCSS). Credit system was introduced for the benefit of the students. The system promotes the mobility of students within the university and outside. But there are challenges in drafting the syllabus, motivating and training the staff. Students also have to be made aware of the importance of attendance, continuous evaluation and semester system. Academic board has to plan measures to overcome these challenges.

Clement (2010) recommends there is nobody right approach to build up homeroom the executives and control. Every single new instructor must locate their own agreeable harmony among benevolence and emphaticness. In Choice based credit framework (CBCS), an understudy can gain a few credits from one school and move the credits to some other school. An understudy who is going after low upkeep reason can obtain two or three attributes and stretch his examinations to four or five years as showed by his convenience. There is no drive to complete a degree program in three years. There is an arrangement to change the school in the wake of acquiring a couple of credits whenever wanted. CBCS has the office to move the credits starting with one foundation then onto the next and considers barely any credits earned in a related industry inside the educational plan. Understudies can likewise include credits from imaginative and performing expressions which are getting main stream in grounds.

Olawande Daramlo et. al 2014, in this work, has introduced the structure, execution, of a canny Course Advisory Expert System (CAES) that uses a mix of rule-based reasoning , and case-based deduction to recommend courses that an understudy should enroll in a specific semester by making proposition reliant on the understudy's insightful history. The evaluation CAES yielded adequate execution to the extent reasonably of its proposition, and comfort.

Tahira Mahboob et. al 2016, understudy appraisal on e-learning stages is a discussed subject. The central accentuation of this exploration study is to anticipate reasonable/straightforward understudy assessment utilizing AI calculations. A forecast on understudies' last grade demonstrating whether the understudy will pass or come up short would profit the understudy/educator and go about as a guide for future proposals/assessments on execution. An inside and out examination on the evaluation procedures for e-learning, for example, Markov Model, met psychological points of view has been led.

J. V. Monaco (2013), states that the principle utilization of enthusiasm for this investigation is checking the character of understudies in online assessment situations, an application that is getting more significant with the understudy enrolment of online classes expanding, and educators and organizations getting worried about assessment security and scholarly uprightness. Keystroke biometric frameworks measure composing attributes accepted to be novel to an individual and hard to copy.

The keystroke biometric is a conduct biometric, and the vast majority of the frameworks grew already have been exploratory in nature. All things considered, there has been a long history of financially ineffective executions focused on persistent acknowledgment of a typist. Late PC examines have utilized stylometry to decide creation of messages, tweets, and texting, with an end goal to confirm clients of the more generally utilized advanced media. A couple of studies have applied stylometry to the recognition of deliberate muddling or misleading composing style, and others to the location of the creator's socio-economics

2.2 CHOICE BASED CREDIT SYSTEM IN INDIA

College Grants Commission (UGC) has proposed the Choice Based Credit Framework (CBCS) to be received in Indian colleges in which the understudies have a decision to browse the recommended courses, which are alluded as center, elective or minor or delicate ability courses and they can learn at their own pace and the whole evaluation is reviewed dependent on a credit framework. The essential thought is to investigate the requirements of the understudies in order to stay up with the latest with improvement of advanced education in India and abroad. CBCS plans to reclassify the educational program staying up with the advancement and globalization in instruction. CBCS permits understudies a simple method of versatility to different instructive organizations spread over the world alongside the office of move of credits earned by understudies. CBCS has following highlights:

- CBCS is consistently actualized in all focal, state and other perceived colleges in India.
- CBCS comprises of three sorts of fundamental courses ordered as Core courses, Elective courses and Foundation courses.
- CBCS additionally has non-credit courses to be browsed a pool which will be surveyed as 'Palatable' or "unsuitable'. Non-credit courses are excluded from the calculation of SGPA/CGPA.
- All the three fundamental courses will be assessed and gotten to for figuring of aggregate credit and grade to accommodate a viable and adjusted outcome.
- Core course comprises of mandatory subjects to be concentrated by an understudy to get the predefined degree.
- Elective courses comprise of a pool of subjects from which understudy needs to pick a indicated number of subjects for his/her examinations to get degree. The elective courses may contain pool of subjects which might be quite certain or particular or

progressed or steady to the order/subject of study or which gives an broadened extension or which empowers an introduction to some other discipline/subject/space or supports the up-and-comer's capability/expertise.

- The elective courses are additionally partitioned into following three classes: (a) Control Specific Elective (DSE) Course: These are the elective courses may be offered by the key request/subject of study. The College may moreover offer control related Elective courses of interdisciplinary nature. (b) Exposition/Project: It is an elective course expected to get exceptional/moved data, for instance, supplement study/reinforce study to an endeavor work, and an up-and-comer studies such a workshop in solitude with a notice support by a teacher/staff. (c) Generic Elective (GE) Course: It is an elective course picked by and large from a random control/subject, with a goal to look for presentation.

2.3 STRUCTURE AND IMPLEMENTATION OF CHOICE-BASED CREDIT SYSTEM

The primary component of the CBCS is to make undergrad training understudy driven as opposed to framework driven or educator driven. For accomplishing these destinations, the CBCS endeavors to make an all encompassing schedule. In this way notwithstanding committed spotlight on a control through different point of view whether in a distinctions educational program or an ordinary educational plan, elective regions have been included which will give understudies the opportunity to pick the unified/applied/wide regions of their order and furthermore the regions of different orders of their advantage.

2.3.1 Learner-Centric Approach

The most significant change brought by the CBCS framework is making the learning framework "Understudy Centric". CBCS will permit understudies to pick between disciplinary, intra-disciplinary courses, ability situated framework (even from different orders as indicated by their adapting needs, premiums and fitness) and give greater adaptability to understudies in learning. Understudies will be permitted to get credits by consolidating one of a kind branches of knowledge, for example, Physics with Economics, Microbiology with Chemistry or Environment Science and so on. CBCS offers adaptability for understudies to learn at various occasions and at various organizations to finish a course, along these lines giving simplicity of portability to understudies. Credits earned at one organization can be moved to another establishment also. In this way, if viably actualized the CBCS framework gives great adaptability to address the issues of each understudy.

2.3.2 Subject Categories

CBCS framework permits understudies their preferred adaptability of choosing the subjects. The subjects are sorted in to different gatherings permitting understudies to choose subjects of their enthusiasm under each gathering. The classifications determined by UGC are given underneath:

- ✓ Core Course
- ✓ Elective Course
- ✓ Discipline specific elective Course
- ✓ Generic Elective
- ✓ Project
- ✓ Ability Enhancement Courses
- ✓ Skill Enhancement Courses

2.3.2 Grading

The CBCS framework follows the semester design where two back to back semesters (odd and even) establish a scholarly year; Grading and assessment of understudy's exhibition in each subject happens toward the finish of every semester. CBCS utilizes a credit-based reviewing framework and not a rate savvy framework. Despite the fact that the utilization of credit-based evaluating is regular among colleges, the credit framework indicated by UGC is determined beneath. The accompanying delineations could be taken for instance for figuring SGPA and CGPA from credits for praises courses in all controls, degree Program courses in Science subjects and degree Program courses in Humanities, Social Sciences and Commerce subjects: Test representation of figuring SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average) for subjects under CBCS framework

2.3.3 Ballot System

In spite of the fact that the CBCS framework have been around for an a lot of years, it is as of late that parcel of accentuation has been placed in its execution. The most effortless and least complex approach to execute CBCS framework at an organization for a little associate of understudies is the voting form framework. Toward the start of every semester all the accessible subjects (in light of UGC rules and educator accessibility) for understudies are made accessible as unfilled canisters. Understudies at that point can choose their preferred subject by dropping a part with their name on it in containers of the significant subject. Along these lines the establishment will have the option to gather information on the inclinations of the subject by understudies. This kind of subject choice technique is attainable just for few clients. When the subject determination is finished then the rundown of understudies for each subject is digitized by the subject-explicit instructor and all subject explicit data (Time table,

prospectuses and so forth) are shared to the understudies. Participation and Grading according to the CBCS framework ought to be finished by the instructor physically and evaluated all the time.

2.3.4 Online System

At the point when CBCS framework must be actualized for a huge gathering of understudies, the better option for manual work would be a computerized online framework worked to meet your prerequisites. An online framework should guarantee viable and simple execution of the CBCS framework at your grounds and let you improve, alter and make changes later on. A decent online framework to actualize CBCS framework at your grounds should assist you with doing the accompanying.

2.3.5 Subject Selection by Students

When the foundation has concluded the subjects, credits, paring, pre-imperative courses and so forth, for the specific course, the information must be transferred in to the framework. The framework ought to permit understudies to choose the subject and educator according to their advantage. The framework ought to have the option to confine the determination of subjects by understudies dependent on the rules that fits the prerequisite of the foundation. Along these lines of subject determination will evacuate the intricacy that may happen when following a manual framework. Educators ought to likewise have the option to share notes, lead tests, talk about on branches of knowledge with understudies in this way making learning a connecting with understanding for understudies.

2.3.6 Timetable Generation

When the subjects are chosen by every understudy, a period table ought to be produced by the framework for every understudies dependent regarding their matter determination. This ought to be made accessible for understudies constantly and furthermore to instructors, so educators know about the understudies in their group for different subjects.

2.3.7 Attendance

The time-table for educators ought to likewise permit them to gauge participation for each subject they handle. This will decrease any desk work engaged with keeping up participation registers and the confusion while computing the complete participation percent for every understudy.

2.3.8 Grading according to CBCS

For foundations that as of now utilize the credit based framework for assessment, the CBCS framework would not include a lot of progress. Establishments where Controller of Examinations (CoE) previously utilizing on the web framework for assessment will comprehend the straightforwardness and effortlessness an online framework can give them. The online framework ought to have the option to produce the SGPA and CGPA dependent on the data sources got by the educators of each subject. Despite the fact that there are numerous online frameworks that give such an assistance, the best one's future those that are easy to understand and straightforward for the instructors to utilize. The online framework equipped for printing mark sheets dependent on organizations prerequisites makes the work significantly less complex for colleges and self-sufficient universities.

It additionally opens up open doors for understudy portability, permitting them to take credits earned in one organization to another foundation to which they move. In this manner,

CBCS assists with building up consistency and equality inside and across establishments, which would likewise be valuable for understudy's opportunities openings. In order to, various authors have given the contributions according to situations, which are presented in table 1.

Table 2.1 Contribution Table

Authors	Year	Contribution	Criteria
Aithal et. al. [17]	2016	Analysis of Choice Based Credit System in Higher Education	Quantification Based
Alka S. Kelkaret. al. [35]	2014	Reform of Choice Based Credit System	Theoretical Based
Amutha Josephet. al. [36]	2012	Observation of CBCS parameters	Parametric observation
B. Saharishet. al. [37]	2009	Evaluation System on Reforms in Higher Education	Quantitative evaluation
Moradi et. al. [38]	2012	Predict Student Scores Using Bayesian Networks	Quantitative evaluation
Naiduet. al. [39]	2016	Evaluation of Choice Based Credit System	Quantitative evaluation
Suheel Rasoolet. al. [40]	2017	Highlighted to Issues and Challenges of Choice Based Credit System	Theoretically
Hasanet. al. [41]	2015	Pros and Cons of Choice Based Credit System	Theocratically
Dr. Rastogi Himanshuet. al. [42]	2018	Given to innovative concept for Choice Based Credit System	Qualitative evaluation
P. S. Aithalet. al. [43]	2020	Analysis of Choice Based Credit System	Quantitative evaluation

2.4 PROBLEM DEFINITION

India, which is ranked second in the world population, and has around 1.4 million schools, with more than two hundred million students enrolled, around 700 universities, and 35000 colleges [50]. Over the last decade, the Indian education framework has undergone various revisions to accommodate students with varying skill sets and abilities and provide them with career opportunities focusing on their existing skill set. The changes try to ensure that the Indian education system to global patterns. UGC has taken first step by introducing Choice Based Credit System (CBCS). The CBCS allows students to focus on their subject interests and prioritize their learning. However, the lack of infrastructure in higher education institutes makes it difficult for pan-India implementation of CBCS.

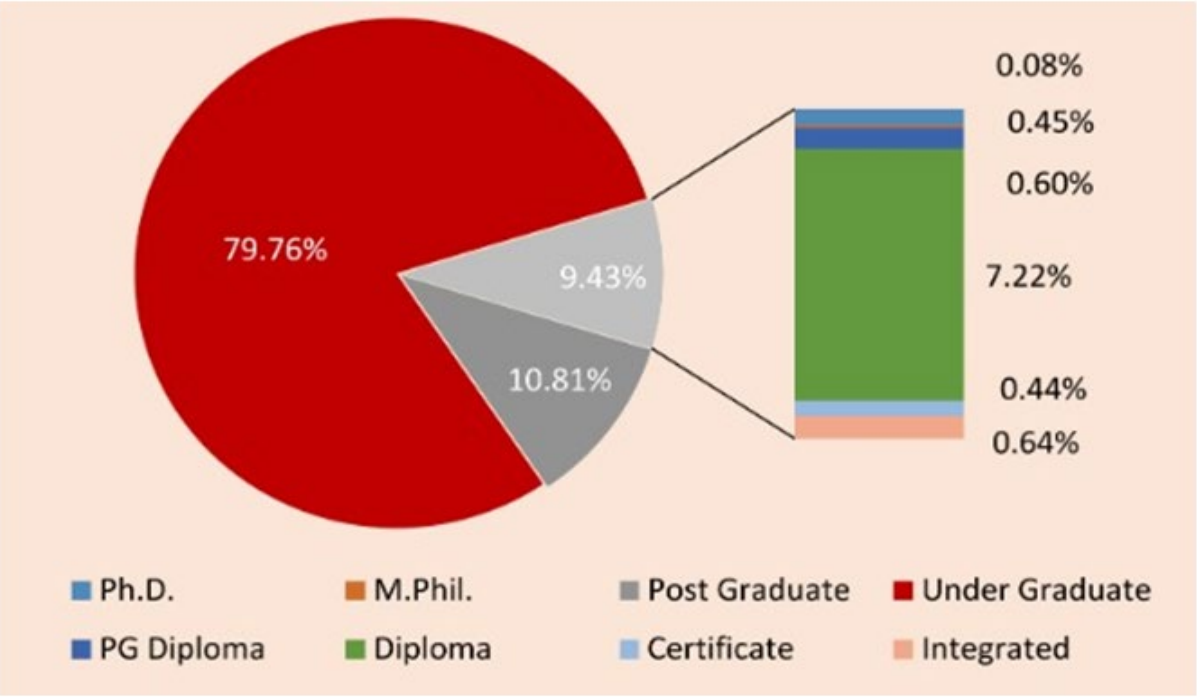

Figure 2.1 Percentage share of student enrolment in 8 levels

(As per AISHE Report 2018-19)

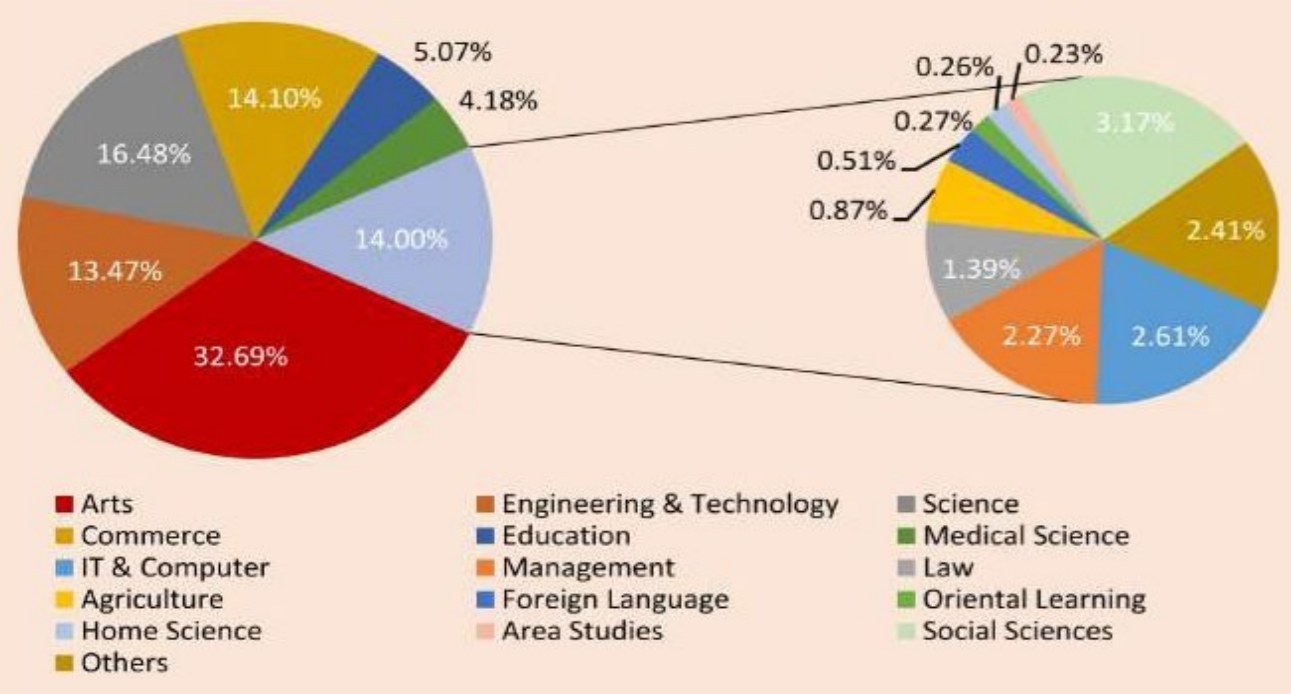

Figure 2.2 Stream-wise Distribution of Under Graduate Enrolment

(As per AISHE Report 2018-19)

All India Survey on Higher Education has reported that the total percentage of student enrolment in Under Graduate courses are around 79% (Figure 2.1) 13% opted for Engineering & Technology (Figure 2.2) as their preferred stream. Based on the data present in the report, the Gross Enrolment Rate (GRE), for age group 18-23 years, was calculated to be 24.5%. Taking in consideration a total of 39,071 Colleges and 799 Universities, as recognized by AISHE for the year 2018-19, the low percentage of Gross Enrolment Rate shows that students are not taking interest in Higher Education. Large number of dropouts also contributes to the low Gross Enrolment Rate (GRE). There have also been several other studies conducted by Institutions such as Jawaharlal Nehru Technological University (JNTU) which shows that only 3% to 4% of the total students drop out every year among those who

join engineering colleges, dropout every year [51]. Another study by AICTE shows the dropout rate at 30%-35%. This data shows that out of every 10 engineering students, 3 of them are leaving the college before completing their degree. A research project by **Matthew Meyer et al.** [22] asked dropout participants to draw an illustrated map of their journey in and out of the engineering program using which factors were deduced, which may explain their reasons for leaving the engineering program. All the different factors were grouped into two separate categories, namely "Individual Factors" and "Institutional Factors." The study further shows that there was a high uncertainty among students regarding whether or not they can complete their engineering program. In such cases, it is the responsibility of the Institution to assess their students and motivate those who may secure low grades. This research aims to use the Bayesian Network to predict students' grades for their assessment, which will help to remove any uncertainty from their minds and boost their morale and self-confidence.

2.5 SUMMARY

The review of literature provided information and ideas about the nature of research in the field of investigation. With its help the investigator could properly design the study. Above segment provides the rotated issues, and variance explained by the expert’s theory. Because of usage of CBCS as an experiential module in the academic's, understudies could learn best when they were by and by associated with industry issues, research work and business enterprise ventures. Likewise, usage of CBCS for understudies assisted with improving their exhibition in different competitive tests and campus placement activities. We prevailing to pick up progress in CBCS. **(i)**CBCS viably as an education system, and as a part or pioneer in study various, and in multidisciplinary settings.

(ii) Apply CBCS standards and focus on professional ethics, duties, and standards of the building practice by ten percent when compared with each year. Over the past decades, the education system in India has advanced a wide margin. There have been new policies, methodologies, and rules actualized to make the system more understudy driven and career-centric. One such arrangement was the presentation of the Choice Based Credit System (CBCS) by the University Grants Commission (UGC). However, the system has yet to be implemented across several institutions, and its adaptation will pose many challenges to the institutions in terms of increasing the infrastructural requirements and switching entirely from non-CBCS to CBCS. From the basic survey evidence understudies see the CBCS to be understudy driven which gives understudy independence/freedom and has lucidity in assessment with clear schedules and sufficient school resources giving all-round development of students. It is presumed that the critical factors. In this manner, CBCS will empower the smooth change from an educator driven system to an understudy driven system.

CHAPTER 3

PROPOSED METHODOLOGY

3.1 INTRODUCTION

CBCS is presented for various reasons. UGC has sketched out the few interesting about it [3]. The investigates have uncovered that the student driven relevant educational program and the ideal student results proposed can be accomplished mostly through Choice Based Credit System (CBCS) [12]. It is the important apparatus of acquiring the change the advanced education arrangement of India. The scholarly changes in the current arrangement of advanced education are the need of great importance. The all encompassing activity plan is required for the stage savvy presentation of considerable scholastic changes in the foundations of advanced education in the nation. Scholarly changes are a key towards granting better quality training that is arranged towards employability and development. Notwithstanding changes in the current framework, we have to present new arrangements that make the advanced education framework progressively adaptable to the requirements of the understudies and the general public. As per RUSA record Choice-based credit framework (CBCS) has a few novel highlights: upgraded learning openings, capacity to coordinate understudies' academic needs and desires, between organization transference of understudies, and greatness, adaptability for employable understudies to finish the program over an all-inclusive timeframe, normalization and equivalence of instructive projects the nation over, and so on. CBCS was viewed as the benchmark for our scholarly establishments against the universal level foundations. India has embraced the CBCS on the proposal of the Knowledge Commission (Sam Pitroda) just according to the Eleventh Five Year plan so as to achieve quality and transformational change in Indian advanced education [4]. Under the CBCS, an understudy would seek after three sorts of courses and they are necessary establishment courses, elective courses and center courses. Here, it is compulsory for an understudy to have the center subjects each semester and pick electives from the recommended pool of subjects inconsequential to her own control [34]. The CBCS targets acquainting multidisciplinary

approach with advanced education empowering an understudy to have solid hold over various subjects from a wide scope of elective subjects.

3.2 LITERATURE REVIEW

The application of Bayesian Networks to various fields has always been a progressive research topic. Apart from medical field, there are several use cases of Bayesian Networks wherever there is uncertainty involved. One such use case consists of predicting students' academic performance based upon values of some identified student- related attributes.

RafeTorabi et al. [45] proposed a Bayesian Model to predict scores of students enrolled in the Islamic Azad University, Sanandaj. The model was constructed through data obtained from 500 students and used different algorithms such as PC and Greedy Thick Thinning, to build a Bayesian Network. Greedy Thick Thinning is a structure learning algorithm which is based upon Bayesian Search approach. It is used whenever we need to learn about the dependencies between the variables in a network. By using Greedy Thick Thinning algorithm, the researchers were able to find the best performing network structure, by optimizing it, either by adding(thickening) or removing(thinning) the arcs between nodes based upon conditional independence test of variables. The other approach used by the researchers carries out several independence tests on the database of students and build a Bayesian Network in agreement with the test results. PC algorithm is the best example of this approach. The proposed model demonstrated an accuracy of 66% while predicting the students score.

Ashkan Sharabiani et al. [46] used Bayesian Network to predict the scores of the students enrolled in the University of Illinois, Chicago, in three subjects, i.e., General Physics II, Calculus II, C/C++ Programming. The proposed model took into consideration students' demographic attributes such as Age, Sex, Race, and Citizenship Status as well as Academic

attributes such as Grade in subjects and First Semester GPA. Researchers used different constraint based, score-based and hybrid algorithms to find the optimal configuration of the proposed model. An optimal network structure fully describes the relationship between the model variables. The accuracy of the proposed model was also compared with several data mining algorithms such as Decision Trees, Naive Bayes, K-nearest Neighbors.

An approach to Educational Data Mining (EDM) was proposed by **Anal Acharya et al. [47]** to predict the academic performance of students using various classes of Machine Learning Algorithm such as Decision Trees, Bayesian Networks, Artificial Neural Networks and some other. The attributes and data set used for training and testing the different MLAs were obtained from students majoring in Computer Science in some undergraduate colleges in Kolkata. Student's family size, board at higher secondary level, family income, number of study hours, marks in midterm exams and private tuitions were all determined to effect student's academic performance. All of these attributes were used to predict student grades on a scale of O-F where O signifies that student is outstanding and F signified that student is poor in studies and may need remedial classes. Among the different classes of algorithms, Decision Trees were the most useful for generating production rules. Production rules were used for improving the accuracy of classification of decision trees. They contain a smaller number of attribute-value conditions. The production rules used by the author are generally in the form of if-then-else statements. C4.5 was used for generating the decision tree. Unlike ID3 algorithm, which continues to grow the tree until it makes no errors over the set of training data makes it prone to over fitting. Data often has some degree of error or random noise within it. Thus, making the model conform too closely to inaccurate data can reduce its predictive power. This is known as Over fitting. C4.5 employs pruning to mitigate over fitting. The algorithm can also work with discrete as well as continuous data. The efficiency of prediction algorithm was determined using F-Measure and Kappa Statistic.

Shiva Asadianfam et al. [48] proposed a Bayesian Model for selection of academic major of High School students of the Maragheh city of Iran. Model parameters were gathered using a questionnaire provided to the students, and Bayesian Network was constructed using Genie Software. An academic advisor was also consulted to provide relationships between parameters. It was concluded that out of the three algorithms i.e., Likelihood Sampling, Logic Sampling, EPIS. Sampling, the Logic Sampling algorithm had a better outcome.

The research presented by **Rahel Bekele et al. [49]** used several social and personal attributes of Ethiopian students to predict their academic performance. The test subjects were students of a senior high school in Addis Ababa, Ethiopia. An interactive system was developed for the students to fill in their details as well as indicate their extent of agreement to questions provided by the system. Students' response was then used by the Bayesian network to calculate the probability of the student having above satisfactory, below satisfactory or satisfactory performance.

3.3 METHODOLOGY DEVELOPED

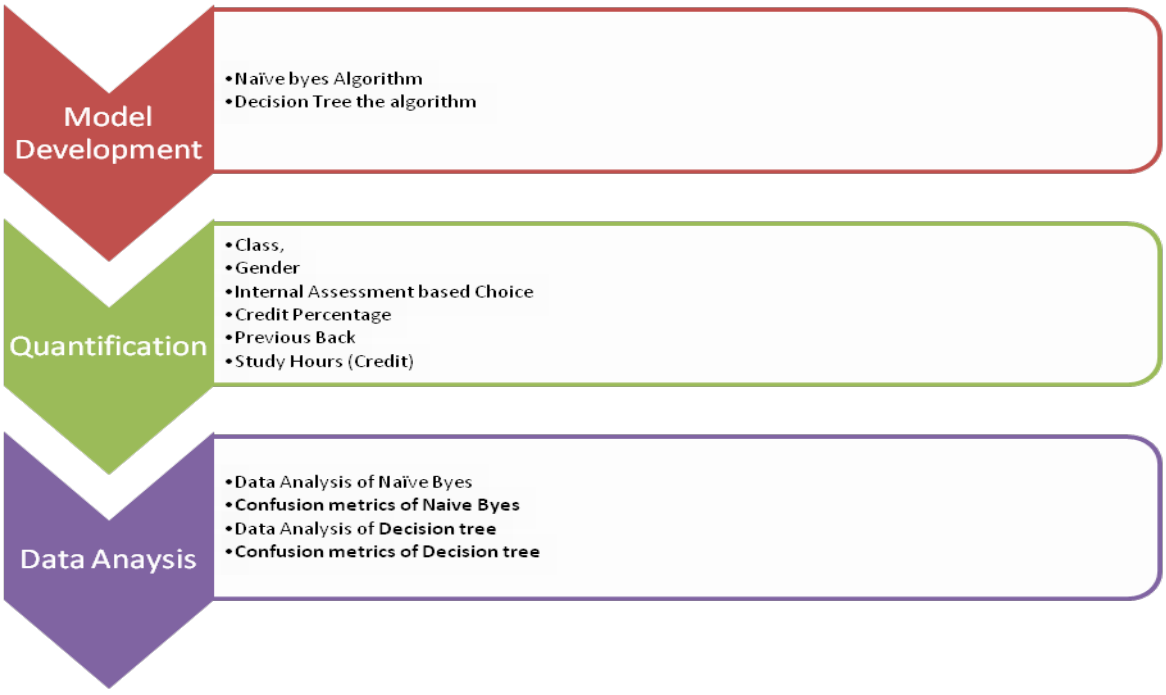

Figure 3.1 Proposed Methodology

3.4 MODEL DEVELOPMENT

As indicated by the estimations of the parting characteristic, the preparation information are apportioned into a few subsets during model development. Up till all occurrences in a subset have a place with a similar class in any Naive byes and Decision Tree the calculation continues iteratively in model turn of events.

3.5 QUANTIFICATION

The dataset [1] that is used in the experiment is choice-based credit system-based dataset. Dataset description is as follow. The CBCS dataset have taken from open source dataset. The main technique utilized by the creators was Bayesian Network (BN). As indicated by Naïve byes had broke down the presentation of CBCS informational index. This quantification has been done on the basis of these parameters:

- Class
- Gender
- Internal Assessment based Choice
- Credit Percentage
- Previous Back
- Study Hours (Credit)

3.6 DATA ANALYSIS

The basic structure of data analysis is based on the parameters chosen and Algorithm applied i.e. **Naive Byes and Decision tree.**

These both algorithms is used for different machine learning methods and following had been generated to support the strengthen the claim:

- ✓ Data Analysis of Naïve Byes
- ✓ **Confusion Metrics of Naive Byes**
- ✓ Data Analysis of **Decision Tree**
- ✓ **Confusion Metrics of Decision Tree**

A disarray framework contains data about real and anticipated orders done by a characterization system. Execution of such frameworks is usually assessed utilizing the information in the lattice.

3.8 SUMMARY

Before the use of noteworthy calculation we have to break down the information utilizing a few information mining instruments and methods. Assessment and correlation of such procedures are likewise critical to take near good choice. We have utilized two well known information mining calculation Decision Tree and Naïve Bayess to sum up information for choosing a gathering of client. At that point a novel calculation [4-7] is utilized to separate significant information. This calculation forms choice tree and acquire activities that are related with characteristic worth changes of the customers from one status (not an investor) to another (contributor).

The Naïve Byes and Decision Tree algorithms were applied on the choice-based credit system dataset. Decision tree (D.T) outflanks others as far as exactness, time and accuracy. It very depends on the calculation utilized for proposal to discover intriguing assets. Finally, the extensive investigation is done about D.T calculations and naive bayes is the calculation for this dataset is extremely exact and generally precise among the others. The CBCS based open source data set. The total number of records was 1000 with 5 attributes. After that two diverse arrangement calculations were utilized. They were Bayes Net and

Random Forest. The information mining apparatus utilized in the analysis was KNIME. In light of the exactness and the arrangement blunders one may reason that the Naive strategy was the most fit calculation for the dataset. The innocent byes calculation was applied to the dataset utilizing KNIME to discover probably the best guidelines. The information might be reached out to gather a portion of the extra-curricular perspectives and specialized aptitudes of the understudies and mined with various Intelligence calculations to anticipate the understudy execution as task to be accomplished in near future. The makers moreover excited about working in future on data of understudy's assessments for each course endeavoring to appreciate what kind of understudy persuade what kind of courses. It may portray what kinds of courses are balanced for each property of informational collection who has comparative properties. It may in like manner give diverse multidimensional summary reports and reconsider educational learning perspectives. According to the usage of this undertaking, information characterization with decision tree is simple with contrasted with other strategy. Due to past records and pictorial view, the errand of classification of information turns out to be simple. When the outcome acquired, it very well may be reused for next exploration. The dataset is of type text and number. As the limit is expanded, the time taken to prepare decision tree is to be diminished. The benefit of naive byes is that it gives a hypothetical system to considering not just the test information to plan an ideal classifier, yet in addition an auxiliary conduct for permitting better speculation ability.

CHAPTER 4

MODEL DEVELOPMENT

4.1 INTRODUCTION

All the credit framework empowers college understudies to choose courses without anyone else. Diverse course groupings from this boundless credit framework will bring about various accomplishments. As indicated by the encounters, courses masterminded with logical successions as a rule lead to better evaluations to understudies; actually, outlandish course game plans by and large lead to less than stellar scores. This is, obviously, just one factor among all components affecting understudies' scores. For instance, such showing factors as essentials and educational plan framework settings; there are some shrouded factors, for example, the showing capacity of educators, the test trouble level, and so forth. In the interim, factors other than showing exist, for example, understudies' very own ability, etc. Under normalized conditions, to be specific, the showing capacity of instructors, the trouble level of test questions and the understudies' scholarly conditions are at typical levels, connection between courses might be the primary variables prompting accomplishment contrasts.

In this chapter the proposed Naïve Bayes calculation portrays how to create a college class routine inside a mediocre scope of certain limitations. A guileless byes-based characterization calculation has been acquainted with understand issues is a regarded innovation for taking care of difficult issues which incorporate many (nonlinear) compels. CBCS Constraint engendering method has been applied to conquer the particular necessities for openings of instructors, courses from pre-prompting by understudies and study hall assignment. Adaptable decisions for courses may prompt a gridlock circumstance. Oolz utilized needs heuristic requesting [2] where Abdennadher presented an improved cost-based standard mining [3, 4] to take care of these sorts of issues.

4.2 BAYESIAN NETWORK

They are a kind of Probabilistic Graphical Model that can be used to manufacture models from data just as ace end. They can be used for a wide extent of endeavors (figure 4.1) including estimate, quirk distinguishing proof, diagnostics, automated getting, thinking, time plan desire and dynamic under weakness. Bayesian frameworks are a probabilistic graphical model that unequivocally get the known unforeseen dependence with facilitated edges in a chart model. Each and every missing affiliation describe the unforeseen independencies in the model.

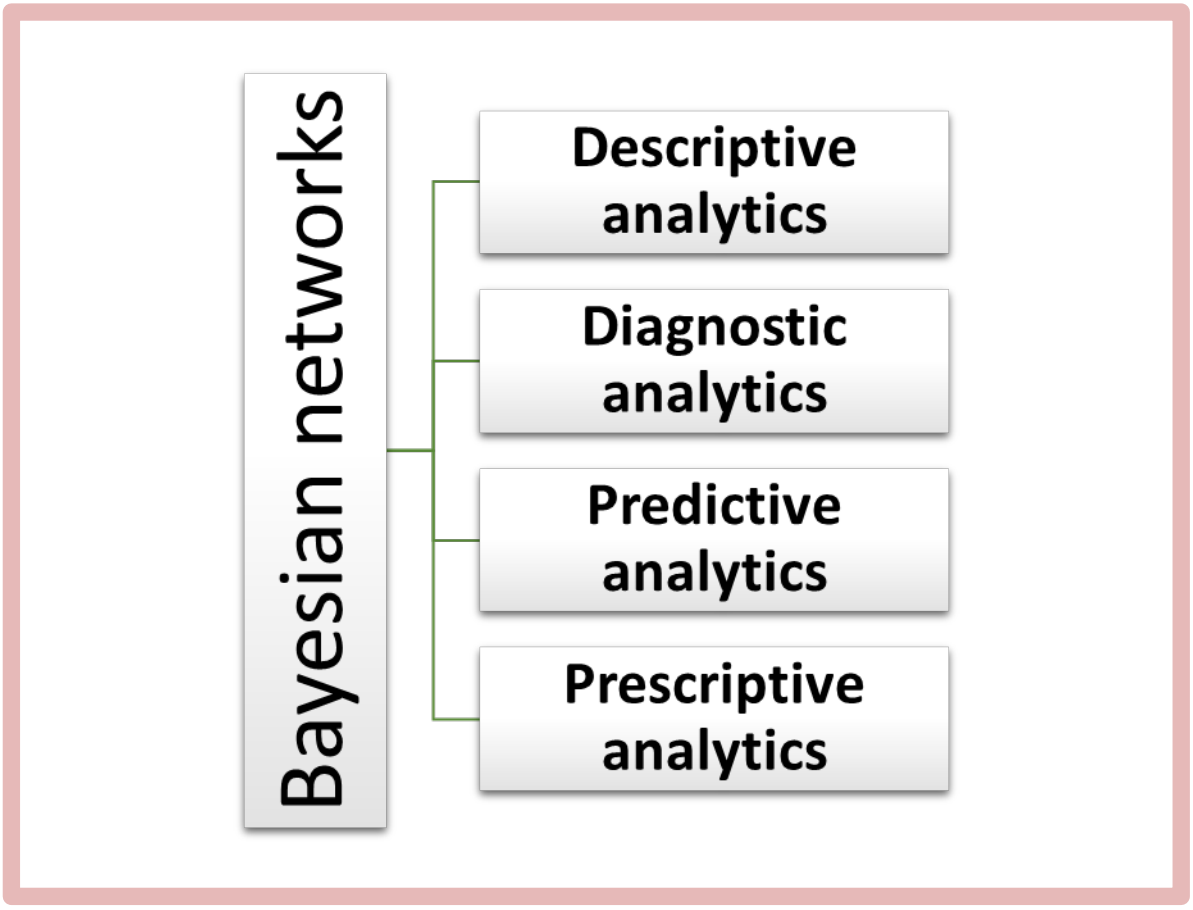

Fig 4.1 Bayesian network task

A typical way to deal with tending to this test is to include some improving suppositions, for example, expecting that every single arbitrary variable in the model are restrictively free. This is an exceptional suspicion, despite the fact that it demonstrates valuable by and by, giving the premise to the Naive Bayes characterization calculation. An elective methodology is to build up a probabilistic model of an issue with some contingent freedom suspicions. This gives a transitional methodology between a completely restrictive model and a completely restrictively free model.

4.2.1Naive Bayes

It is a basic, yet powerful, AI classifier. The characterization that they do is generally utilizes information mining strategy, which further builds up a class and allocate each arrangement of information to a specific class in figure 4.2. The arrangement dependent on learning and characterization. In the learning the characterization calculation dissects the information. In order to check the exactness of grouping rules the characterization test information are utilized and on the off chance that the precision is acceptable, at that point rules are applied on the new information tuples.

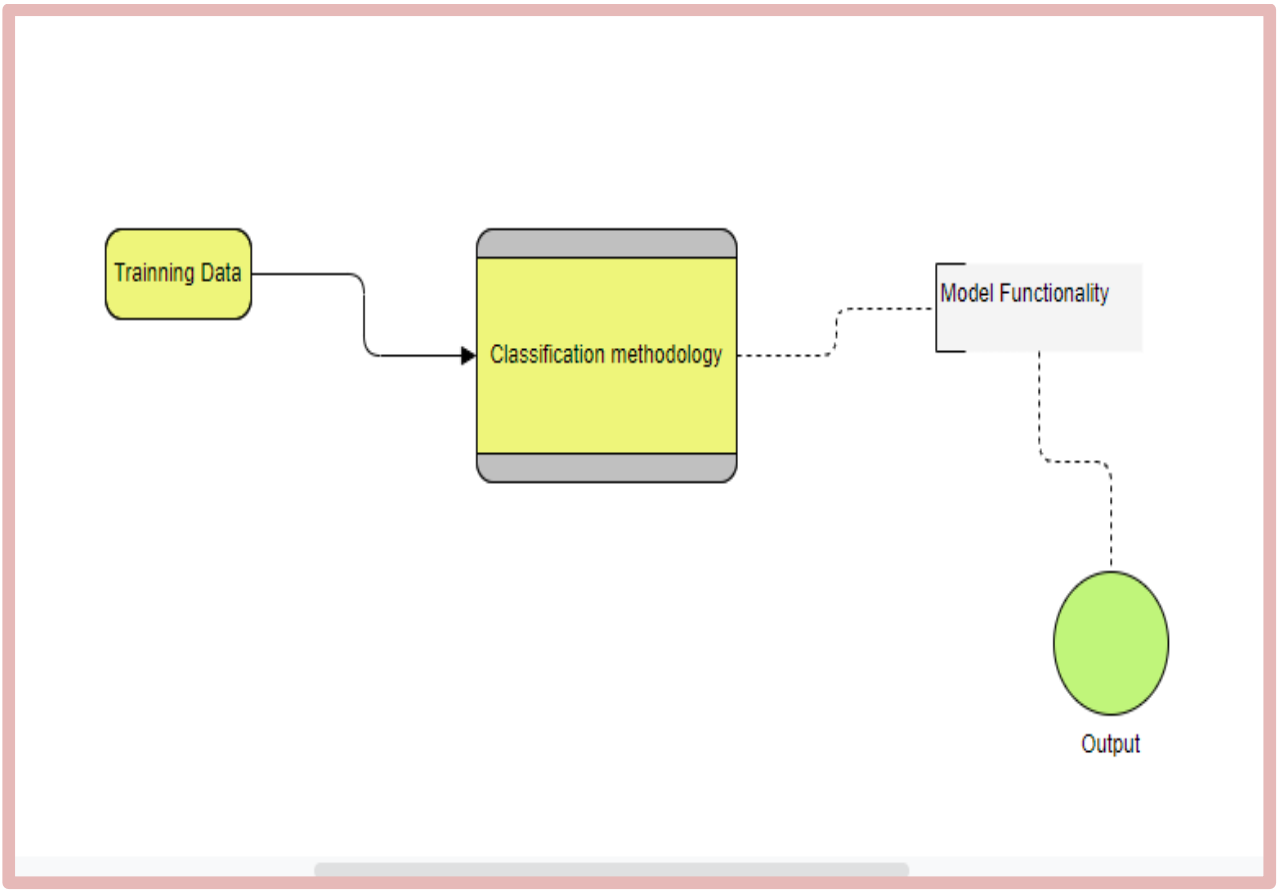

Fig 4.2 Naive Bayes Work Flow

4.3 DECISION TREE

It is a flowchart-like structure in which each internal center point addresses a "test" on a quality, each branch addresses the consequence of the test, and each leaf center point addresses a class name (choice taken in the wake of registering all qualities). The ways from root to leaf speak to order runs the show. Choice tree calculations are utilized to part the credits to test at any hub to decide if parting is "Ideal" in singular classes. The subsequent divided at each branch is PURE as could reasonably be expected, for that parting measures must be indistinguishable. An ordinary tree incorporates root, branches and leaves. A similar structure is followed in Decision Tree. It contains root hub, branches, and leaf hubs. Testing a trait is on each interior hub, the result of the test is on branch and class name accordingly is on leaf hub. A root hub is parent everything being equal and as the name recommends it is

the highest hub in Tree. A choice tree is where every hub shows a component (trait), each connection (branch) shows a choice (rule) and each leaf shows a result (unmitigated or proceeds with esteem). As choice trees imitate the human level reasoning so it's so easy to snatch the information and make some great translations. The entire thought is to make a tree like this for the whole information and procedure a solitary result at each leaf.

4.4 MODEL DEVELOPEMNT

As per the estimations of the parting trait, the preparation information are apportioned into a few subsets during model turn of events. Until all examples in a subset have a place with a similar class in any credulous byes and Decision Tree the calculation continues recursively in model turn of events. In the event that the qualities are near one another, the set can be supposed to be exact. On the off chance that their typical is close to the real estimation of the sum being assessed, the set can should be exact. Just at whatever point given a great deal of data centers from repeated estimations of a comparable sum then one can check more than two counts. The assessment is reproducing on logical instrument. For information tasks, contraptions are a collection of AI computations. For data pre-getting ready, request, backslide, gathering, alliance rules, and portrayal contains instruments. An alternate instrument is open source programming gave under the Public License. It is in like manner fitting for developing new AI plans. The estimations can either be applied direct to a dataset.

4.4.1 Quantification

The dataset which is utilized in the analysis is decision based credit framework based dataset. By applying this dataset on three calculations of the innocent byes and choice tree. Dataset portrayal is as follow. The CBCS dataset have taken from open source dataset. The creators had applied two of the characterization techniques individually similar precision. The main technique utilized by the creators was Bayesian Network (BN). As indicated by Naïve

byes had broke down the presentation of CBCS informational index. He found that BN was the most appropriate grouping strategies. Coordinated non-cyclic diagrams are utilized in Bayesian systems to delineate the conditions among irregular factors. Arbitrary factors are spoken to as hubs. In the event that the hubs are associated by a circular segment, at that point these factors are reliant on one another. BN has been utilized for performing bi-directional surmising since 1980. It is likewise utilized for thinking under vulnerability. Table 4.1, disperses the informational collections on three kinds of class. The after-effects of calculations in the terms seven characteristics with the assistance of the table 4.1. The parting Criteria section gives data about how the calculation split so as to improve result. The credit type table 4.2 to 4.7 gives data about what kind of qualities the calculation can deal with. Regardless of whether the calculation finds the missing worth or not, the outcome characterizes from the Missing Value segment and along these lines the calculation is precise or not we can discover. Missing Value segment and along these lines the calculation is exact or not we can find.

Table 4.1 Class

Attribute	Good	Average	Poor
	(0.43)	(0.36)	(0.22)

Table 4.2 Student Gender

Attribute	**Good**	**Average**	**Poor**

F	34.0	20.0	8.0
M	**24.0**	**29.0**	**22.0**
[Total]	**58.0**	**49.0**	**30.0**

Table 4.3 Internal Assessment Based Choice

Attribute	**Good**	**Average**	**Poor**
Vg	31.0	25.0	10.0
Good	**19.0**	**20.0**	**17.0**
Pass	**3.0**	**3.0**	**4.0**
Best	**7.0**	**3.0**	**1.0**
[Total]	**60.0**	**51.0**	**32.0**

Table 4.4 Credit Percentage

Attribute	**Good**	**Average**	**Poor**
Vg	19.0	23.0	15.0
Good	**26.0**	**17.0**	**2.0**
Pass	**8.0**	**2.0**	**1.0**
Best	**7.0**	**9.0**	**14.0**
[Total]	**60.0**	**51.0**	**32.0**

Table 4.5 Previous Back

Attribute	Good	Average	Poor
Y	21.0	29.0	15.0
N	**37.0**	**29.0**	**15.0**
[Total]	**58.0**	**49.0**	**30.0**

Table 4.6 Study Hours (Credit)

Attribute	Good	Average	Poor
Poor	15.0	21.0	12.0
Average	**28.0**	**19.0**	**15.0**
Good	**16.0**	**10.0**	**4.0**
[Total]	**59.0**	**50.0**	**31.0**

Table 4.7 Me

Attribute	Good	Average	Poor
Asm	23.0	23.0	17.0
Eng	**33.0**	**22.0**	**10.0**
Hin	**2.0**	**4.0**	**4.0**
Ben	**2.0**	**2.0**	**1.0**

[Total]	**60.0**	**51.0**	**32.0**

As we can see the below table (4.8, 4.10) is the practical result of naïve byes algorithms and decision tree. One can see that takes 0.5 seconds and 0.7 to execute a calculation. The quickest execution is guileless byes. Despite the fact that gullible byes take less time or we can say it is the slowest one among them, exactness is most noteworthy and it gives exact outcome than different calculations. In this way, we can finish up from the above table 10 that in the event that we do the near investigation of every one of the three calculations, the innocent byes are ideal to pick.

Table 4.8 Data Table of Naïve Byes

TP Rate	**FP Rate**	**Precision**	**Recall**	**F-Measure**	**ROC Area**	**PRC Area**	**Class**
0.625	**0.360**	**0.565**	**0.625**	**0.593**	**0.676**	**0.599**	**Good**
0.234	**0.333**	**0.282**	**0.234**	**0.256**	**0.439**	**0.320**	**Average**
0.393	**0.184**	**0.367**	**0.393**	**0.379**	**0.754**	**0.388**	**Poor**
0.435	**0.313**	**0.421**	**0.435**	**0.426**	**0.118**	**0.608**	**0.454**

As shown in table 4.9, there are three alternatives for selection. You can choose three number of attributes from given set. First, we have to choose the best condition.

Table 4.9 Confusion Metrics Naive Byes

A	B	C	
35	**15**	**6**	**A=Good**
23	**11**	**13**	**B= Average**
11	**13**	**11**	**C= Poor**

Table 4.10 Data Table of Decision Tree

TP Rate	FP Rate	Precision	Recall	F-Measure	ROC Area	PRC Area	Class
0.554	**0.480**	**0.463**	**0.554**	**0.504**	**0.527**	**0.486**	**Good**
0.298	**0.417**	**0.286**	**0.298**	**0.292**	**0.454**	**0.325**	**Average**
0.143	**0.107**	**0.267**	**0.143**	**0.186**	**0.603**	**0.263**	**Poor**
0.374	**0.378**	**0.357**	**0.357**	**0.374**	**0.360**	**0.517**	**0.381**

As, appeared in given figure 4.3, we see that there are five properties (for example Understudy Gender, Study Hours (Credit), Me, Previous Back, Internal Assessment based Choice) to conclude that CBCS is ought to be choice. For result, there are four classes, for example, great, average, best and pass. These properties might be expanded or diminished. In any case, if the quantities of characteristics are beyond what information order should be possible with more precision. The decision or choice tree for above information can be produced as appeared in figure 4.3.

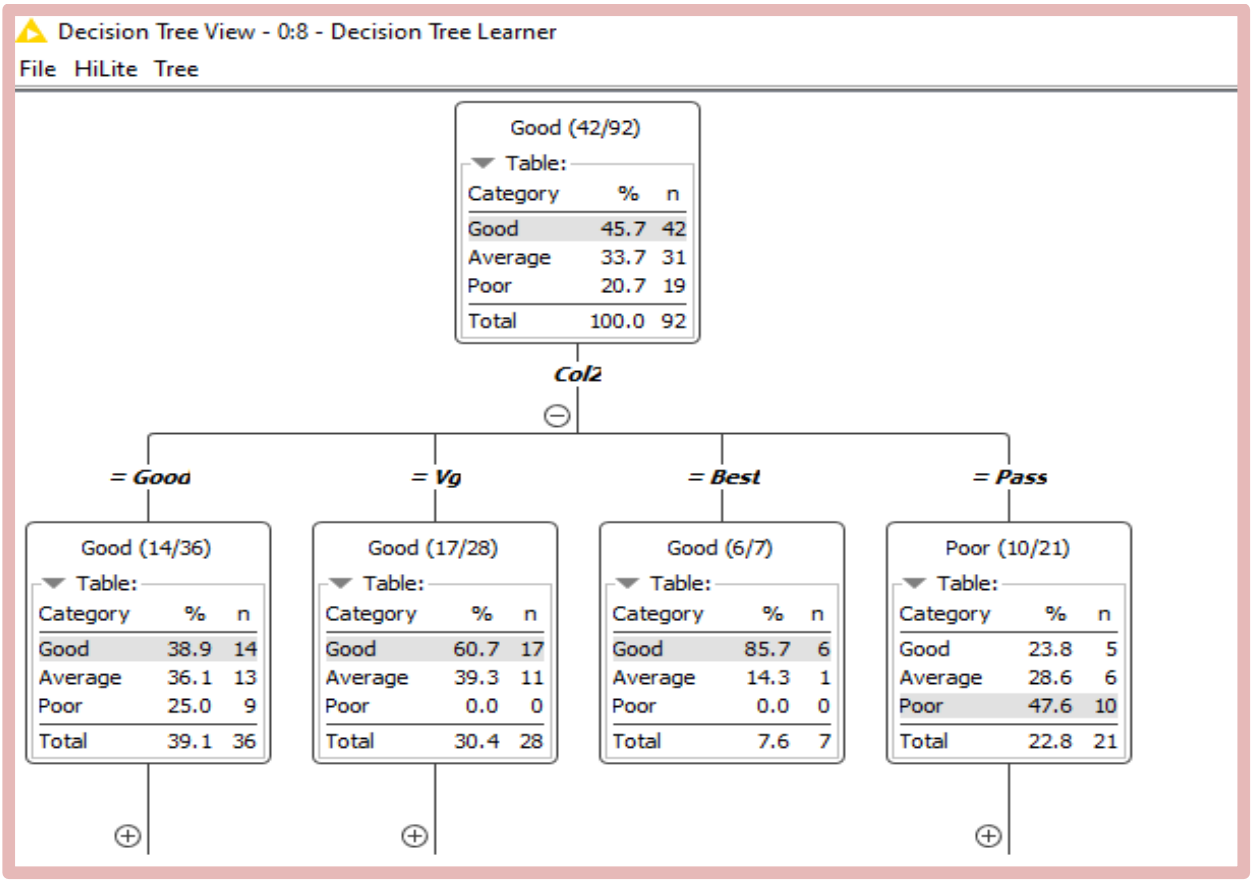

Fig 4.3 Learner Structure

As appeared in the table 4.11 we can say that when number of characteristics expands then condition increments gradually, precision increments exceptionally, and because of good degree of expectation goes to high. In spite of the fact that, it is actuality that 100 % forecast is beyond the realm of imagination with any framework, along these lines, grouping precision alone can be misdirecting if perception have an inconsistent number of perceptions in each class.

Table 4. 11 Confusion Metrics Decision Tree

A	B	C	
31	**22**	**3**	**A=Good**
25	**14**	**8**	**B= Average**
11	**13**	**4**	**C= Poor**

4.5 SUMMARY

The Naïve Byes and Decision Tree algorithms were applied on the choice-based credit system dataset. Choice tree beats others regarding exactness, time and accuracy. It very depends on the calculation utilized for proposal to discover fascinating assets. Finally, the far reaching study is done about choice tree calculations and guileless byes is the calculation for this dataset is exact and generally precise among the others. The CBCS based scholarly execution was assessed dependent on scholastic and individual information gathered from open source informational index. The complete number of records were 1000 with 5 traits. After that two diverse order calculations were utilized. They were Bayes Net and Random Forest. The information mining instrument utilized in the analysis was KNIME. In view of the precision and the order mistakes one may reason that the Naive strategy was the most fit calculation for the dataset. The naive byes calculation was applied to the dataset utilizing KNIME to discover the absolute best guidelines. The information might be stretched out to gather a portion of the extra-curricular angles and specialized abilities of the understudies and mined with various Intelligence calculations to anticipate the understudy execution as future work. The makers moreover enthusiastic about working in future on data of understudy's evaluations for each course endeavoring to acknowledge what kind of understudy sway what kind of courses. It may describe what kinds of courses are balanced for every property of enlightening assortment who has comparative characteristics. It may in like manner give diverse multidimensional summation reports and re-evaluate instructive learning paths. As per the execution of this venture, information grouping with choice tree is simple with contrasted with other technique. In view of past records and pictorial view, the errand of arrangement of information turns out to be simple. When the outcome acquired, it tends to be reused for next exploration. The dataset is of type text and number. As the limit is expanded,

the time taken to prepare choice tree is to be diminished. The upside of guileless byes is that it gives a hypothetical system to considering not just the trial information to plan an ideal classifier, yet in addition a basic conduct for permitting better speculation capacity.

CHAPTER 5

COMPARATIVE STUDY

5.1 BAYESIAN NETWORK

AI techniques, specifically Bayesian systems (BNs), can possibly help unravel the trap of relations among qualities, condition, and association. BNs are a multivariate displaying strategy ready to at the same time represent quality (epistasis) and quality condition connections, just as influence the analytic capability of clinical or physiological elements. BNs additionally lead legitimately to prognostic models: a built system, anyway mind boggling, can be utilized to proficiently register the likelihood that a person with a specific genotype and ecological introduction will display the phenotype of intrigue. BNs have been applied in an assortment of settings for the motivations behind causal investigation and probabilistic forecast, including clinical determination, wrongdoing and psychological oppression hazard, criminological science, and biological protection, study. In bioinformatics, they have been utilized to investigate quality articulation information, infer protein flagging system, anticipate variable connections, perform family examination, lead considers, and survey the exhibition of microsatellite markers on CBCS repeat. In this section, we approve the potential for BNs and to add to uncovering the environmental basis of CBCS.

5.2 DECISION TREE

It focuses on a supervised learning approach, preparing a model dependent on an example of referred to perceptions as info and referred to reactions as yields. The tree structure results from the recursive parting of the root hub, which contains all preparation dataset, as indicated by straightforward standards of the sort $xi \leq d$, where xi is the estimation of an autonomous variable (or trait) and d is a genuine number. In each progression of the top-down voracious pursuit, a variable is chosen to isolate the information of the hub, in view of the data gain basis, for example how homogeneous (unadulterated) would be the information remembered for the kid hubs. The parting proceeds until a leaf hub (or end hub) is reached, in which foreordained virtue or halting guidelines have been met. These halting

measures can be tight or free, making little and under-fitted or enormous and over-fitted trees. A few pruning techniques have been designed to permit trees to overfit the preparation dataset and afterward lessen their size, expelling sub-trees that expansion multifaceted nature and decrease speculation exactness.

5.3 VALIDATION WITH INSTANCES

SPSS 21 choice tree programming was utilized to apply CART investigation to the understudy information. So as to anticipate a clear cut variable, SPSS CART usage, as a matter of course, uses the Gini file. The info fields (indicators) were the quantities of messages traded, synergistic commitments made, records saw and tests taken, while the understudy disappointment or achievement was the objective variable. The split-example approval (70% - 30%) method was utilized for model assessment. The base subgroup size was set to be 15, roughly 4% of the whole example. Model occasions is appeared in Figure 5.1, while the incited calculations perception is appeared in Figure 5.2 to 5.7.

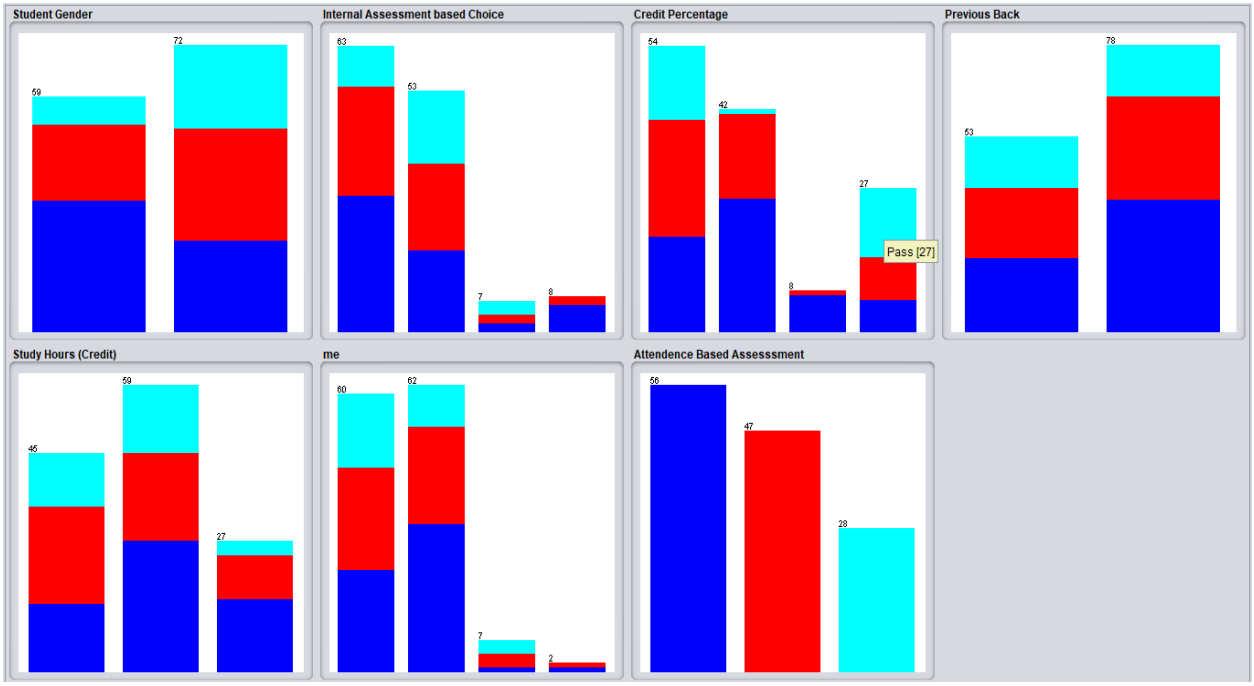

Fig 5.1 Attributes Visualization

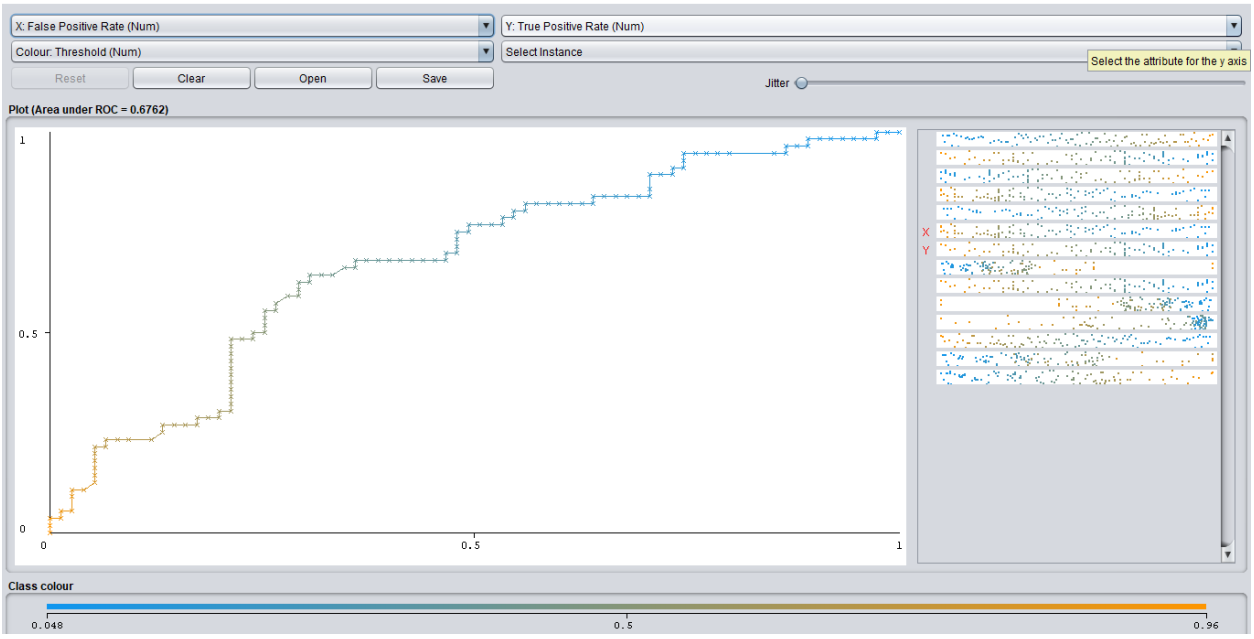

Fig 5.2 Good for Naïve Byes Algorithms_Threshold Curve

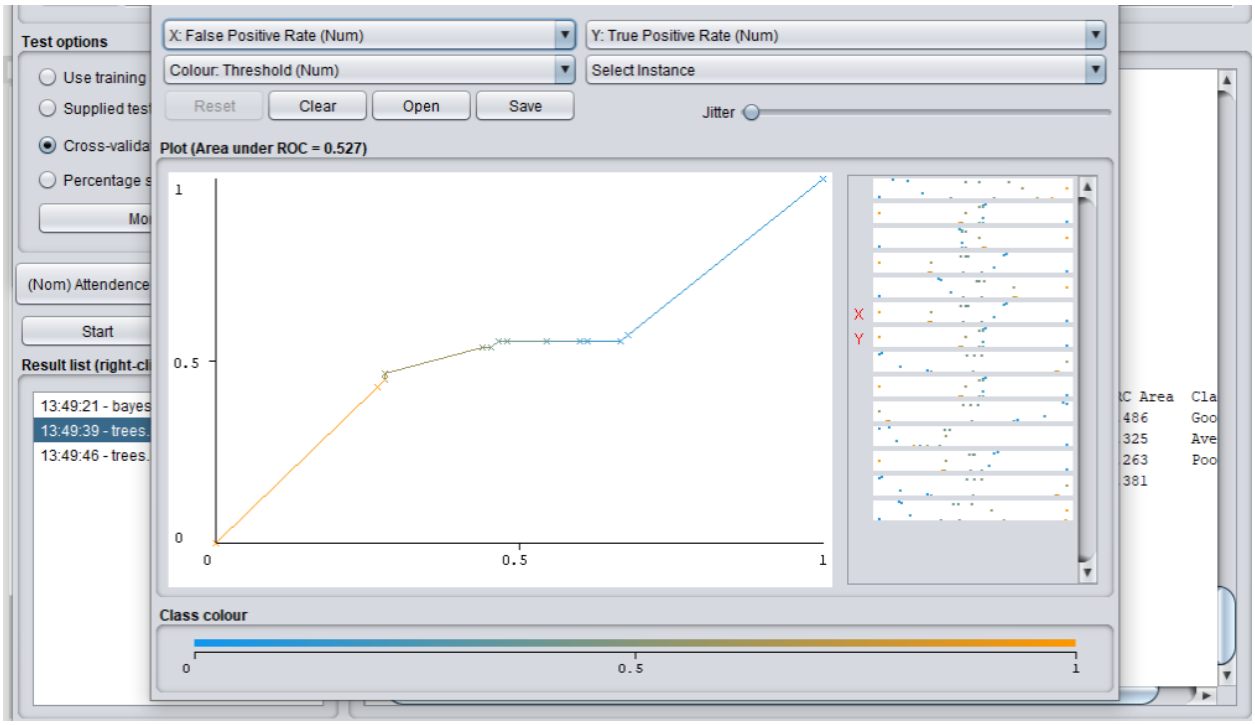

Fig 5.3 Good for Decision Tree Algorithms_Threshold Curve

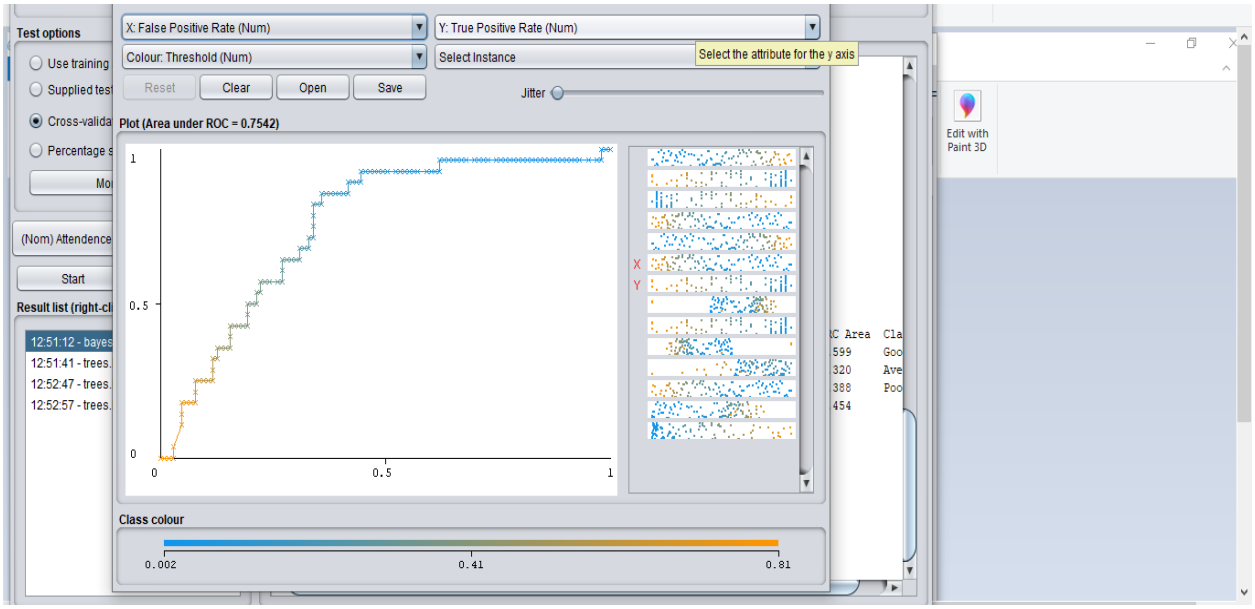

Fig 5.4 Poor for Naïve Byes Algorithms_Threshold Curve

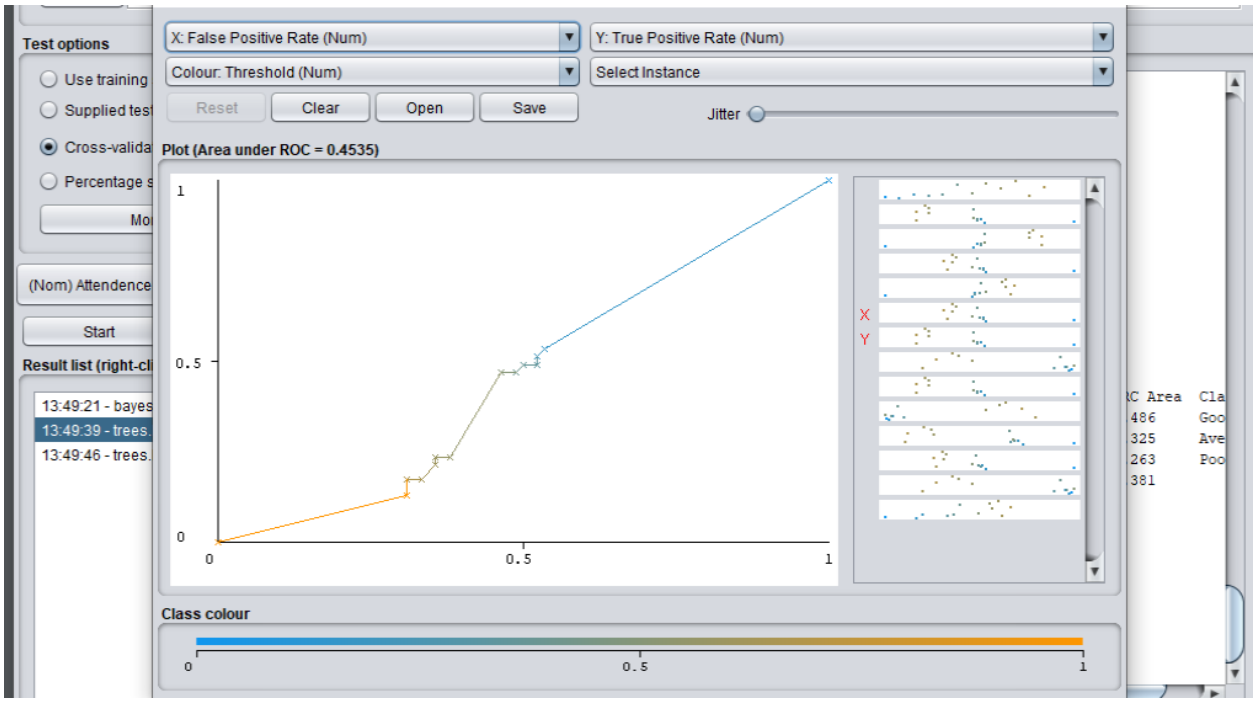

Fig 5.5 Poor for Decision Tree Algorithms_Threshold Curve

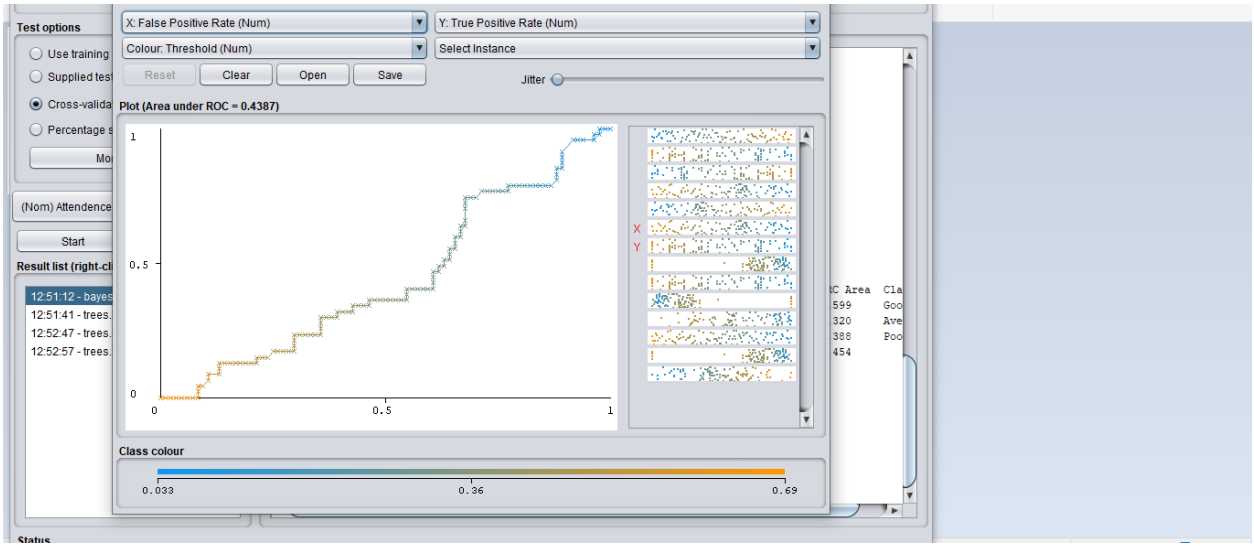

Fig 5.6 Average for Naïve Byes Algorithms_Threshold Curve

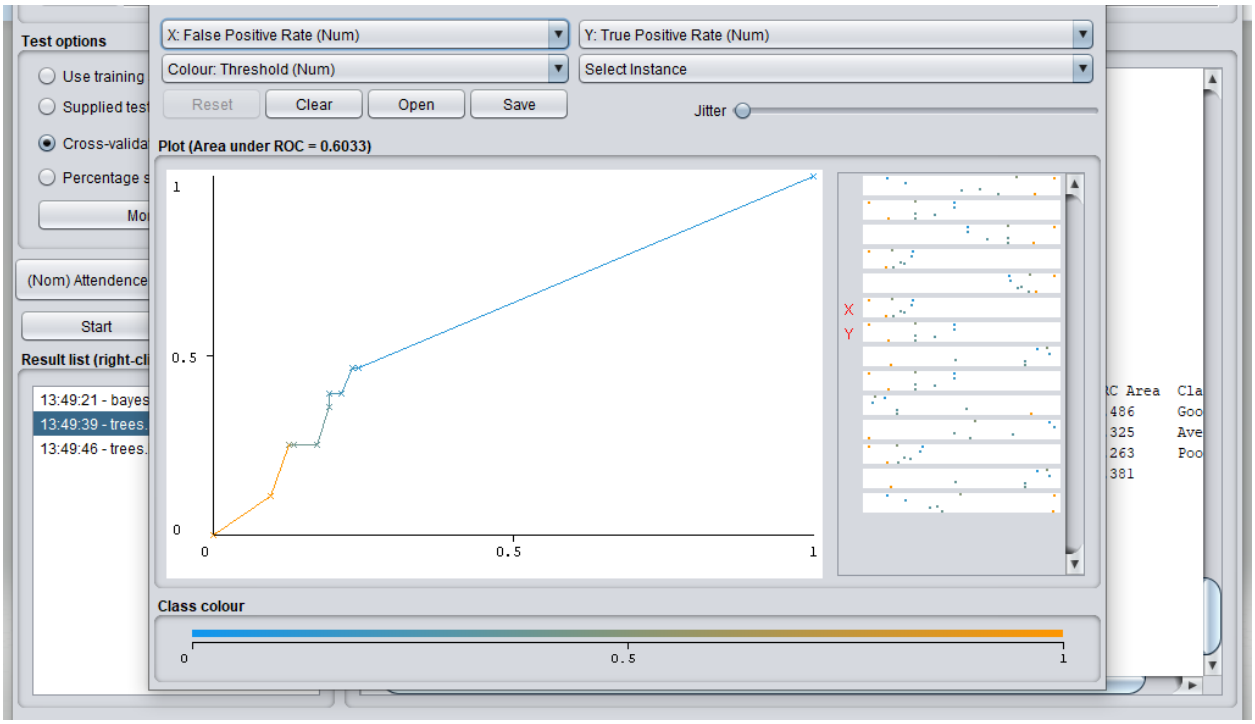

Fig 5.7 Average for Decision Tree Algorithms_Threshold Curve

As referenced above figure, learning approaches within the sight of complete informational index of CBCS is an altogether more difficult issue than boundary learning. This is on the grounds that the E-venture of the standard calculation would need to process expected frequencies for exponentially numerous applicant structures before the progression

could pick the structure that augments the normal score. Presumably the most popular arrangement has been to install the occasions search inside the calculation's methodology. Initially alluded to as figure 5.2 to 5.7 have introduced to limit bend for three point of view and later as show its graphical effect, this calculation switches back and forth between looking over system structures and processing the normal frequencies for each example, on CBCS. Other standard strategies can be utilized in the Naïve Byes search since this progression is proceeded as though there were finished information. A computational improvement to the standard choice calculation is to shift back and forth between emphases that advance the boundaries for the flow boundaries and cycles that scan for another issue. Different speculations of the fundamental calculation have since been proposed.

A major issue with approaches, for example, calculations, is that they are inclined to discover just nearby maxima. While various arbitrary restarts may support this issue, stochastic inquiry strategies speak to another arrangement. Specialists present a developmental calculation that advances both the arrangement of system structures and the estimations of the missing information.

Moderately little work has done in creating requirement based ways to deal with Class, Student Gender Internal Assessment based Choice, Credit Percentage, Previous Backin the nearness of missing information. Two proposed calculations incorporate - Bayesian autonomy testing approach and choice based calculation, which factors acquired from potential culminations of the fragmented information are appeared in figure 5.2 to 5.7.

5.4 SUMMARY

In this Chapter, we compelled ourselves here to examining systems containing just factors for which there are some recorded information. Obviously, much of the time, not every single pertinent part of an issue have been watched. Such shrouded factors can

introduce an issue for organize basic learning, as exclusion of hubs adequately sums to minimization of the basic joint conveyance, conceivably prompting complex conditions among the staying, watched factors. For instance, in the CBCS condition setting, information might be accessible on a few natural and results, just as various inclining investigation factors. Notwithstanding, in the event that the genuine introduction level isn't being estimated, at that point all the watched factors (Good, Poor and Average) will give off an impression of being identified with one another, presumable in complex ways.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 CONCLUSION

The aim of this research work is to discuss the need for choice-based credit system in all levels of any educational institute. An effective CBCS cycle was presented to clarify the process and apply approaches. We will take this research further by incorporating Naïve Byes and decision tree developed through tools and later improved. And also develop a frame for CBCS student to make their insightful decisions. Moreover, we will also focus on data selection, and preparation phases when the system is tested for accuracy, validation, and verification. Utilizing the equivalent dataset, it is conceivable to accomplish more methodologies undertakings on it, just as, apply more calculations. For the present, it is fascinating to apply affiliation precludes mining to discover intriguing principles with regards to the understudy's information. Thus, bunching would be another information mining task that could be fascinating to apply. In addition, the understudies' information that was gathered in this examination incorporated a great inspecting process which was a tedious errand, it could be better if the information was gathered as a major aspect of the affirmation procedure of the college, that way, it is simpler to gather the information, just as, the dataset would have been a lot greater, and the college could run these CBCS assignments consistently on their understudies to discover intriguing examples and perhaps improve their exhibition according to changes.

6.1.1 Key Consideration

In this area, a measure of the execution of the Naïve Bayes characterization strategy and Decision tree was introduced on the CBCS dataset utilized in this examination, just as, its presentation and exactness have been tried and approved. Moreover, this segment has recommended a few strategies to discover intriguing examples with regards to the Naïve Bayes model and Decision Tree. As a last investigation, this area introduced high expected outcomes in the examination of the Naïve Bayes model and Decision tree model.

6.2 FUTURE SCOPE

- Naïve Bayes and Decision tree model as well as the other AI based methods can be utilized to infer better patterns in future.
- This study also aims of analyzing algorithms and giving accurate forecasts using different features, in near future.

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A Systematic Review on Existing Intelligent System for Choice Based Credit System

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Abstract

Quality is the major concern of the present higher education which could be judged and assessed only by the universally acclaimed system of evaluation and this could be possible through the CBCS. CBCS is essential for Higher Education as this system increases the sincerity among the students as they are preferring to learn the subjects of their choice. Under CBCS, students are given more flexibility in the course and subject choices they can make, provided subject selections fulfills subjects' prerequisite and corequisite. The learner has the complete autonomy to select courses as per their choices, learn as per their own pace, take charge of their learning. In this paper, we made an attempt to systematic review the Bayesian algorithms parameters, Choice Based Credit System (CBCS) and research findings which have direct bearing on the present study. However, during the review of this study in higher education institutions, there are many challenges which require attention and discussion in order to put it on the right track.

Keywords *Higher Education, CBCS, Bayesian algorithms parameters*

I INTRODUCTION

Choice Based Credit System was considered to be the benchmark for our academic institutions against the international level institutions. India has adopted the Choice Based Credit System on the recommendation of the Knowledge Commission (Sam Pitroda) as well as per the Eleventh Five Year plan in order to bring about quality and transformational change in Indian higher education. Under the Choice Based Credit System, a student would pursue three kinds of courses and they are compulsory foundation courses, elective courses and core courses. Here, it is mandatory for a student to have the core subjects every semester and choose electives from the prescribed pool of subjects unrelated to her own discipline. The Choice Based Credit System aims at introducing multidisciplinary approach to higher education enabling a student to have strong hold across multiple subjects from a wide range of elective subjects [5]. In India,

Higher education is imparted largely through Universities and Colleges. Majority of universities and colleges, particularly central universities, have adapted semester system to make higher education more compatible. However, present Indian education system producing graduates who are lacking in knowledge, skills, values, confidence and academic efficiency as a whole. In figure 1, Choice based credit system have dependent on various segment. The current pathetic conditions of Indian higher education system call the necessary reformation and transformation of higher education system by introducing and devising innovations, and also by developing learner center approach as well as globally claimed evaluation system. Most of the Indian Universities and Colleges have been following marks or percentage-based evaluation system, which is acting as a barrier for students' mobility and not letting them to move from institutions to another one to pursue the desired subjects or courses.

Fig 1 Choice Based Credit System Domain

II LITERATURE REVIEW

The application of Bayesian Networks to various fields has always been a progressive research topic. Apart from medical field, there are several use cases of Bayesian Networks wherever there is uncertainty involved. One such use case consists of predicting students' academic performance based upon values of some identified student- related attributes.

Rafe Torabi et al. [18] proposed a Bayesian Model to predict scores of students enrolled in the Islamic Azad University, Sanandaj. The model was constructed through data obtained from 500 students and used different algorithms such as PC and Greedy Thick Thinning, to build a Bayesian Network. Greedy Thick Thinning is a structure learning algorithm which is based upon Bayesian Search approach. It is used whenever we need to learn about the dependencies between the variables in a network. By using Greedy Thick Thinning algorithm, the researchers were able to find the best performing network structure, by optimizing it, either by adding(thickening) or removing(thinning) the arcs between nodes based upon conditional independence test of variables. The algorithm produces an acyclic directed graph that gives the maximum score. The other approach used by the researchers carries out several independence tests on the database of students and build a Bayesian Network in agreement with the test results. PC algorithm is the best example of this approach. The proposed model demonstrated an accuracy of 66% while predicting the students score.

Ashkan Sharabiani et al. [17] used Bayesian Network to predict the scores of the students enrolled in the University of Illinois, Chicago, in three subjects, i.e., General Physics II, Calculus II, C/C++ Programming. The proposed model took into consideration students' demographic attributes such as Age, Sex, Race, and Citizenship Status as well as Academic attributes such as Grade in subjects and First Semester GPA. Researchers used different constraint based, score-based and hybrid algorithms to find the optimal configuration of the proposed model. An optimal network structure fully describes the relationship between the model variables. The accuracy of the proposed model was also compared with several data mining algorithms such as

Decision Trees, Naive Bayes, K-nearest Neighbors.

An approach to Educational Data Mining (EDM) was proposed by **Anal Acharya et al. [16]** to predict the academic performance of students using various classes of Machine Learning Algorithm such as Decision Trees, Bayesian Networks, Artificial Neural Networks and some other. The attributes and data set used for training and testing the different MLAs were obtained from students majoring in Computer Science in some undergraduate colleges in Kolkata. Student's family size, board at higher secondary level, family income, number of study hours, marks in midterm exams and private tuitions were all determined to effect student's academic performance. All of these attributes were used to predict student grades on a scale of O-F where O signifies that student is outstanding and F signified that student is poor in studies and may need remedial classes. Among the different classes of algorithms, Decision Trees were the most useful for generating production rules. Production rules were used for improving the accuracy of classification of decision trees. They contain a smaller number of attribute-value conditions. The production rules used by the author are generally in the form of if-then-else statements. C4.5 was used for generating the decision tree. Unlike ID3 algorithm, which continues to grow the tree until it makes no errors over the set of training data makes it prone to over fitting. Data often has some degree of error or random noise within it. Thus, making the model conform too closely to inaccurate data can reduce its predictive power. This is known as Over fitting. C4.5 employs pruning to mitigate over fitting. The algorithm can also work with discrete as well as continuous data. The efficiency of prediction algorithm was determined using F-Measure and Kappa Statistic.

Shiva Asadianfam et al. [15] proposed a Bayesian Model for selection of academic major of High School students of the Maragheh city of Iran. Model parameters were gathered using a questionnaire provided to the students, and Bayesian Network was constructed using Genie Software. An academic advisor was also consulted to provide relationships between parameters. It was concluded that out of the three algorithms i.e., Likelihood Sampling, Logic Sampling, EPIS. Sampling, the Logic Sampling algorithm had a better outcome.

The research presented by **Rahel Bekele et al. [14]** used several social and personal attributes of Ethiopian students to predict

their academic performance. The test subjects were students of a senior high school in Addis Ababa, Ethiopia. An interactive system was developed for the students to fill in their details as well as indicate their extent of agreement to questions provided by the system. Students' response was then used by the Bayesian network to calculate the probability of the student having above satisfactory, below satisfactory or satisfactory performance.

2.1 Choice Based Credit System (CBCS)

Over the past few years Ministry of Human Resource Development (HRD), Government of India, has already been taken initiatives for making ground to the formulation of New Education Policy. The goal being, to reform the Indian Education System as well as to improve the quality of Indian higher education and make it as par the world level. The higher authority of Indian Higher Education, University Grants Commission (UGC), proposed a new innovation in the 11^{th} plan which involved steps for reform in higher education. The proposal was meant to change the Indian education system from teacher-centric to student- centric. In order to do so, UGC set up a Committee on Academic and Administrative Reforms, with professor Gyanam as convenor, and several other educationists from a diverse range of disciplines. Based on the committee report, an action plan was developed for the phase-wise introduction of the Choice Based Credit System (CBCS) in the institutions of higher education of the country.

University Grants Commission (UGC) has suggested the Choice Based Credit System (CBCS) to be adopted in Indian universities. **(Kelkar, A.S & Ravishankar, L. 2014)** revealed in their study that many universities/autonomous institutions have already implemented the same, Mumbai University made it compulsory in 2011. **(Ghose, R. & Sarkar, B. 2017)** in their research recognized universities such as University of Delhi, Pondicherry University, Ravenshaw University, Gujarat University, Himachal Pradesh University, University of Kashmir, which have implemented the CBCS after recommendations of the UGC. Under CBCS, students have a choice to choose from prescribed courses, which are referred to as core, elective, or minor or soft skill courses, and they can learn at their own pace, and the entire assessment is graded based on a credit system. CBCS allows students' an easy mode of mobility to various education institutions spread across the world along with the facility of transfer of credits earned by students.

CBCS aims to promote a multi-disciplinary approach to curriculum development, transaction, and evaluation, laying a strong foundation for student's across multiple subjects, enabling them to select a study path of their interest to gain mastery of a subject of their choice. CBCS ensures students' needs, interests, and choices are always fulfilled. It also opens up opportunities for student mobility, allowing them to take credits earned in one institution to another institution to which they transfer. Thus, CBCS helps to establish uniformity and parity within and across institutions, which would also be beneficial for student's placement opportunities. In order to, various authors have given the contributions according to situations which are presented in table 1.

Table 1 Contribution Table

Authors	Year	Contribution	Criteria
Aithal et. al. [1]	2016	Analysis of Choice Based Credit System in Higher Education	Quantification Based
Alka S. Kelkaret. al. [2]	2014	Reform of Choice Based Credit System	Theoretical Based
Amutha Josephet. al. [3]	2012	Observation of CBCS parameters	Parametric observation
B. Saharishet. al. [4]	2009	Evaluation System on Reforms in Higher Education	Quantitative evaluation
Moradi et. al. [6]	2012	Predict Student Scores Using Bayesian Networks	Quantitative evaluation
Naiduet. al. [7]	2016	Evaluation of Choice Based Credit System	Quantitative evaluation
Suheel Rasoolet. al. [8]	2017	Highlighted to Issues and Challenges of Choice Based Credit System	Theoretically
Hasanet. al. [9]	2015	Pros and Cons of Choice Based Credit System	Theocratically
Dr. Rastogi	2018	Given to innovative concept for	Qualitative evaluation

Himanshuet. al. [10]		Choice Based Credit System	
P. S. Aithalet. al. [11]	2020	Analysis of Choice Based Credit System	Quantitative evaluation

2.2 Bayesian Network

Baye's theorem is a formula that describes how to update the probabilities of hypotheses when given evidence. A Bayesian network model consists of two parts: a structure and parameters. The structures are a directed acyclic graph (DAG). The nodes in the graph represent random variables, and edges show the conditional independencies and dependencies between variables. Each node in the graph is associated with a conditional probability table. With the help of a Bayesian network, we can define a probabilistic model for a complex problem by stating all of the conditional independence assumptions for the known variables, whilst allowing the presence of unknown (latent) variables. To construct a Bayesian network, the first step involves declaring model variables and their values. The values can be discrete, continuous or discretization of continuous values. Then relations are defined between the model variables to determine the causal relationship between them. If there are no relations between variables, it does not mean that they are completely independent, as they may be connected via other nodes. Conditional independence describes the relationship among multiple random variables, where a given variable may be conditionally independent of one or more other random variables. Bayesian networks makes it possible to determine the causal relationship among events and to determine the probability of an event if new information on changes in the state of any variable becomes available.

2.3 Problem Definition

India, which is ranked second in the world population, has over 1.5 million schools, with more than 260 million students enrolled and around 751 universities and 35,539 colleges [19]. Over the past several years, the education framework in India has undergone various revisions to accommodate students with varying skill sets and abilities and provide them with career opportunities focusing on their existing skill set. The changes also ensured that the Indian education system is akin to global patterns. One such step was the introduction of Choice Based Credit System (CBCS) by the University Grants Commission (UGC). The CBCS allows students to focus on their subject interests and prioritize their learning. However, the lack of infrastructure in higher education institutes makes it difficult for pan-India implementation of CBCS.

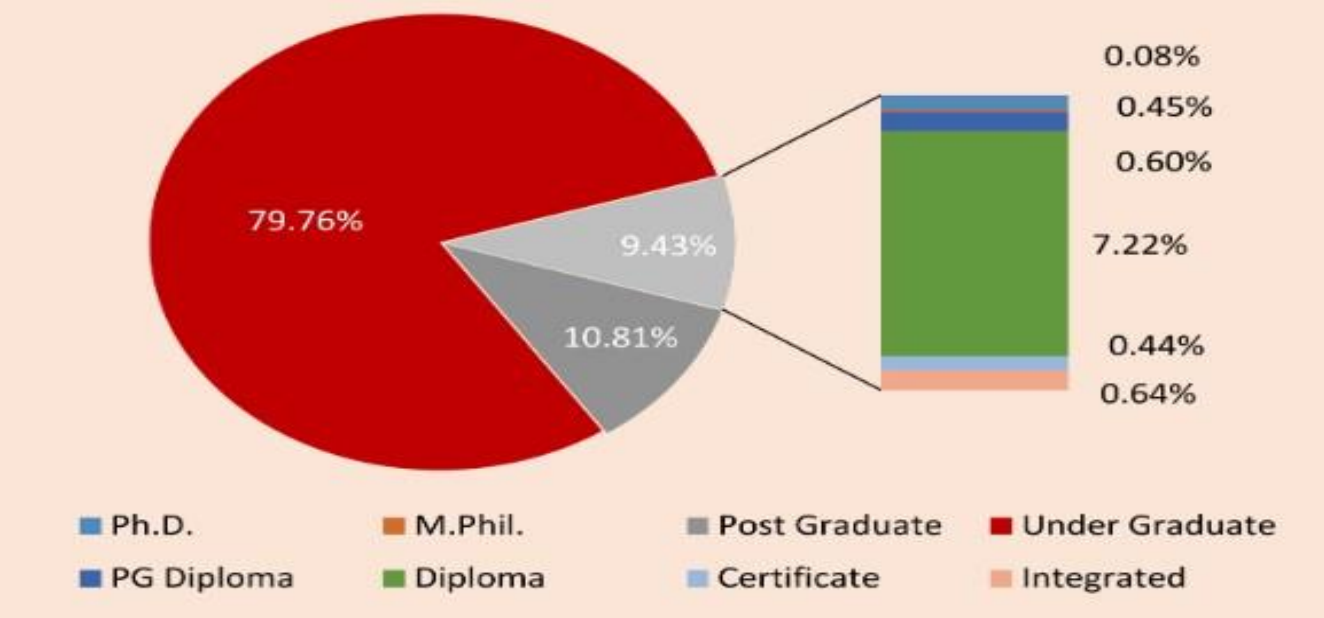

Figure 2 - Percentage share of student enrolment in 8 levels

(All India Survey of Higher Education (AISHE) Report 2018-19

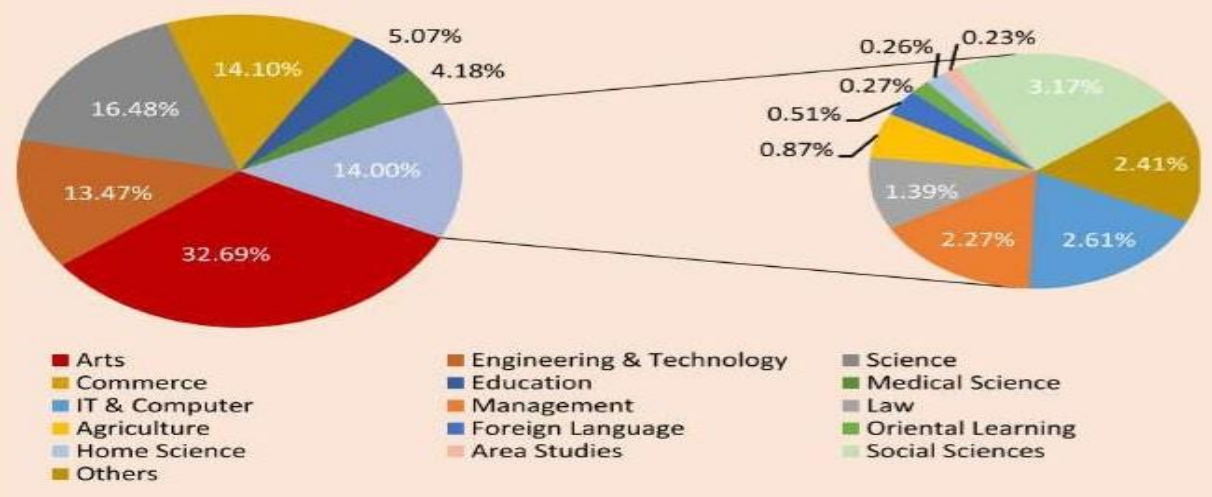

Figure 3 - Stream-wise Distribution of Under Graduate Enrolment

(All India Survey of Higher Education (AISHE) Report 2018-19)

As per the report of All India Survey on Higher Education (AISHE), the total percentage of student enrolment in Under Graduate courses are around 79.76% (Figure 2) 13.47% opted for Engineering & Technology (Figure 3) as their preferred stream. Based on the data present in the report , the Gross Enrolment Rate (GRE), for age group 18-23 years, was calculated to be 24.5%. Taking in consideration a total of 39,071 Colleges and 799 Universities, as recognized by AISHE for the year 2018-19, the low percentage of Gross Enrolment Rate shows that students are not taking interest in Higher Education. Large number of dropouts also contributes to the low Gross Enrolment Rate (GRE). There have also been several other studies [21] conducted by Institutions such as Jawaharlal Nehru Technological University (JNTU) which shows that about 3%-4% of students, who join engineering colleges, dropout every year [21]. Another study by AICTE shows the dropout rate at30%-35%. This data shows that out of every 10 engineering students, 3 of them are leaving the college before completing their degree. A research project by Matthew Meyer et al. [22] asked dropout participants to draw an illustrated map of their journey in and out of the engineering program using which factors were deduced, which may explain their reasons for leaving the engineering program. All the different factors were grouped into two separate categories, namely "Individual Factors" and "Institutional Factors." The study further shows that there was a high uncertainty among students regarding whether or not they can complete their engineering program. In such cases, it is the

responsibility of the Institution to assess their students and motivate those who may secure low grades. This research aims to use the Bayesian Network to predict students' grades for their assessment, which will help to remove any uncertainty from their minds and boost their morale and self-confidence.

III Discussion and Conclusion

Above segment provides the rotated issues, and variance explained by the expert's theory. Due to implementation of CBCS as an experiential module in the academic's, students could learn best when they were personally involved in industry problems, research work and entrepreneurship projects. Also, implementation of CBCS for students helped to improve their performance in various competitive exams and campus placement drives. We succeeded to gain improvement in CBCS. **(i)**CBCS effectively as an education system, and as a member or leader in study diverse, and in multidisciplinary settings. **(ii)** Apply CBCS principles and commit to professional ethics and responsibilities and norms of the engineering practice by 10 % as compared to every year. Over the past few years, the education system in India has progressed leaps and bounds. There have been new policies, strategies, and rules implemented to make the system more student-centric and career-oriented. One such plan was the introduction of the Choice Based Credit System (CBCS) by the University Grants Commission (UGC). However, the system has yet to be implemented across several institutions, and its adaptation will pose many challenges to the institutions in terms of increasing the infrastructural requirements and switching entirely from non-CBCS to CBCS. From the critically review evidence students perceive the CBCS to be student centric which provides student autonomy/freedom and has clarity in evaluation with clear syllabi and adequate college resources providing all round development of students. It is concluded that the significant factors. Thus, CBCS will enable the smooth transition from a teacher-centric system to a student-centric regime.

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A Prediction Model in Choice Based Credit System through Bayesian Network

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ABSTRACT

The institutions of higher education are in need of an infusion of a new model of education in order to keep the curriculum in pace with changing environment which includes technology adoption, changing industry requirement, changing aspiration of students and changing expectations of society. Intelligence system is the process of finding of complete information from exact data. Intelligence system analyzing the data from different source and convert it into meaningful information. Bayesian network is a new powerful network that helps student to focus on important information like choice-based credit system. There are a lot of advantages of naïve byes technique in education sector. Naïve byes techniques help to predict the grades, final results of the students. Choice Based Credit System aims to redefine the curriculum keeping pace with the liberalization and globalization in education. CBCS allows students an easy mode of mobility to various educational institutions spread across the world along with the facility of transfer of credits earned by students. In this paper, we have attempted to make a comparative analysis of "Choice Based Credit System" using naïve byes algorithms and comparative analysis. We can also develop new techniques from statistics for the analysis of educational data and improves the teaching learning process.

Keywords Choice Based Credit System, Bayesian network, Naïve byes, Prediction

I. INTRODUCTION

All the credit system enables university students to select courses by themselves. Different course sequences from this unlimited credit system will result in different achievement. According to the experiences, courses arranged with scientific sequences usually lead to better grades to students; on the contrary, unreasonable course arrangements in general lead to poor grades. This is, of course, only one factor among all factors influencing students' scores. For example, such teaching factors as prerequisites and curriculum system settings; there are some hidden factors, such as the teaching ability of teachers, the test

difficulty level, etc. Meanwhile, factors other than teaching exist, such as students' personal talent and so on. Under standardized conditions, namely, the teaching ability of teachers, the difficulty level of test questions and the students' intellectual conditions are at normal levels, relationship between courses may be the main factors leading to achievement differences. In this paper the proposed Naïve byes algorithm describes how to generate a university class routine within a tolerable range of some constraints. A naïve byes-based classification algorithm has been introduced to solve issues is a respected technology for solving hard problems which include many (nonlinear) constrains. CBCS Constraint propagation technique has been applied to overcome the preferential requirements for slots of teachers, courses from pre-advising by students and class room allocation. Versatile choices for courses may lead to a deadlock situation. Oolz used priorities heuristic ordering [2] where Abdennadher introduced an optimized cost-based rule mining to solve these types of problems.

II. CHOICE BASED CREDIT SYSTEM

CBCS is introduced for different reasons. UGC has outlined the several unique features of Choice-Based Credit System (CBCS) [3]. The researches have revealed that the learner centric contextual curriculum and the desired learner outcomes proposed can be achieved mainly through Choice Based Credit System (CBCS) [12]. It is the important tool of bringing the transformation in the higher education system of India. The academic reforms in the present system of higher education are the need of the hour. The holistic action plan is needed for the phase-wise introduction of substantive academic reforms in the institutions of higher education in the country. Academic reforms are a key towards imparting better quality education that is oriented towards employability and innovation. In addition to changes in the existing system, we need to introduce new policies that make the higher education system more flexible to the needs of the students and the society. According to RUSA document Choice-based credit system (CBCS) has several unique features: enhanced learning opportunities, ability to match students' scholastic needs and aspirations, inter-institution transferability of students (following the completion of a semester), part-completion of an academic program in the institution of enrolment and part-completion in a specialized (and

recognized) institution, improvement in educational quality and excellence, flexibility for working students to complete the program over an extended period of time, standardization and comparability of educational programs across the country, etc. Choice Based Credit System was considered to be the benchmark for our academic institutions against the international level institutions. India has adopted the Choice Based Credit System on the recommendation of the Knowledge Commission (Sam Pitroda) as well as per the Eleventh Five Year plan in order to bring about quality and transformational change in Indian higher education [4]. Under the Choice Based Credit System, a student would pursue three kinds of courses and they are compulsory foundation courses, elective courses and core courses. Here, it is mandatory for a student to have the core subjects every semester and choose electives from the prescribed pool of subjects unrelated to her own discipline. The Choice Based Credit System aims at introducing multidisciplinary approach to higher education enabling a student to have strong hold across multiple subjects from a wide range of elective subjects.

III. BISAYAN NETWORK

Bayesian networks are a type of Probabilistic Graphical Model that can be used to build models from data and/or expert opinion. They can be used for a wide range of tasks (figure 1) including prediction, anomaly detection, diagnostics, automated insight, reasoning, time series prediction and decision making under uncertainty [5]. An alternative is to develop a model that preserves known conditional dependence between random variables and conditional independence in all other cases. Bayesian networks are a probabilistic graphical model that explicitly capture the known conditional dependence with directed edges in a graph model. All missing connections define the conditional independencies in the model.

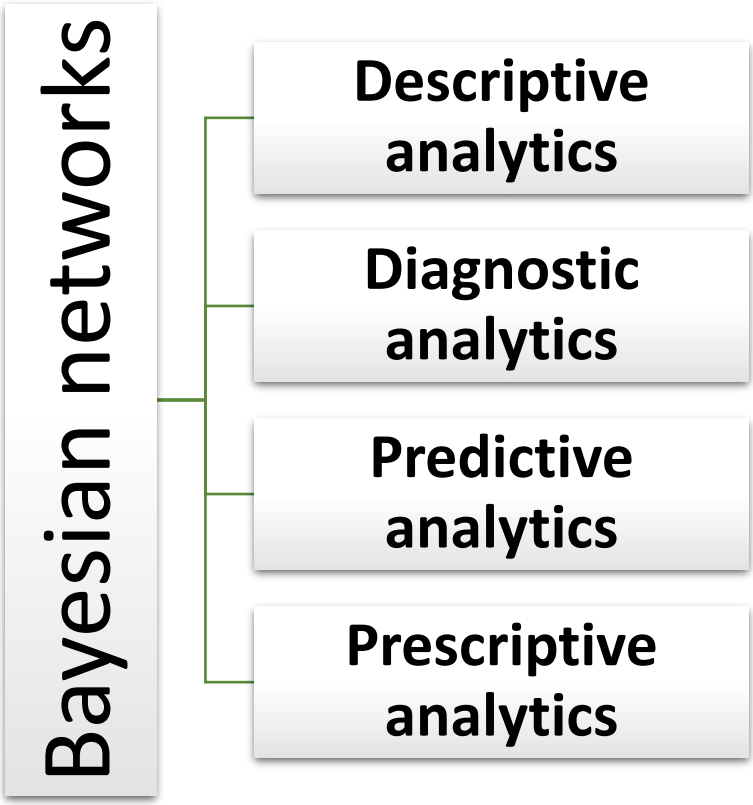

Fig 1. Bayesian network task

A common approach to addressing this challenge is to add some simplifying assumptions, such as assuming that all random variables in the model are conditionally independent. This is a drastic assumption, although it proves useful in practice, providing the basis for the Naive Bayes classification algorithm. An alternative approach is to develop a probabilistic model of a problem with some conditional independence assumptions [6]. This provides an intermediate approach between a fully conditional model and a fully conditionally independent model.

3.1 Naive Bayes

Naive Bayes is a simple, yet effective and commonly-used, machine learning classifier. It is a probabilistic classifier that makes classifications using the Maximum A Posteriori decision rule in a Bayesian setting. It can also be represented using a very simple Bayesian network [7, 13]. Naive Bayes classifiers have been especially popular for classification, and are a traditional solution for problems such as spam detection. Classification commonly used data mining technique, which is used to develop a class and assign each set of data to

a particular class in figure 2. The classification based on learning and classification. In the learning the classification algorithm analyzes the data. In classification to check the accuracy of classification rules the classification test data are used and if the accuracy is good then rules are applied on the new data tuples.

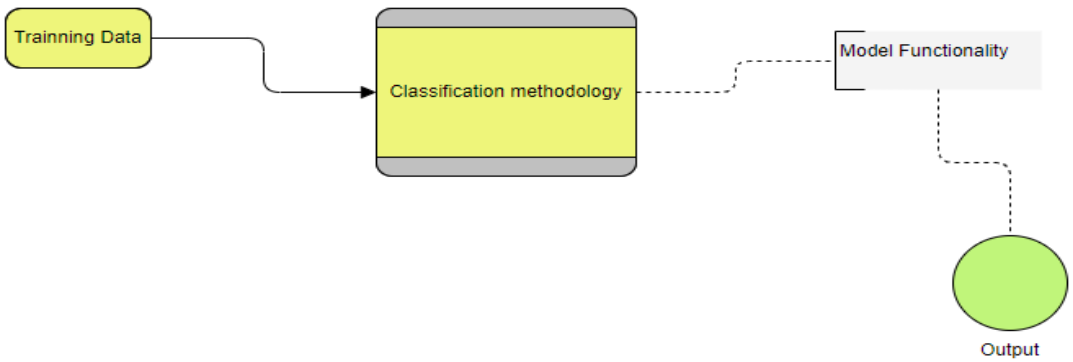

Fig 2 Naive Byes work flow

IV DECISION TREE

A decision tree is a decision support tool that uses a tree-like graph or model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility. It is one way to display an algorithm that only contains conditional control statements. A decision tree is a flowchart-like structure in which each internal node represents a "test" on an attribute, each branch represents the outcome of the test, and each leaf node represents a class label (decision taken after computing all attributes). The paths from root to leaf represent classification rules. Decision tree algorithms are used to split the attributes to test at any node to determine whether splitting is "Best" in individual classes [8]. The resulting partitioned at each branch is PURE as possible, for that splitting criteria must be identical. A normal tree includes root, branches and leaves. The

same structure is followed in Decision Tree. It contains root node, branches, and leaf nodes. Testing an attribute is on every internal node, the outcome of the test is on branch and class label as a result is on leaf node. A root node is parent of all nodes and as the name suggests it is the topmost node in Tree. A decision tree is a tree where each node shows a feature (attribute), each link (branch) shows a decision (rule) and each leaf shows an outcome (categorical or continues value) [10]. As decision trees mimic the human level thinking so it's so simple to grab the data and make some good interpretations. The whole idea is to create a tree like this for the entire data and process a single outcome at every leaf.

V. MODEL DEVELOPEMNT

According to the values of the splitting attribute, the training data are partitioned into several subsets during model development. Until all instances in a subset belong to the same class in any naïve byes and Decision Tree the algorithm proceeds recursively in model development [9]. If the values are close to each other, the set can be said to be precise. If their average is close to the true value of the quantity being measured, the set can be said to be accurate. Only if given a set of data points from repeated measurements of the same quantity then one can measure above two algorithms. The experiment is simulating on analytical tool. For intelligence tasks, tools are a collection of machine learning algorithms. For data pre-processing, classification, regression, clustering, association rules, and visualization contains tools [11]. A various tool is open source software issued under the Public License. It is also well-suited for developing new machine learning schemes. The algorithms can either be applied directly to a dataset.

5.1 Quantification

The dataset [1] which is used in the experiment is choice-based credit system-based dataset. By applying this dataset on three algorithms of the naïve byes and decision tree. Dataset description is as follow. The CBCS dataset have taken from open source dataset. The authors had applied two of the classification methods one by one comparative accuracy. The first method used by the authors was Bayesian Network (BN). According to Naïve byes had analyzed the performance of CBCS data set. He found that BN was the best-suited classification methods. Directed acyclic graphs are used in Bayesian networks to depict the dependencies among random variables.

Random variables are represented as nodes. If the nodes are connected by an arc, then these variables are dependent on each other. BN has been used for performing bi-directional inference since 1980. It is also used for reasoning under uncertainty. Table 1, distributes the data sets on three types of class. The results of algorithms in the terms seven attributes with the help of the table 1. The splitting Criteria column gives information about how the algorithm split in order to get a better result. The attribute type table 2 to 7 gives information about what type of values the algorithm can handle. Whether the algorithm finds the missing value or not, the result defines from the Missing Value column and thus the algorithm is accurate or not we can find.

Table 1 Class

Attribute	Good	Average	Poor
	(0.43)	(0.36)	(0.22)

Table 2Student Gender

Attribute	Good	Average	Poor
F	34.0	20.0	8.0
M	**24.0**	**29.0**	**22.0**
[Total]	**58.0**	**49.0**	**30.0**

Table 3Internal Assessment based Choice

Attribute	Good	Average	Poor
Vg	31.0	25.0	10.0
Good	**19.0**	**20.0**	**17.0**
Pass	**3.0**	**3.0**	**4.0**
Best	**7.0**	**3.0**	**1.0**
[Total]	**60.0**	**51.0**	**32.0**

Table 4Credit Percentage

Attribute	Good	Average	Poor
Vg	19.0	23.0	15.0
Good	**26.0**	**17.0**	**2.0**
Pass	**8.0**	**2.0**	**1.0**
Best	**7.0**	**9.0**	**14.0**
[Total]	**60.0**	**51.0**	**32.0**

Table 5Previous Back			
Attribute	Good	Average	Poor
Y	21.0	29.0	15.0
N	**37.0**	**29.0**	**15.0**
[Total]	**58.0**	**49.0**	**30.0**

Table 6Study Hours (Credit)			
Attribute	Good	Average	Poor
Poor	15.0	21.0	12.0
Average	**28.0**	**19.0**	**15.0**
Good	**16.0**	**10.0**	**4.0**
[Total]	**59.0**	**50.0**	**31.0**

Table 7 Me			
Attribute	Good	Average	Poor
Asm	23.0	23.0	17.0
Eng	**33.0**	**22.0**	**10.0**
Hin	**2.0**	**4.0**	**4.0**
Ben	**2.0**	**2.0**	**1.0**
[Total]	**60.0**	**51.0**	**32.0**

As we can see the below table (8, 10) is the practical result of naïve byes algorithms and decision tree. One can notice that takes 0.5 seconds and 0.7 to execute an algorithm.

The fastest execution is naïve byes. Though naïve byes take less time or we can say it is the slowest one among them, accuracy is highest and it gives very precise result than the other algorithms. So, we can conclude from the above table 10 that if we do the comparative study of all three algorithms, the naïve byes are best to choose.

Table 8 Data Table of Naïve Byes							
TP Rate	FP Rate	Precision	Recall	F-Measure	ROC Area	PRC Area	Class
0.625	**0.360**	**0.565**	**0.625**	**0.593**	**0.676**	**0.599**	**Good**
0.234	**0.333**	**0.282**	**0.234**	**0.256**	**0.439**	**0.320**	**Average**
0.393	**0.184**	**0.367**	**0.393**	**0.379**	**0.754**	**0.388**	**Poor**
0.435	**0.313**	**0.421**	**0.435**	**0.426**	**0.118**	**0.608**	**0.454**

As shown in table-9, there are three alternatives for selection. You can choose three number of attributes from given set. First, we have to choose the best condition.

Table 9 Confusion metrics Naive Byes			
A	**B**	**C**	
35	**15**	**6**	**A=Good**
23	**11**	**13**	**B= Average**
11	**13**	**11**	**C= Poor**

Table 10 Data Table of Decision tree							
TP Rate	FP Rate	Precision	Recall	F-Measure	ROC Area	PRC Area	Class
0.554	**0.480**	**0.463**	**0.554**	**0.504**	**0.527**	**0.486**	**Good**
0.298	**0.417**	**0.286**	**0.298**	**0.292**	**0.454**	**0.325**	**Average**
0.143	**0.107**	**0.267**	**0.143**	**0.186**	**0.603**	**0.263**	**Poor**
0.374	**0.378**	**0.357**	**0.357**	**0.374**	**0.360**	**0.517**	**0.381**

As, shown in given figure 3, we see that there are five attributes (e.g. Student Gender, Study Hours (Credit), Me, Previous Back, Internal Assessment based Choice) to decide that CBCS is should be decision. For result, there are four classes such as good, vg, best and pass. These attributes may be increased or decreased. But if the numbers of attributes are more than data classification can be done with more accuracy. The decision tree for above data can be generated as shown in figure-3.

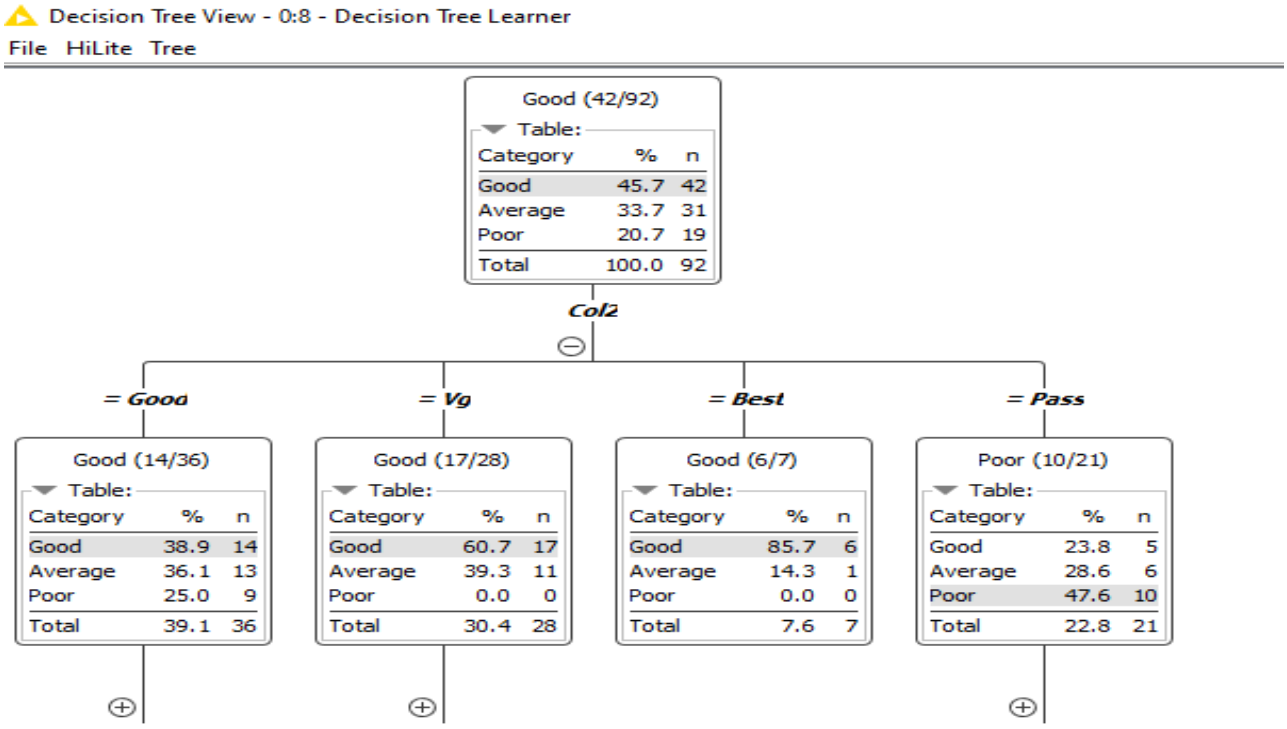

Fig 3 Learner Structure

As shown in the table 11 we can say that when number of attributes increases then condition increases slowly, accuracy increases highly, and as a result of good level of prediction goes to high. Although, it is fact that 100 % prediction is not possible with any system because ultimately the God is great. So, Classification accuracy alone can be misleading if observation have an unequal number of observations in each class .

Table 11 Confusion metrics Decision tree			
A	**B**	**C**	
31	**22**	**3**	**A=Good**

25	**14**	**8**	**B= Average**
11	**13**	**4**	**C= Poor**

VI. Conclusion

The Naïve Byes and Decision Tree algorithms were applied on the choice-based credit system dataset. Decision tree outperforms others in terms of accuracy, time and precision. It quite relies on the algorithm used for recommendation to find interesting resources. At last, the comprehensive study is done about decision tree algorithms and naïve byes is the algorithm for this dataset is very precise and most accurate among the others. The CBCS based academic performance was evaluated based on academic and personal data collected from open source data set. The total number of records was 1000 with 5 attributes. After that two different classification algorithms were used. They were Bayes Net and Random Forest. The data mining tool used in the experiment was KNIME. Based on the accuracy and the classification errors one may conclude that the Naive method was the most suited algorithm for the dataset. The naïve byes algorithm was applied to the dataset using KNIME to find some of the best rules. The data may be extended to collect some of the extra-curricular aspects and technical skills of the students and mined with different Intelligence algorithms to predict the student performance as future work. The authors also interested in working in future on data of student's assessments for each course trying to know what kind of student succeed on what kind of courses. It may define what kinds of courses are adapted for every attributes of data set who shares the same characteristics. It may also provide various multidimensional summary reports and redefine pedagogical learning paths. As per the implementation of this project, data classification with decision tree is easy with compared to other method. Because of previous records and pictorial view, the task of categorization of data becomes easy. Once the result obtained, it can be reused for next research. The dataset is of type text and number. As the threshold is increased, the time taken to train decision tree is to be decreased. The advantage of naïve byes is that it provides a theoretical framework for taking into account not only the experimental data to design an optimal classifier, but also a structural behavior for allowing better generalization capability.

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