A

Project I Report

on

ANALYSIS AND PREDICTION OF STUDENTS BEHAVIOUR BY DATA MINING'S CLASSIFICATION METHOD

Submitted in Partial Fulfillment of
the Requirements for the Degree
of

Bachelor of Engineering

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North Maharashtra University, Jalgaon

Submitted by

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CERTIFICATE

This is to certify that the Project I entitled *ANALYSIS AND PREDICTION OF STUDENTS BEHAVIOUR BY DATA MINING'S CLASSIFICATION METHOD*, submitted by

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in partial fulfillment of the degree of *Bachelor of Engineering* in *Computer Engineering* has been satisfactorily carried out under my guidance as per the requirement of North Maharashtra University, Jalgaon.

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Place: Jalgaon

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Abstract

Students opting engineering as their disciple is increasing rapidly. But due to various factors and inappropriate primary education in India dropout rates are high. Students are unable to excel in core engineering subjects which are complex and mathematical, hence mostly get drop / keep term (kt) in that subject. With the help of data mining techniques we can predict the performance of students in terms of grades and dropout for a subject can be predicted. In the proposed system , various classification data mining techniques such as naive Bayes, LibSVM, J48, random forest, and JRip are compared and by overcoming the flaws of existing techniques somewhat new classification technique is developed. Based on the rules obtained from the developed technique ,the system can derive the key factors influencing student performance.

Chapter 1

Introduction

It is highly important to evaluate and predict Students Academic performance in Academic settings because it plays an important role in guiding the Students towards becoming great leaders of tomorrow and source of manpower for the country. The amount of data stored in educational database increasing rapidly.

This chapter is organized as follows. Section 1.1 presents background. Motivation is presented in section 1.2. Section 1.3 presents problem definition.Scope is presented in Section 1.4. Section 1.5 presents objectives. Organisation of the report is presented in Section 1.6. Finally, summary of the chapter is given in the last section.

1.1 Background

Education is the key to prosperity of any nation. India is one of the fastest growing nation in the world with largest youth of population [1]. Hence in order to build a skilled workforce education becomes necessary. Students are opting for the elds such as engineering, science and technology. Unfortunately due to lack of quality education at primary level, socioeconomic, psychological and other diverse factors, students drop out rates are high and performance is low. Hence to improve the quality of engineering graduates such cases of dropout and poor performance must be monitored proactively. Data mining provide us with tools to analyze large set of data to derive meaningful data known as knowledge. This help us to get insight of data and reach to meaningful conclusion. Initially the application of data mining were restricted to business domain but know it is extended to education and is known as EDM. Educational data mining (EDM) deals with the application of data mining tools and techniques to inspect the data at educational institutions for deriving knowledge.

1.2 Motivation

The motivations of proposed system are listed as follows :

- **Predicting student's future learning behaviour:**With the use student modelling ,this goal can be achieved by creating student models that incorporates the learner's characteristics ,including detailed information such as their knowledge ,behaviors and motivations to learn.
- **Discovering or improving domain needs:**Through the various methods and applications of EDM ,discovery of new and improvements to existing models is possible.
- **Studying the effects of educational support:**It can be achieved through learning system.
- **Advancing scientific knowledge about learning and learners:**by learning and incorporating student models, the fields of EDM research and the technology and software used.

1.3 Problem Definition

In Recent years academics failure rate of student is increasing exponentially.This is Concerned to almost all faculties of Education like Engineering,Medical ,Management,Commerce and Arts etc.This is increasing the Illetaracy factor of Nation and decreasing Education standards and Overall Technical Standards.Learning is the Crucial factor. Inappropriate primary education is causing dropout rates in India are high.On every year this graph is increasing to peak levels.This is predictive type of problem and the various factors affecting to the student performance needs to be calculated either by Heuristic or algorithmic techniques to prevent by depleting the causes responsible for students performance. For students opting engineering as their disciple is increasing rapidly.Students are unable to excel in core engineering subjects which are complex and mathematical, hence mostly get drop/keep term (kt) in that subject is increasing tremendously for large number of students.

1.4 Scope

To implement software that will provide following advantages over the already implemented software:

1.4.1 Robustness

In a robust system performance degrades gracefully rather than catastrophically as conditions become more different from those under which it is trained.

1.4.2 Portability

Portability to goal of rapidly designing ,developing and deploying system for new application.At present system tend to suffer significant degradation when moved to new task.

1.4.3 Adaption

how can system adapt to changing conditions and improve through use ,adaption can occur at many levels in systems ,sub word models ,pronunciation,language model etc.

1.5 Objectives

- To develop new data mining classification technique by overcoming flaws of existing techniques.
- To detect important factors affecting students performance.
- Help students to better results and quality of education by tapping up the potential problem in early stage.
- Help to obtain hidden factors which are not covered in the study or are not disclosed by the student due to fear of loss of privacy.

1.6 Organization of the report

This section species the organization of the project.The chapter one of this project contains the introduction about this project which includes the sections like Background, Motivation,Problem Denition, Scope, Objective, Organization of the report and summary. The System Analysis for the project consists of Literature Survey,summary which is described in the chapter two.Chapter three constitutes of System Requirement Specication including the sections such as Hardware Requirements, Software Requirements, Functional Requirements, Non- Functional Requirements, Other requirement and constraints and summary. The sections System Architecture,UML diagrams(USE Case Diagram, Class Diagram, Sequence Diagram,Component Diagram, Deployment Diagram) and summary are included in chapter four. Thus, the Organization of the report is done in the above manner.

1.7 Summary

In this chapter, background,problem definition,scope,objective,organisation of the report. In the next chapter, analysis is presented.

Chapter 2

Analysis

System analysis is the study of states of interacting entities, including computer system analysis. This field is closely related to requirement analysis or operation research. In this chapter,the system analysis is discussed briefly.

Section 2.1 describes Literature survey. Proposed System is described in section 2.2. Section 2.3 describes the feasibility study of the proposed system. Risk analysis is described in Section 2.4.Finally, summary of the chapter is given in the last section.

2.1 Literature Survey

Since EDM is one of the popular research eld there are numerous papers .Thereby lets discuss some of the works we found most useful for our study. Mohammed M. Abu Tair, Alaa M. El-Halees [3]in their case study discussed various EDM techniques to improve students performance. Data was collected from the college of Science and Technology Khanyounis for 15years [1993 to 2007]. This data set consists of 3360 record and 18 attribute. They have used various techniques such as association rule mining, classication, outlier detection and clustering to identify the various factors that aects various performance.

S. Agarwal [2], et al. suggested that placement is based on student performance in qualifying examination and the test. They have used LibSVM algorithm with Radial Basis Kernel, achieving the overall accuracy of around 97.3. Since placement is one of the most important parameters for quality of education, hence it is immensely necessary that student performance must be improved which is our area of focus throughout the paper. M.S. Kamal [4], et al. suggested that the most important factor for dropout are nancial conditions, age group and gender. They have used Bayes theorem based on knowledge base to predict the dropout.

Carlos Mrquez-Vera [5] , et al. suggested that the most inuential factor for dropout and failure is Poor or Not Presented in Physics and Math; Not Presented in Humanities and Reading and Writing; Poor in English and Social. They have obtained classication results on four cases (1) By using all attributes (2) By using best attributes (3) By using Data Balancing (4) By using Cost-Sensitive classication. In all of these ADTree was one of the top performers while others where Prism, JRip and OneR.

Mashael A. Al-Barrak [6], et al. suggested using J48 algorithm to predict nal GPA of the student. This paper attempted to nd which courses of previous semesters have direct impact on nal GPA. In result it was found out that Java1, Database Principles, Software Engineering I, Information security, Computer Ethics, and Project 2 are most important courses aecting the nal GPA of the students.

Brijesh and Pal [7] , found out using Bayesian classication that student SSC (metric) grade, living location, medium of instruction, mother qualication, student habits and type of family are the most important factors for the student performance.

Dorina Kabakchieva [8], demonstrated that J48 performance is the best, followed by the JRip and the k-NN classier. The Bayes classiers are found to be less accurate than the rest. However, all tested classiers has overall accuracy less than 70 percent which imply that the error rate is high and the predictions are unreliable.

M.S. Mythili [9], et al. concludes that the attendance, parent education, locality, gender, economic status are the high potential parameters affecting student performance in examination. It is also found that random forest is the most accurate classier and take less time to build the model than any other classier.

Qasem A. Al-Radaideh [10] , et al. in their paper attempt to nd out the main parameters which affects the student performance in a particular course. They have used CRISP framework for data mining for this purpose. ID3, C4.5 decision tree and Naive Bayes where compared. C4.5 was found to be better than others.

2.2 Proposed System

There are various data mining methods such as classication, clustering and association to analyze such data. Classication is supervised learning method that builds a model to classify a data item into a particular class label. The aim of classication is to predict the future

outcome based on the current available data. In clustering the data objects are combined into set of objects known as groups or clusters . The objects within a cluster or a group are highly similar to each other but are dissimilar to the objects in other cluster.Dissimilarities and similarities measures are based on the attribute values which describes the objects and often involve distance metrics . Association rule learning involves nding interesting relations between variables in large databases. The aim of association rule learning is to nd strong rules in databases based on the various measures of interesting .

The goal of this study is as follows:

- To obtain the most inuencing factors that affects students performance.
- To nd best classication method for student performance prediction in terms of grade and dropout.

2.3 Feasibility study

Once scope has been identified, it is reasonable to ask: Can we build software to meet this scope? Is the project feasible? All too often, software engineers rush past these questions (or are pushed past them by impatient managers or customers), only to become mired in a project that is doomed from the onset. software feasibility has four solid dimensions:Technology-Is a project technically feasible? Is it within the state of the art? Can defects be reduced to a level matching the applications needs? Finance-Is it financially feasible? Can development be completed at a cost the software organization, its client, or the market can afford?Time-Will the projects time-to- market beat the competition? Resources-Does the organization have the resources needed to succeed?, a project planner must prescribe the time window required for hardware and software and verify that these resources will be available.When a computer-based system (incorporating specialized hardware and software)is to be engineered, the software team may require access to hardware elements being developed by other engineering teams.

2.3.1 Economical Feasibility

This includes an evaluation of all incremental costs and benefits expected if proposed system is implemented. Costs-benefit analysis which is to be done during economical feasibility delineates costs for project development and weighs them against system benefits.The system adds information of colleges and companies for which colleges and companies pays as it provides their information as well as company jobs. So developing this system is economically feasible. when our project will be complete software which if user is using, does

not need to spend extra money for purchasing any type of hardware part hence our project is economic feasible.

1. Performance Risks
2. Costs Risks
3. Support Risks
4. Schedule Risks

2.3.2 Operational Feasibility

When the project will be implemented, using the developed system we can predict the performance of students in terms of grades and dropout for a subject. Since our project is graphically strong and it can be easily understood by the user so it is user-friendly. Our project is extensible since it is software and we can do changes in it when we need it.Operational feasibility determines whether the proposed system satisfied the user objectives and can be fitted in to current system operation. The System can be justified as operationally feasible based on the following Operational feasibility determines if the proposed system satisfied the user objectives and can be fitted in to current system operation. The System can be justified as operationally feasible based on the following: The methods of processing and presentation are completely acceptable by the users because they meet all their requirements:

- The users have been involved during the preparation of requirement analysis and design process.
- The system will certainly satisfy the user objectives and it will also enhance their capability system will certainly satisfy the user objectives and it will also enhance their effectiveness.

2.3.3 Technical Feasibility

It is concerned with hardware and software feasibility. In this study, one has to test whether the proposed system can be developed using existing technology or not. As per client requirements the system to be developed should have speed response because of fast exchange of information, reliability, security, scalability, integration and availability. To meet these requirements.The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level

of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the user of the system. In this section we have discussed the feasibility study regarding this project.

2.4 Risk Analysis

Uncertainty-the risk may or may not happen; that is, there are no 100 percent probable risks. Loss if the risk becomes a reality, unwanted consequences or losses will occur.When risks are analyzed, it is important to quantify the level of uncertainty and the degree of loss associated with each risk. To accomplish this, categories of risks are considered. Project risks threaten the project plan. That is, if project risks become real, it is likely that project schedule will slip and that costs will increase. Project risks identify potential budgetary, schedule, personnel (staff and organization), resource, customer, and requirements problems and their impact on a software project. Project complexity, size, and the degree of structural uncertainty were also defined as project (and estimation) risk factors. Technical risks threaten the quality and timeliness of the software to be produced. If a technical risk becomes a reality, implementation may become difficult or impossible. Technical risks identify potential design, implementation, interface, verification, and maintenance problems. In addition, specification ambiguity, technical uncertainty, technical obsolescence, and leading edge technology are also risk factors. Technical risks occur because the problem is harder. Business risks threaten the viability of the software to be built. Business risks often jeopardize the project or the product. Candidates for the top business risks are:

- Building a excellent product or system that no one really wants(market risk)
- Building a product that no longer ts into the overall business strategy for the company (strategic risk)
- Building a product that the sales force doesn't understand how to sell the support of senior management due to a change in focus or a change in people (management risk).
- Losing budgetary or personnel commitment(budget risks)

It is extremely important to note that simple categorization wont always work. Some risks are simply unpredictable in advance. Another general categorization of risks has been proposed by Charette. Known risks are those that can be uncovered after careful evaluation of the project plan, the business and technical environment in which the project is being

developed, and other reliable information sources (e.g., unrealistic delivery date, lack of documented requirements or software scope, poor development environment). Predictable risks are extrapolated from past project experience (e.g., staff turnover, poor communication with the customer, dilution of staff effort as ongoing maintenance requests are serviced). Unpredictable risks are the joker in the deck. They can and do occur, but they are extremely difficult to identify in advance.

2.5 Summary

In this chapter overall system analysis is presented. In next chapter system requirement specification is focused.

Chapter 3

System Requirement Specication

System Requirement Specification chapter contains the information related to what hardware and software are to be require for build system. Requirements engineering provides the appropriate mechanism for understanding what the customer wants, analyzing need, assessing feasibility, negotiating a reasonable solution, specifying the solution unambiguously,validating the specification, and managing the requirements as they are transformed into an operational system.

Software requirements engineering is a process of discovery,refinement,modeling and specication. Requirement analysis is a software engineering task that bridges the gap between system level requirements engineering and software design.

This chapter is organised as follows. Section 3.1 presents hardware requirements. Software requirements is presented in section 3.2. Section 3.3 presents functional requirements. Non functional requirement is presented in Section 3.4. Finally, summary of the chapter is given in the last section.

3.1 Hardware requirements

- Hard disc : 2GB to 30GB
- RAM : Necessary more than 1024 MB
- I/O device: mouse,keyboard

3.2 Software requirements

- Ubuntu 14.04 OS
- StarUml-v2.7.0

3.3 Functional requirements

The functional requirements are given as follows:

- To correctly predict the resultant of each student.
- To reduce the run time errors that might occur.
- help to predict the accurate behaviour of student
- to provide students tailored learning pathways or assessments material.

3.4 Non-functional requirements

Non-functional requirements are requirements that specify criteria that can be used to judge the operation of a system, rather than specific behaviors.This should be contrasted with functional requirements that specify specific behavior or functions. In general, functional requirements defined what a system is supposed to do whereas non-functional requirements defined how a system is supposed to be.Non-functional requirements are often called qualities of a system. Other terms for non-functional requirements are constraints, quality attributes, quality goals and quality of service requirements. Qualities,Non-functional requirements, can be divided into two main categories.

- Execution qualities, such as security and usability, are observable at run time.
- Evolution qualities, such as testability, maintainability, extensibility and scalability, are embodied in the static structure of the software system.

3.5 Summary

In this chapter, Hardware requirements,Software requirements,Functional requirements,Nonfunctional requirements. In the next chapter, presents System Design.

Chapter 4

System Design

System design is a process of designing the architecture,components,modules,interfaces,data for a system to satisfy specied requirements. System design could be seen as application of system theory to product development. In this chapter, various diagrams which are use in developing a system is discussed.

This chapter is organized as follows. This chapter is organised as follows. Section 4.1 presents system architecture.UML diagrams are presented in section 4.2. Finally, summary of the chapter is given in the last section.

4.1 System Architecture

Before applying the data mining techniques on the data set, there should be a methodology that governs our work. Figure 4.1 depicts the work methodology used which is based on the framework proposed in. The methodology starts from the problem definition, then preprocessing which are discussed in the introduction and the data set and preprocessing sections, then come to the data mining methods which are association, classification ,clustering, and outlier detection, followed by the evaluation of results and patterns, finally the knowledge representation process. In this section; we describe the results of applying the data mining techniques to the data of our case study, for each of the four data mining tasks; Association, classification, clustering and outlier detection, and how can benefited from the discovered knowledge.

4.2 UML Diagrams

UML allows a software engineer to express an analysis model using a modeling notation that is governed by a set of syntactic,semantic and programmatic rules.Eriksson and Penker explain these rules in the following way:The syntax tells us how the symbols should look and how the symbols are combined.The syntax is compared to words in natural language;it

is important to know how to spell them correctly and how to put different words together to form a sentence. The semantic rules tell us what each symbol means and how it should be interpreted by itself and in the context of other symbols; they are compared to the meanings of words in a natural language.The pragmatic rules define the intentions of the symbols through which the purpose of the model is achieved and becomes understandable for others.This corresponds in natural language to the rules for constructing sentences that are clear and understandable.In UML, a system is represented using five different views that describe the system from distinctly different perspectives.Each view is defined by a set of diagrams. The following views are present in UML:

1. **User model view:** This view represents the system(product) from the users(called actors in UML) perspective.The use-case is the modeling approach of choice for the user model view.

2. **Structural model view:** Data and functionality are viewed from inside the system.That is,static structure(classes, objects, and relationships) is modeled.

3. **Behavioral model view:** This part of the analysis model represents the dynamic or behavioral aspects of the system.It also depicts the interactions or collaborations between various structural elements described in the user model and structural model views.

4. **Implementation model view:** The structural and behavioral aspects of the system are represented as they are to be built.

5. **Environment model view:** The structural and behavioral aspects of the environment in which the system is to be implemented are represented.

In general, UML analysis modeling focuses on the user model and structural model views of the system. UML design modeling addresses the behavioral model,implementation model,and environmental model views.

4.2.1 Use Case Diagram

Use case diagrams are one of the five diagrams in the Unified Modeling Language for modeling the dynamic aspects of system.A use case diagram shows a set of use cases and actors (a special kind of class) and their relationships. Use case diagrams address the static use case view of a system. These diagrams are especially important in organizing and modeling the behaviors of a system as shown in Figure 4.3.

4.2.2 Class Diagram

Class diagrams are show static design view of a system.class diagram are important for visualizing,specifying,documenting structural models and for constructing executable systems through forward and reverse engineering as shown in Figure 4.3. The Class diagram is represented by rectangle which divided into three parts,Class Name,Attribute,Operations respectively.Class diagram is also use to show the relation between the various classes. This diagram is comes under the logical view.This diagram contain the Class name,Attributes, and operations perform by the classes.

4.2.3 Sequence Diagram

Sequence diagrams and collaboration diagrams are kinds of interaction diagrams and shows an interaction, consisting of a set of objects and their relationships, including the messages that may be dispatched among them. Interaction diagrams address the dynamic view of a system. A sequence diagram is an interaction diagram that emphasizes the time-ordering of messages; a collaboration diagram is an interaction diagram that emphasizes the structural organization of the objects that send and receive messages. Sequence diagrams and collaboration diagrams are isomorphic, meaning that you can take one and transform it into the other. Sequence diagram shows the Control flow of any system which content object with timeline.the following diagram shows the sequence of Table View with respective Time as shown in Figure 4.4.

4.2.4 State Diagram

A state chart diagram shows a state machine ,consisting of state,transitions,events and activities.State chart diagrams address the dynamic view of a system.They are especially important in modeling the behavior of an interface,class,or collaboration and emphasize the event ordered behavior of an object,which is specially useful in modeling reactive system as shown in Figure 4.5.

4.3 Summary

In this chapter, an overview of the system design along with its solution for the work contained in this dissertation is provided. In the next chapter, implementation of system is presented.

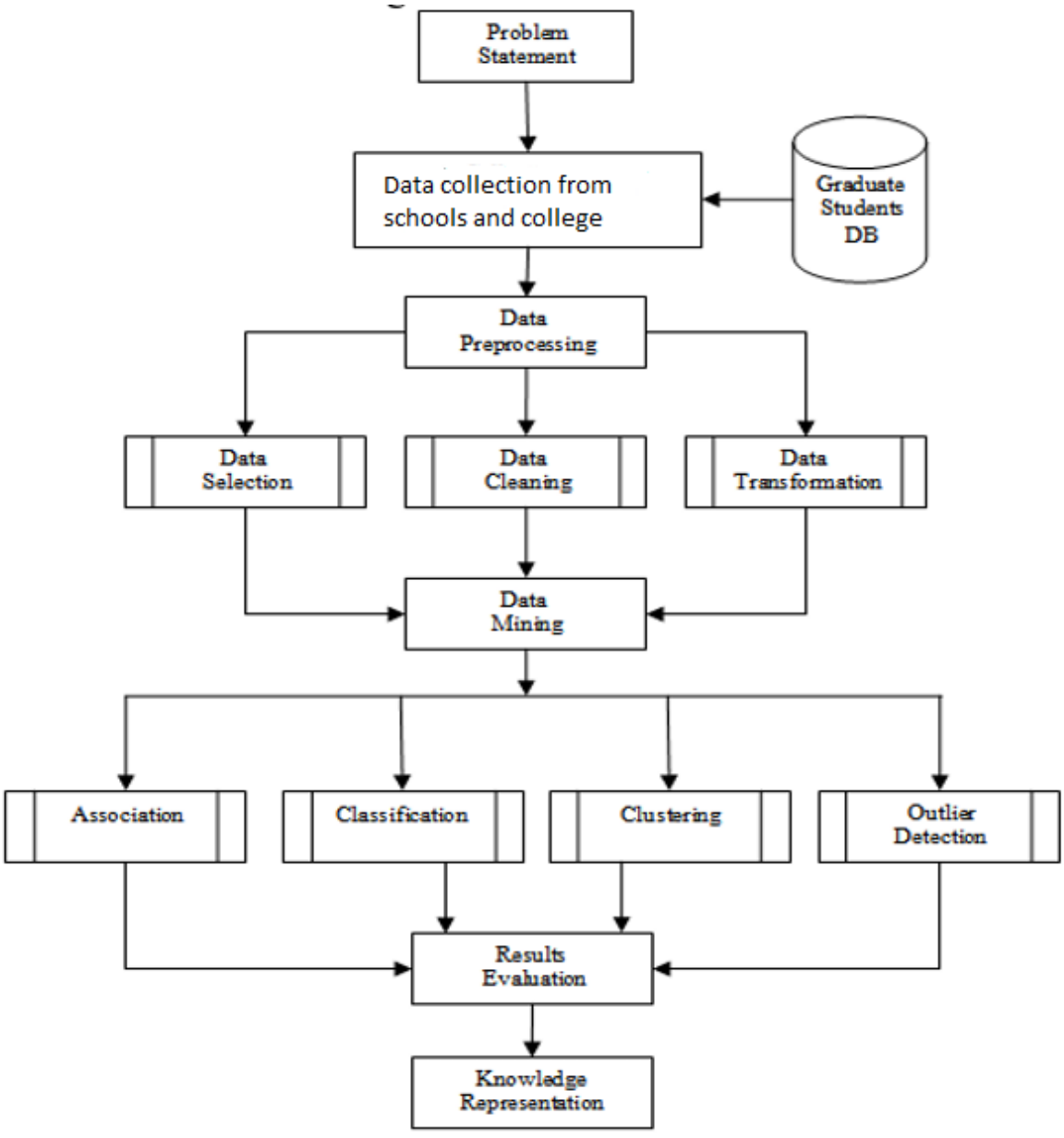

Figure 4.1: System Architecture

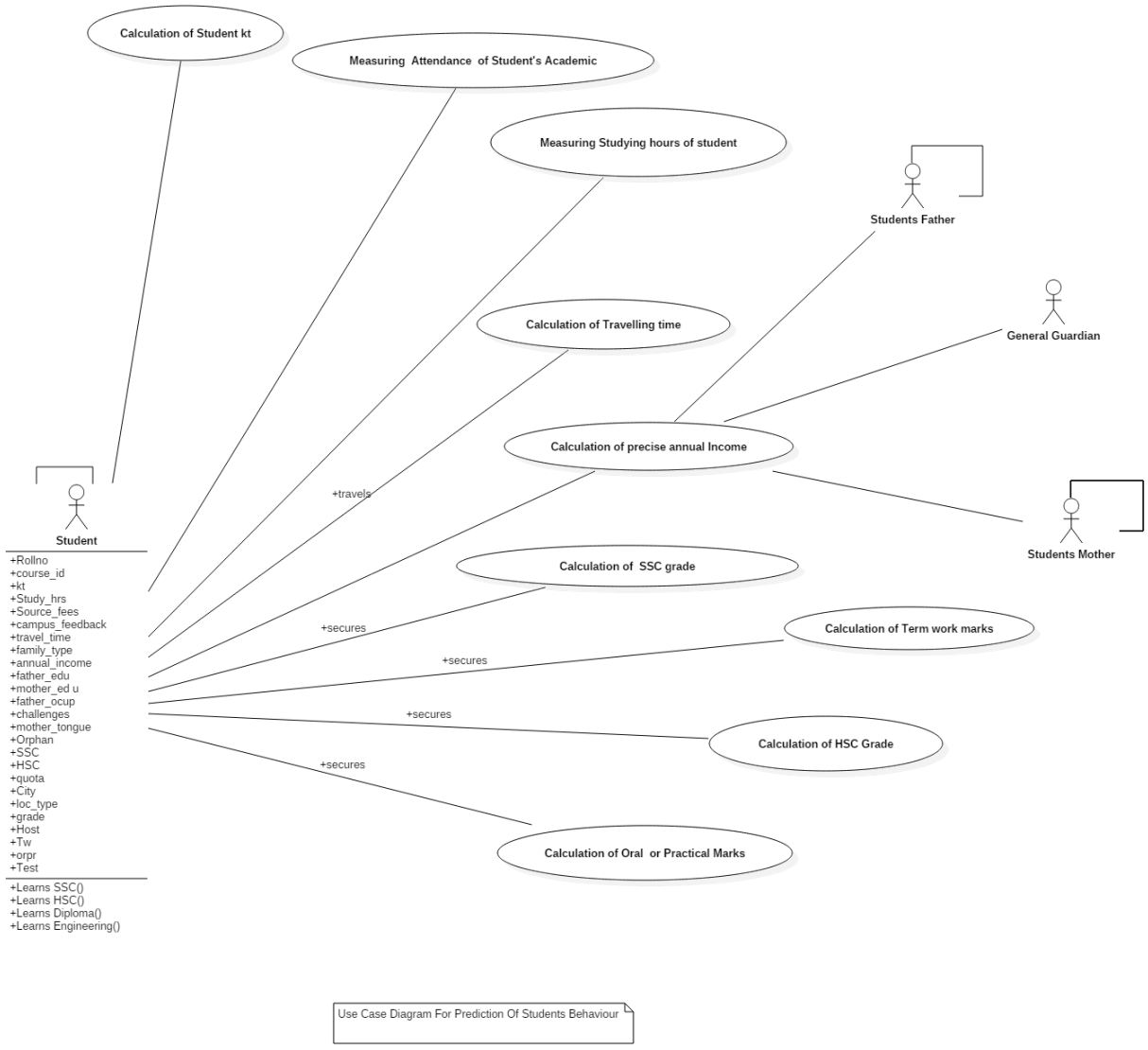

Figure 4.2: Usecase Diagram

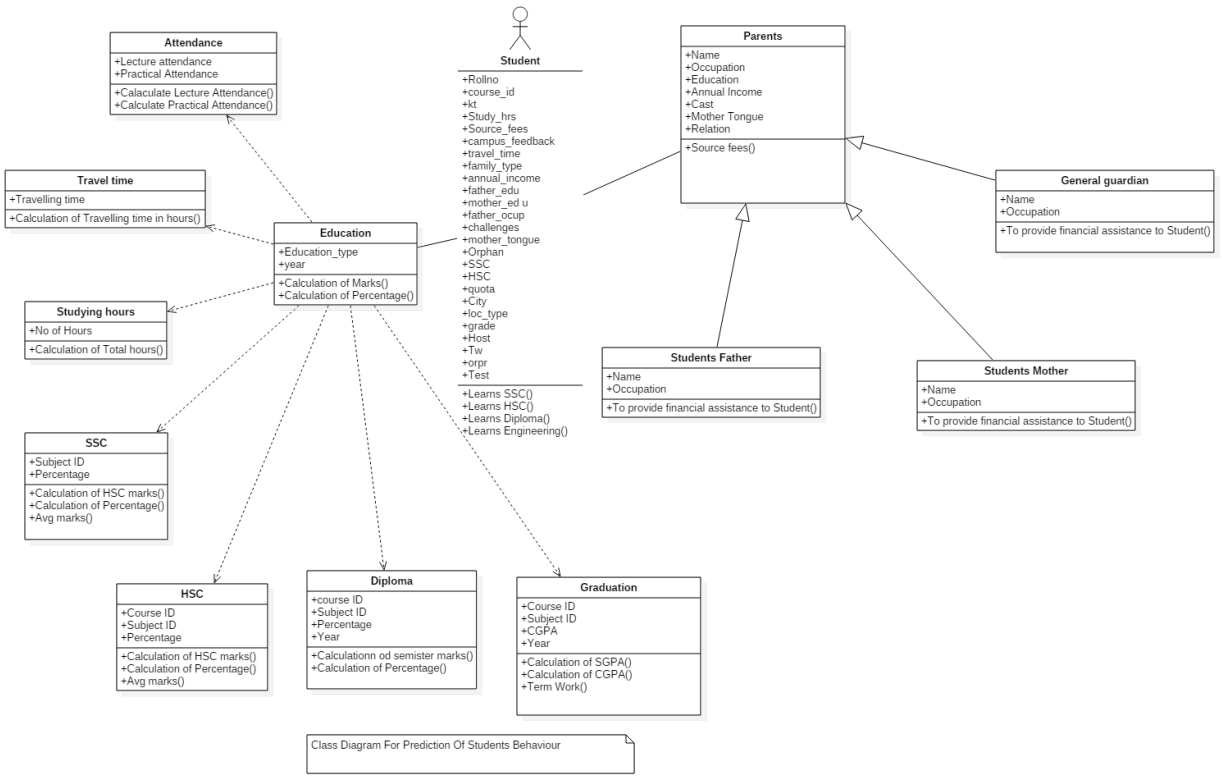

Figure 4.3: Class Diagram

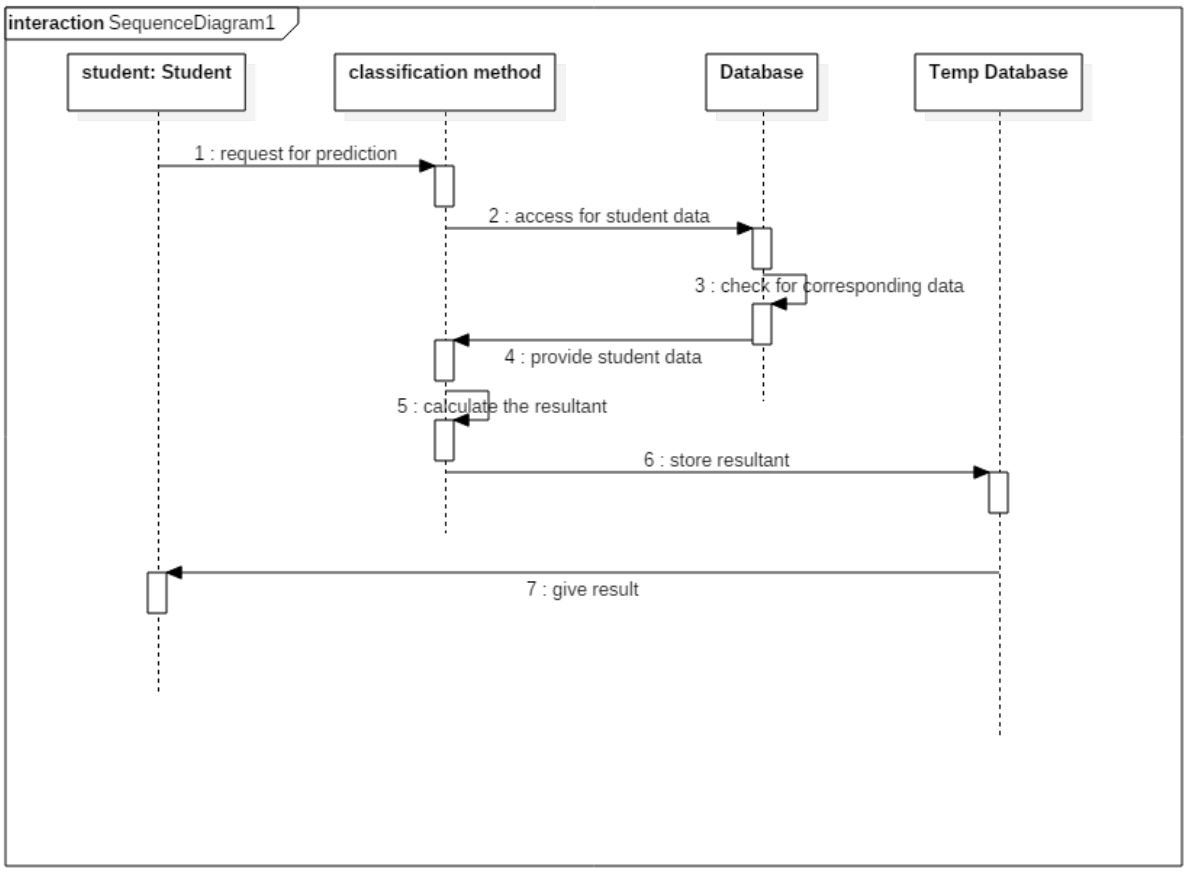

Figure 4.4: Sequence Diagram

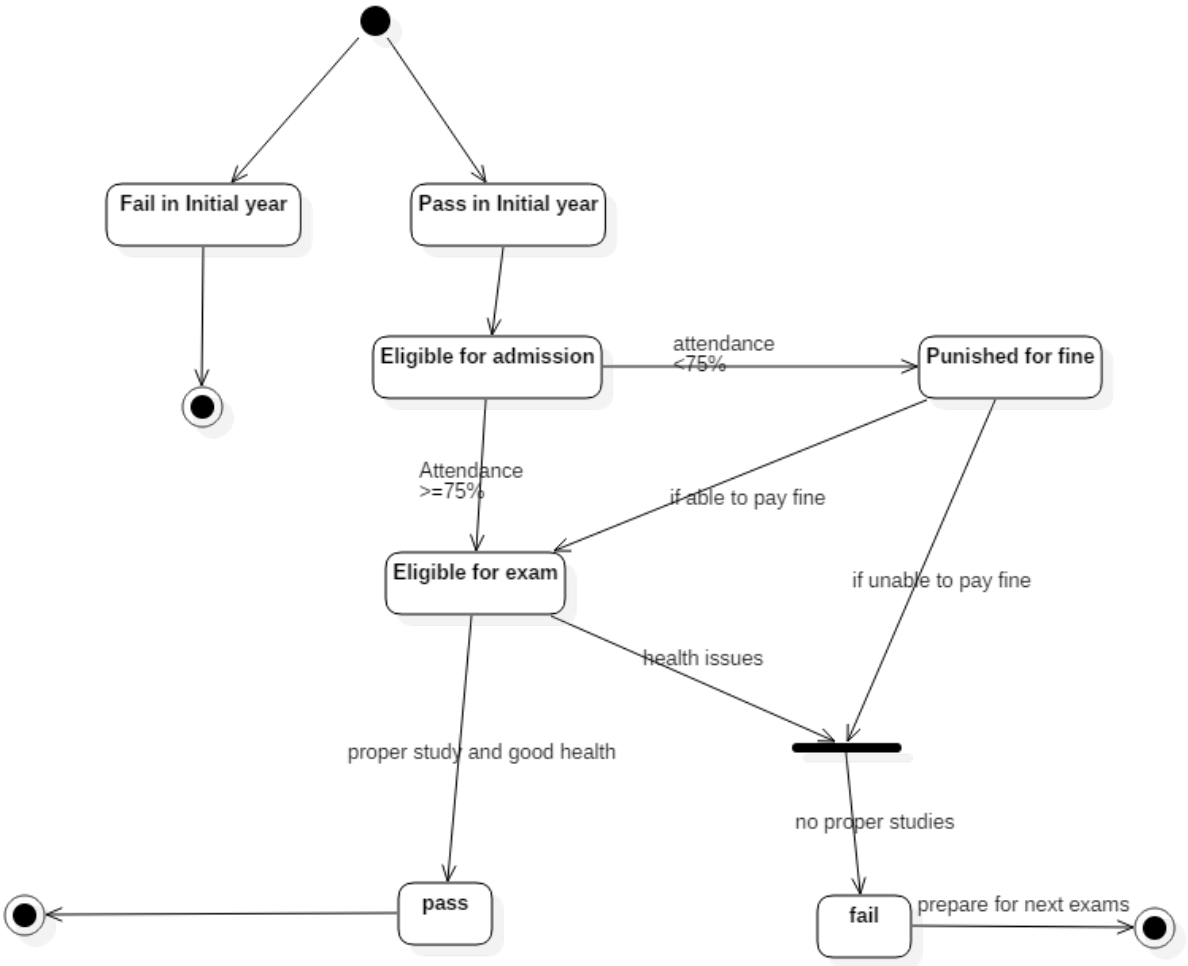

Figure 4.5: State Diagram

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