A Framework for Developing an Alumni Interactive System of Private Higher Educational Institutions Using Data Mining Techniques

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Abstract
Student Alumni Engagement is a novel emerging trend among the Universities, Colleges, Higher Educational Institutions (HEIs) in India. In the same way the private Higher Educational Institutions (PHEIs) and Private Universities are implementing these systems to associate and utilize their pass out students in the best useful way. We believe that every student alumni will be the key function of an organization. Today it is very essential to bring together the student alumni of an organization to harness the power of student alumni relations. In this paper, we have been proposed a framework to develop student's alumni intelligent system in Higher Education Institutions (PHEIs) using data mining techniques.

Keywords
Web Log Data, Data Mining, Weka

I. Introduction

Educational institutions are important parts of our society and playing a vital role for growth and development of the nation. Alumni systems are web-based information systems which have been developed by the pHEIs to maintain relations among the pas out students. pHEIs have been using the systems to collect alumni information and organize outreach activities. Typical systems collect information about the current location, workplace, job information and even hobbies of the alumni. Recent developments in information technology and internet have resulted in faster, easier and less expensive means of communication.

Alumni are one of the most important assets to any university. They are the people who represent the university in the real world. Many alumni networks were initially started from regional groups of alumni brought together for university fundraising activities. Later, these networks slowly gained added importance in the development of the universities because of their enormous outreach potential that benefits the university and helps current students in their career paths. The alumni groups have been in existence for decades and they are constantly changing with time. There have been very big changes in the recent years with the development of the internet and social networking that forces the alumni system to undergo huge changes. Therefore, it is really important for universities to focus on the alumni networks and find ways to enhance their growth and development.Universities have well maintained websites dedicated to university news, departmental, course and faculty information. Using the same means, most universities developed alumni information systems which typically list the information of student alumni like their year of graduation, current occupation and other details. Such systems, while providing a good listing of alumni details through dedicated pages on university website do not have any medium to facilitate interactions between the alumni. The main theme of such systems is to have a listing of alumni contact information which is used for the purpose of actively pursuing donations. Some universities have developed attractive alumni websites, but the major drawback of these systems is that they are limited only to alumni. Most of the alumni systems are now focused on just on College alumni. However, this system will not be much use for the old student alumni and the College. One could expand the member base to include current students, faculties, other affiliated staff members and guests or even people who are curious to know about the college. Such an expanded heterogeneous system tends to facilitate multiple kinds of interaction between its constituent members and can help to bring aboard all the people associated with the university on a single platform to discuss everything from upcoming activities, news and research to career programs. The goal of our proposed Alumni Interactive System (AIS) framework is to provide easy environment to the college. Our proposed system contains various vital factors such as old student alumni, current students, faculty, administration, staff and visitors. On the basis of these factors the Alumni Interactive System (AIS) will provide efficient communication channels. This can be done by offering social networking feature as part of the student alumni system. All Members in the system can virtually interact one-on-one or in a group, and the user data or data resulting from their interaction can be used to extract useful information for further studies or use, through the application of data mining techniques.

Paper is organized in different sections: Section II explains the data mining. Related works is shown in Section III. Proposed work and methodology are described in section IV. Section V contains experimental results. Conclusion is shown in section VI while references are mentioned in the last section.

II. Data Mining

Data miming consists of a set of techniques that can be used to extract relevant and interesting knowledge from large data set. Data mining is a computational method of processing data which is successfully applied in different areas including education domains that aim to obtain useful knowledge from the huge data set [1]. It is the creation of new knowledge in natural or artificial form, by using business knowledge to discover and interpret patterns in data. Data mining has several tasks such as association rule mining, classification and prediction, and clustering. Classification techniques are supervised learning techniques that classify data item into predefined class label. It is one of the most useful techniques in data mining to build classification models from an input data set. The used classification techniques commonly build models that are used to predict future data trends. There are many algorithms for data classification such as decision tree and Naïve Bayes classifiers. With classification, the generated model will be able to predict a class for given data depending on previously learned information from the collected data [2].

III. Related Works

There have been done some works in the area of data mining in private higher education system. Each of them is trying to enhance the educational system by discovering patterns among the great

deal of data. In this section, we will analyze the existing works.
In [3] Delavari et al. was investigated the capabilities of data mining when applied in the context of higher education system. The authors propose a roadmap analysis model DM_EDU which is aimed at improving the decision making procedures related to various processes which are essential to maintain the quality of educational system. Knowledge discovered by application of data mining techniques to raw educational data assists decision makers to improve the decision-making procedures and to set more enhanced policies for educational processes.
In [4] Barnard was proposed an online community portal which is beneficial to both alumni and higher education institutions in South Africa. The portal was a web-based secured database which allows free sharing of information between alumni management teams and its members. Using empirical survey methods, the amount of information disseminated to target alumni audiences at the University of Johannesburg and their opinions on community portals is collected. Based on the collected information the needs for building a network which is beneficial to both the alumni and the university are identified and a prototype portal is built which discards the on-size-fits-all 'notion of information sharing among alumni. However, this study was limited to alumni members and university as its stakeholders and had provision for limited interactions between the alumni.
In [5] Arceo et. al was highlighted the need for maintaining alumni systems in his work on the role of student and alumni associations in democratization of Spain during the post-Franco political transition. Arceo explained how student and alumni associations of Spain served as a bridge or boundary spanners between the educational institutions, their people (students, alumni, professors and political sector) and the job market. Eventually, these associations grew in their presence to decision-making bodies which helped retraining of the unemployed youth and thereby contributed towards development of people's lives through decreased unemployment.
In [6] Lakshmi Prasanna Andham et. al has proposed a Framework for Designing Smart Alumni Systems. The proposed Smart Alumni System has been implemented using ASP.net with C#. The implemented system provides a platform for communication and active interaction between alumni as well as current students, faculty, and other personnel affiliated with the university.
In [7] E.M. Castleman et. al, had proposed a model and implemented to manage CPD for the alumni of a PHEI might be one of the ways to differentiate one PHEI from another in doing just that. The beneficiaries of the model are therefore the PHEIs, the alumni and, ultimately, the receivers of health care.
In [8] Wienkes, Kirk, T., et.al, A LARA model was proposed and as a result of the software development process, the end product LARA was successfully developed. Once deployed, LARA will be a great first step for the local chapter of Campus Crusade for Christ on the University of Wisconsin - La Crosse campus in solving the logistical problems faced by the full-time staff in managing student leader and alumni information.

IV. Methodology Used

The complete system framework has the data repository system that holds the data of Alumni Interactive System (AIS) framework. It contains user data obtained from records, data obtained from thirty parties like social networking websites etc. The complete proposed methodology in this work is as follows:

A. Data Selection

1. User Datasets

Information entered by the user during registration or later is one of the key datasets of Alumni Interactive System (AIS) framework. It contains all personal, educational, professional and miscellaneous details about the member user.

2. College Datasets

Most College tends to conduct surveys from graduate students on wide range of related to educational standards and expectations at the college. The huge amount of data collected from such surveys can be analyzed to help the college administration with key decisions related to improving the education experience at their institution. The data repository scheme can also be used to store both raw data from college surveys and processed data obtained after analysis.

3. Weblog Datasets

Many social networking websites contain web log data resides in the web server. Integration of these datasets with Alumni Interactive System (AIS) framework data would expand the research scope of Alumni Interactive System (AIS) framework and benefit all the stakeholder of it. For example, a Alumni Interactive System (AIS) framework member may be able to search and invite prospective Student Alumni Intelligent System (AIS) framework members among people who are currently registered with social networks. Analysis of data obtained from university or social network repositories can be yields additional business intelligence. An SQL server would handle such databases and any query pertinent to it. Data saved in database is tabular format and can be retrieved into an Excel sheet or .csv file format.

B. Proposed Framework

The proposed framework contains different attributes which are summarized in Table 1 below.

Table 1: Attributes Description of AIS Framework

Sr. No	Stake Holders (Main Module)	Sub Module	Description
1.	Administrator		Person who have rights to maintain the system & giving access to users
2.	College/HEI		Users of high level in the College or Higher Educational Institutions (HEIs)
3.	Faculty Members	Full-time Faculty	Faculty Members who belongs to the concerned Department.
		Guest/ Visiting Faculty	All Faculty Members who belongs to the other colleges
4.	Support Staff	Technical	Person or employees who are working in different Departments.
		Non Technical	Person or employees who are working in different Departments.

5.	Present Student	Full Time	Students who takes courses regularly
		Part Time	Students who takes courses part time
6.	Student Alumni	Under Graduate	Students from the different departments of the college
		Post Graduate	
7.	Visitors	Parents Parents	People who wish to access the system of the College
		Recruiters	
		Prospective Students	

C. The Concrete Structure of AIS Framework

The proposed framework includes different modules which are described in this paper.

The concrete structure of the proposed Alumni Interactive System (AIS) framework is shown in fig. 1. The complete system framework holds the data repository scheme which database layer essentially holds all the data of Alumni Interactive System (AIS) framework. It contains user data, data obtained from college records; data obtained from thirty parties like social networking websites. Our AIS framework is based on a three-tier architecture computing model that contains three essential components such as: an interface, middle ware and database which are shown in fig. 1.

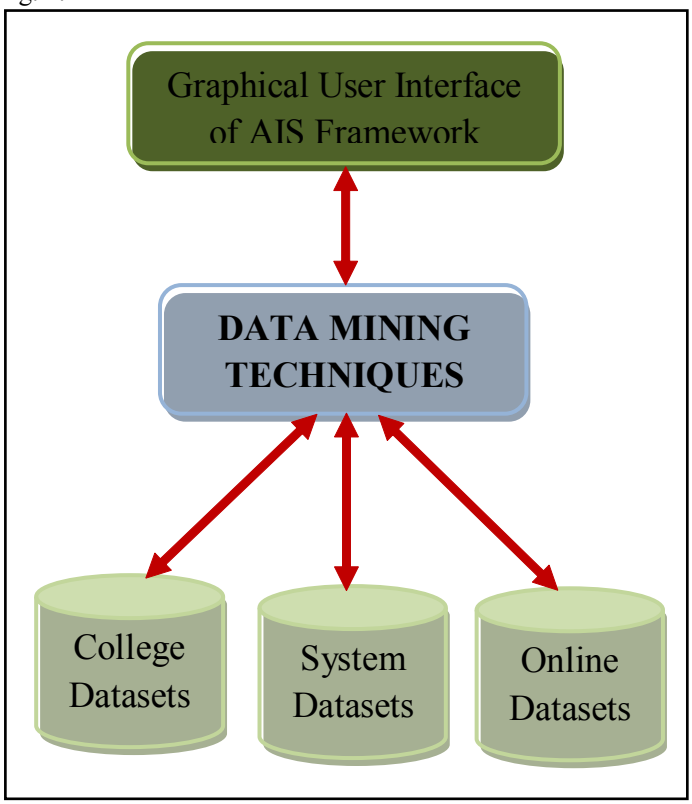

Fig. 1: The Concrete Structure of AIS Framework

D. The Design View of AIS Framework

In this paper, the design and structure of our proposed framework is shown. The Alumni Interactive System framework (AIS) has been developed as a novel model by implementing data mining techniques and algorithms in PHEIs. The complete structure of our proposed AIS framework contains different modules which provide powerful and useful features which are mentioned in this section. The user interface layer allows the users to access the system framework. The middle layer of the system contains program code used to access the databases or datasets and enforce system access control. The middleware includes complete data mining process. The database layer manages all system data-information entered by the user, data obtained from external sources and data analyzed by applying different data mining techniques.

1. Module–I : Fund Donation

Now days, due to privatization in education sector, it has been found that there have been cuts in funds for the Colleges and it has been become very hard for some Colleges to survive today in the completive environment. At this point, it is really important for the private Colleges and HEIs to search for other options for securing the required operating and developmental funds. The student alumni can be perceived as one of the major contributors to the private Colleges and HEIs over the long run. The Alumni Interactive System (AIS) framework has the information of all the student alumni who are members of the system. All this data can be analyzed using the data mining functions to find out who among the alumni will be willing to contribute for the Colleges and HEIs as shown in fig. 2. Every detail of the student alumni can be used from the place of residence, current position and year of graduation etc. for finding out the likely patterns which are not known a priori. Once a model is developed it can be probed to further know the list of student alumni who can be contacted.

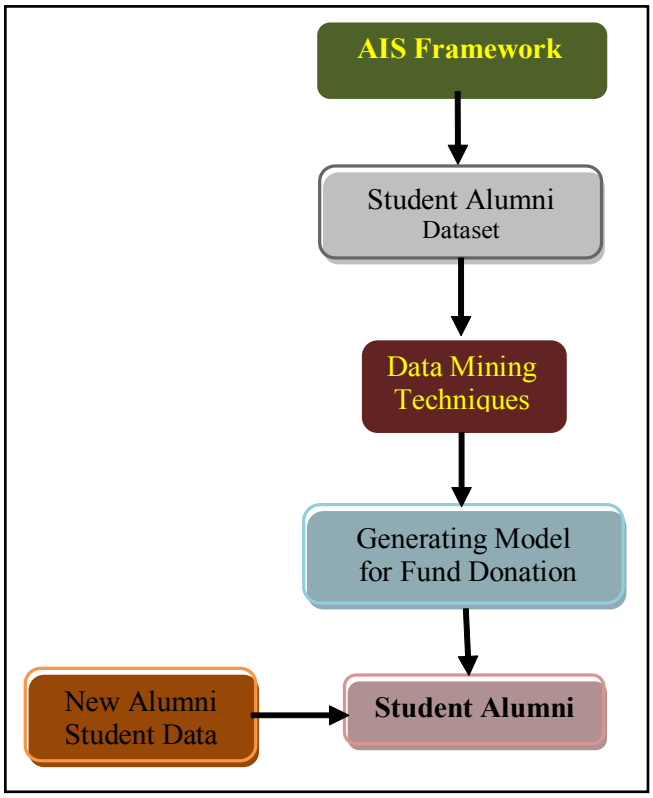

Fig. 2: Fund Donation Through AIS Framework

2. Module–II: Alumni Career Scope

Our proposed Alumni Interactive System (AIS) framework includes alumni information ranging from the year of joining the College, year of passing degree, their initial occupation to their current work profiles.

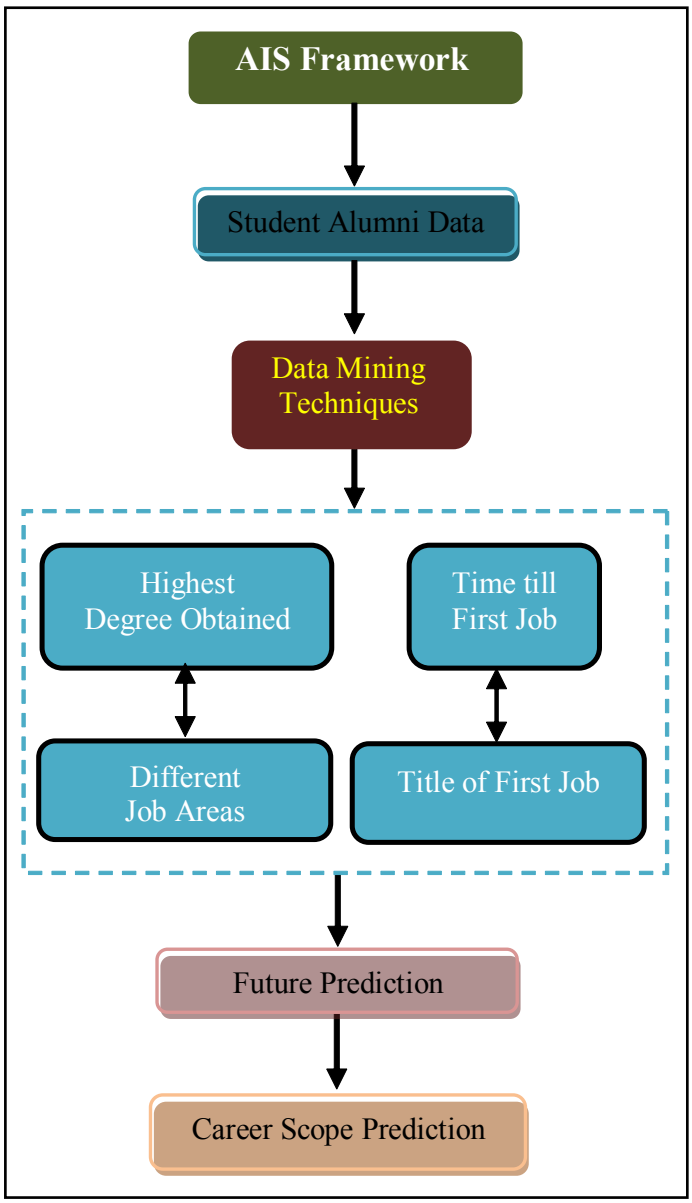

Fig. 3: Alumni Career Scope through AIS Framework

For the better development of the College, Alumni Interactive System (AIS) framework will be able to obtain the career path of alumni which can be helpful in different ways. For example, the old student alumni passing B.Tech in Mechanical Engineering may choose to become a software Engineer, while some might choose to become teachers and educators. The graduating students can make use of these pre-opted career options, and try to focus or if necessary change their job search strategy. If the students with the undergraduate in a particular college are getting a master degree from another college, they can try to analyze the reason for this step. It will also help the college to put the future career of the current students in perspective motivate them through predictions based on old student alumni who have already been through the process before. Alumni Career Scope through AIS Framework is shown in fig. 3.

3. Module–III: Assistance to the Visitors/Recruiters

There is an additional feature in our AIS framework for the visitors, guest users, and recruiters to be member of the system. The visitors can be prospective students, their parents, recruiters etc. The type of interaction they have within the system or with the system will make an impression on them about the College. It is always beneficial to the college to have more potential students enroll with it as it would increase the reputation and image of the college.

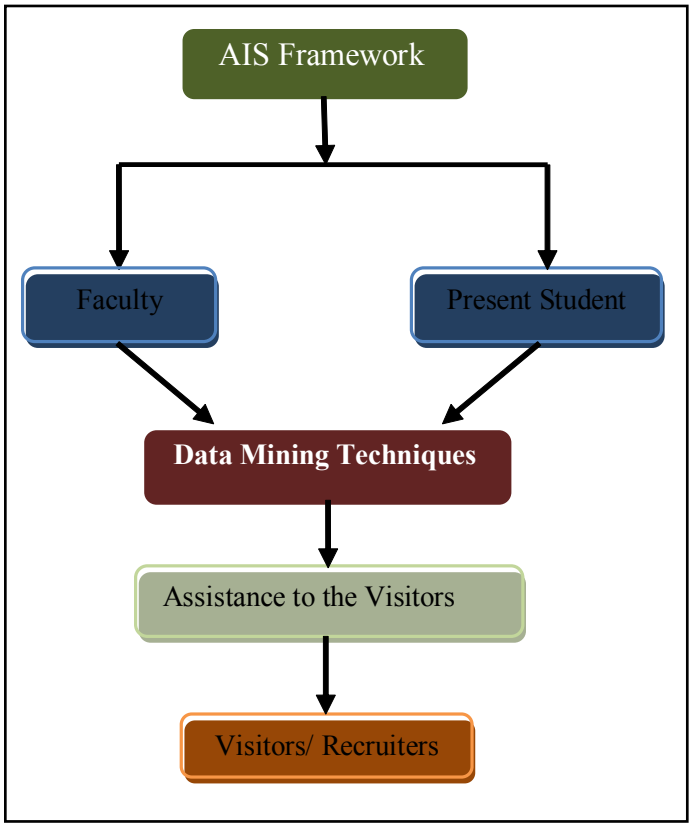

Fig. 4: Assistance to the Visitors/Recruiters Through AIS Framework

Visitors in Alumni Interactive System (AIS) framework can interact with the faculty members and current students are shown in fig. 4. Therefore when a guest user registers with the AIS framework, depending on the purpose of the visit to the system, they will be guided to appropriate people or resources. For example, if a parent registers with the system for knowing more about the college and a specific department, our AIS framework can send them information about the corresponding faculty members who can be of more helpful. Moreover, when prospective students register with AIS framework, they can have access to faculty members and current students to whom they can ask their questions about the program, courses, college hostels, Mess, and living and activities. Data mining also permits us to keep track of the number of guests who become associated with the university as well as to run predictions depending on the several data available about the guest which help the college to concentrate in aspects relevant to attracting a multitude of visitors. In fig. 4, data mining can determine the best faculty members and students who match the requirement of the guest users and visitors and contact them for getting more information.

4. Module–IV: Recruitment Process through AIS Framework

Pass out old students have been settled in different- different reputed industries and sectors. They can be perceived as the representatives of the college at their work areas because the companies gauge the standard of education being taught in a particular college through their work performance.

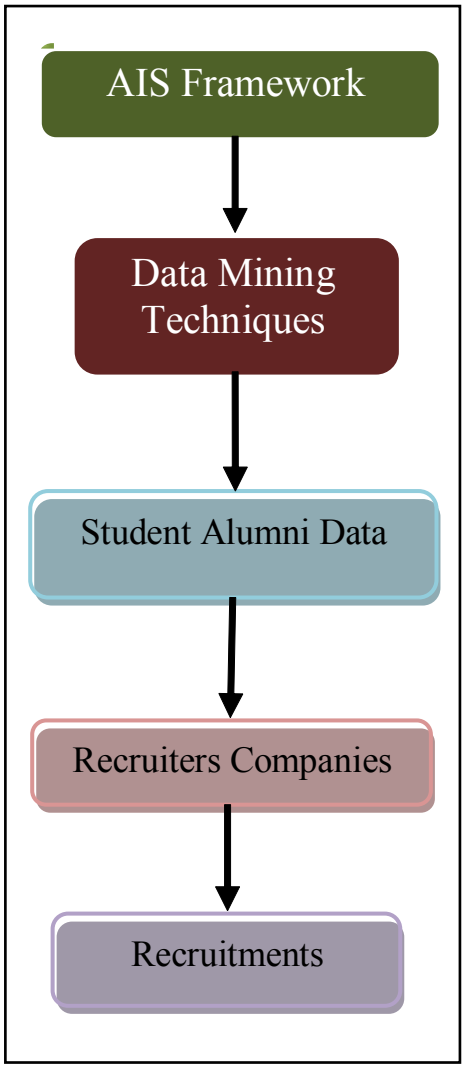

Fig. 5: Recruitment Process through AIS Framework

When fresh batch of graduating students need to find jobs, they can concentrate on the companies and organizations who currently host their senior old alumnus from the college. The student alumni can help the current students by giving information of the openings in the company, about the work culture and the key persons whom they can approach, without crossing the guidelines of the company. All such interactions can be done on a one-by-one approach where only a single student contacting the alumni is benefited. Alternatively, the alumni could try to convince their employers to visit the college where they have passed degrees and graduated when in need of new recruits. The process is shown in fig. 5. In AIS all the alumni in the system can be divided in accordance to the employer they are working for, their currents position and the college can contact the old student alumni and ask them to encourage their employers to schedule a visit for recruitments in the college. This will definitely be a great help to the current students, as well as to the college management. This feature will reduce the time taken to search appropriate job for the students and placement cell of the college. As shown in above fig. 3 old student alumni in AIS framework can be mined to group the old student alumni on the basis of several attribute such as- company in which alumni is working, designation of alumni , years for they working in a company. These attribute will be tested by using data mining techniques. On the basis of all these attribute the suitable old student alumni can be asked who can be able to convince their employer to visit the college for the recruitments. This is even beneficial for the recruiting companies as they can get more potential employees from recruiting in a single place and, before coming for the recruitment, the companies will have a better idea to check the potential of the students from the old student alumni working for them.

V. Experimental Results

Identification of information needed to improve a system is instrumental to the success and sustainability of the system itself. As in the case of any information system, the Alumni Interactive System (AIS) framework is likely to accumulate huge amount of data that can be further process to extract meaningful information by using data mining techniques. Improvements in methods used for processing the data would translate to improvements in extracting information and will lead to the significant improvement the system quality itself.

Our goal is to implement the various powerful and useful data mining techniques and algorithms to be used in improving the quality of the SAIS framework.

A. Data Sets Used

We have been collected the dataset of old alumni students who have been passed out and working in different technologies and sectors. The collected datasets contain many data samples in excel sheets but converted into csv formats and arff formats as per requirements of the data mining tool WEKA [9] for the experimental work. This dataset has been collected from the Chandrawati Group of Institutions, An Engineering College, Bharatpur, Rajasthan. The data files contain many attributes for the applying data mining process. The summary of the grades is shown in table-2.

Table 2: Grade's Classification

Percentage Marks	Grade
Per>=60	Excel
Per>=45	Good
Per>=35	Avg

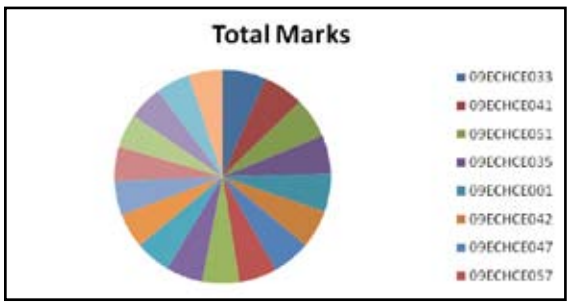

Fig. 6: Pie Chart of Old Student Alumni of Civil (CE) Branch Having Percentage > 60

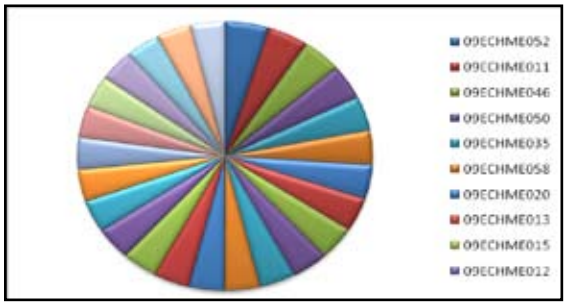

Fig. 7: Pie Chart of Old Student Alumni of Mechanical (ME) Branch Having Percentage > 60

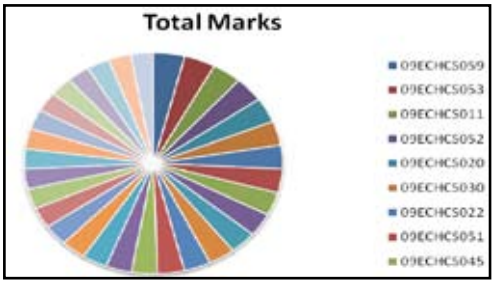

Fig. 8: Pie Chart of Old Student Alumni of Computer Science (CS) Branch Having Percentage > 60

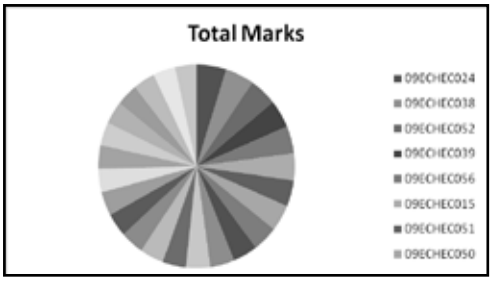

Fig. 9: Pie Chart of Old Student Alumni of Electronics & Communication (EC) Branch Having Percentage > 60

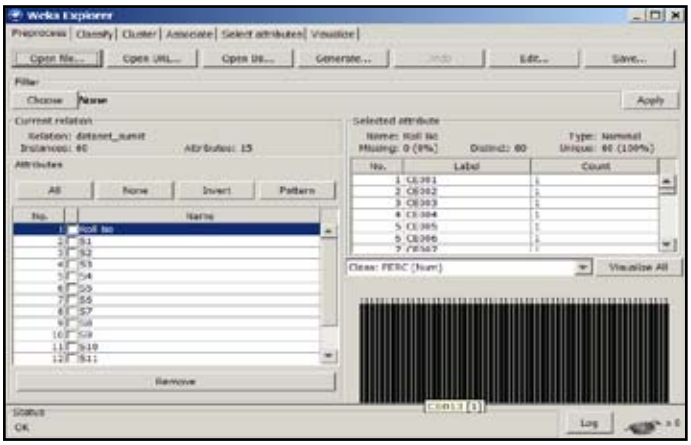

Fig. 10: Loading Dataset Alumni.csv

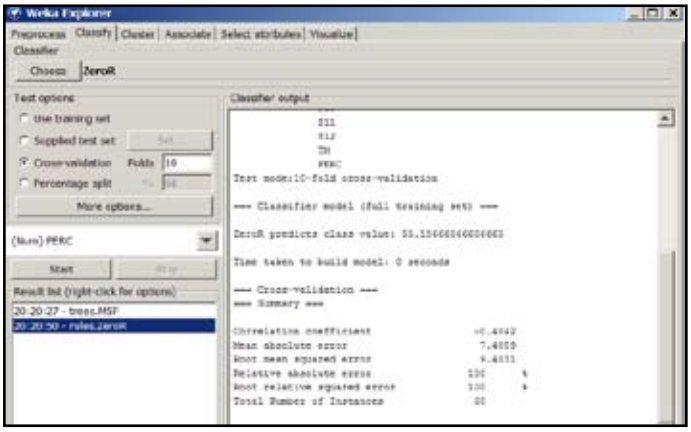

Fig. 11: Classification Results in Weka

Fig. 12: Overall % Age of Grades for Alumnus

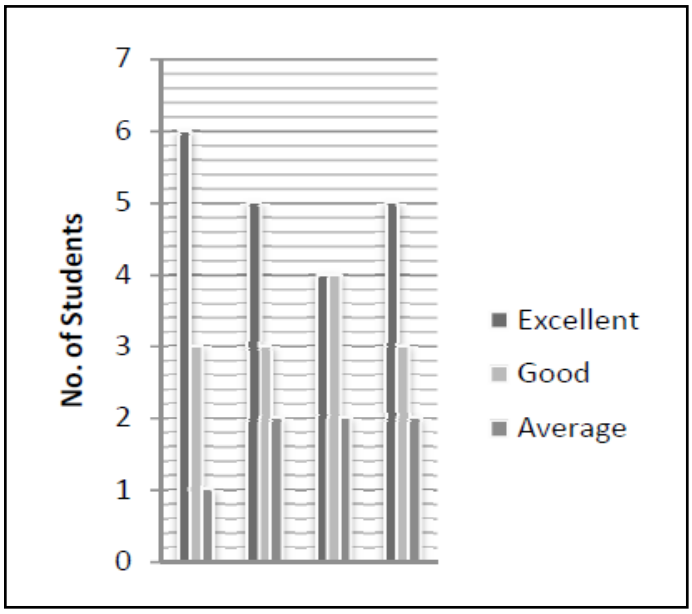

Fig. 13: Branch-wise Grades of Alumnus

VI. Conclusion

The future researchers will understand the importance of our proposed and developed system in Higher Education Institutes and Universities. This system will definitely help the Colleges and Universities in many aspects such as storing the data of graduating students and accurate in generating report such as Information of the old Student Alumnus. This system will be used in monitoring and updating the information of a student alumnus. Several Private Higher Education Institutions (PHEIs) have been facing problems with the manual systems such as taking more time in monitoring and updating each student information. Hence this Alumni Interactive System (AIS) Framework will help the College to solve these problems. Furthermore, the data mining techniques have applied to user data obtained from old student alumni to enhance the functionality of the Alumni Interactive System (AIS) framework. In future the data mining techniques can be applied to develop similar types of intelligent systems by using Soft Computing and Mobile Computing technologies.

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