A Study on Employability of Engineering Graduates using Statistical and Data Mining Techniques

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Abstract— The constant flow of new graduates each year makes the Indian job market highly competitive. Enabling these new job seekers to acquire a decent employment is a challenge to stakeholders in education. Unemployment has effected engineering education in such as way that millions of engineering graduates are struggling to get placed in the related jobs. Irrespective of the branch of study, maximum engineers opt for jobs that don't rely on the specific subjects they have studied. Information technology companies, now a major part of the Indian private sector, have been prominent in such recruitment, but the competences they seek in engineering students appear to be different in terms of priorities. Students with Computer/IT background are mostly interested in software jobs while students with core engineering and circuit branches prefer core engineering jobs. The present study aimed to focus the employability of engineering graduates and to determine the possibilities of enhancing employability skills deals with the adequate teaching methodologies. The primary data was collected from engineering graduates. The formulated set of hypotheses was tested with the collected data by SPSS tool and their performances were evaluated. Attribute selection, Classification, Association and Cluster data mining functionalities are done by using WEKA tool. The study revealed that the FT tree is more accurate than the other algorithms. Overall, the studies suggest that the engineering graduates should acquire and demonstrate a set of generic skills in addition with technical skills such as communication skills, problem solving and interpersonal skills.

Keywords: Classification Techniques, Data Mining, Employability, J48

I. Overview of Education

Education is an important tool that is applied in the contemporary world to succeed, as it mitigates the challenges which are faced in life. The knowledge gained through education enables individuals' potential to be optimally utilized owing to training of the human mind. This opens doors of opportunities enables individual to achieve better prospects in career growth.

A. Employability Skills

The technical knowledge (Degree) is not sufficient for securing a good job, but students should concentrate on adding value to their profile in the form of some set of skills now called as employability skills required by the employers in their field to make them more employable.

B. Engineering Education

Engineering is the field or discipline, practice, profession and art that relates to the development, acquisition and application of technical, scientific and mathematical knowledge about the understanding, design, development, invention, innovation and use of materials, machines, structures, systems and processes for specific purposes.

C. Quality of Education

"Over the years, a large number of programmes and schemes have been formulated and implemented for improving the quality and standards of technical education in India. They include programmes related to faculty development, curriculum development, apprenticeship training, community polytechnics, development of rural technology, modernization and removal of obsolescence, institutional networking, technical man power information system, advanced technician courses, continuing education, research and development, industry-institution interaction, and so on". Further several innovative programmes have been introduced as part of the implementation of National Policy on Eduation-1986. But because of inadequate resources the scope and dimensions of these Programmes have been reduced considerably.

The emphasis on higher education in India can be understood by the number of universities currently present in India and the quality of education they provide. As of 2014, there are 677 universities, 37,204 colleges and 11443 stand-alone institutions in India, as per the latest statistics from the website of India's HRD ministry. India has achieved the production capacity of 1.5 million engineers every year with mammoth 4000 institutes..!!! Over the last ten years, There is a almost 200 % increment in the intake and pass out of (so called) engineers. Right now, India is producing engineers more than US and China producing engineers together.

Growth of INTAKE of Technical Institutions in the Country (UNDER GRADUATE)

Year	Engg	Phar	Arch	HMCT	Total	Added in Year
2006-07	659717	76030	5085	5840	746672	30432
2007-08	701214	77582	5189	5959	789944	43272
2008-09	753910	78763	5268	6050	843991	54047
2009-10	1093380	80370	5375	6174	1185299	341308
2010-11	1219347	81594	5457	6268	1312666	127367
2011-12	1386083	83041	6894	6295	1482313	169647
2012-13	1565722	85461	8874	6355	1666412	184099
2013-14	1634596	86444	8614	6520	1736174	69762

Table 1: Growth of intake of technical institutions in the country

D. Skills That Makes Students Employable

Personal Development, Communication, Creativity and Innovation, Teamwork, Professionalism, Organisational skills, Flexibility, Commercial awareness, Problem solving/analysing, Initiative

E. Scope of the Study

Choosing the right career path is becoming more and more important for young students today. Career counselling at early age in school when students are made aware of the possibilities and realities of each stream. Students have to take into account many things when choosing a career and college major. Many factors can influence a student's decision, including parents, coaches, religious figures, or any role models in a student's life.

A degree is a fantastic start but the students also need to plan for their future career. A degree is no longer enough to secure job, employers are looking for graduates who can prove they have good communication skills, advanced digital literacy and strong team-working abilities. Think about which environment would be right for you. Institutions must ensure that career and employability programs are as strong and effective as possible. Training & Placement Cell also roles as a catalysts, consultants and as trainers for the employability of graduate engineers. Job satisfaction is the sense of fulfillment and pride felt by people who enjoy their work and perform it well. The satisfied workers produce more result

F. Research Questions

- Is there any relationship between Engineering Branch and the working specialization.
- How does Colleges has to improve for better placement
- Is there any relationship between Placement opportunities in campus interview and CGPA of a student.

G. Research Objectives

Research objective is to find out the suitable algorithm which is closely related to the statement of the problem.

1) To test whether the engineering graduates are working on their specialization.
2) To test whether engineering colleges producing skilled students.
3) To know whether the employed graduates are satisfied with their job profile.
4) To know the general opinion from the graduates about which stake holders plays vital role in improving the quality of engineering graduates

II. Literature Review

This section presents a literature survey of the approaches related to the study. The purpose of the study was to throw light on the employability skills required for technology and management graduates, to discuss the initiatives taken by the State Government towards skill building of technical students, to explore how soft skills can be integrated with curriculum thereby grooming the professional students for employment the author used secondary data that soft skill are identified to be the most critical skill and the current job market especially in the area of technology. It's concluded that the HR in term of quality and quantity are India's biggest assets, to gear up education system through various innovative and initiatives.

A. Ravichandran et al [7] (2015) analyzed the factors that are utilized to improve employee's job satisfaction level. The factors that affect job satisfaction are working condition, promotion and work environment. Employees play a vital role in production. Hence job satisfaction of employee is extremely important. The study reveals that majority of the employees are satisfied with the job

Meshram S. and DeveshDubey (2015) report that the skill sets required by young graduates to enter the IT industry for their sustainability and to assess how there can be a value creation for better chances of survival in the tough global job market. The study concludes education focuses on the fundamentals, concepts in different subjects which brings out with excellent basics and strong foundation. But we should provide skills both technical and soft skills to students and facilitate their employability and play a role in empowering employable India.

Chandra Sekhar Patro and B.Lohit (2014) The present paper projects the impact of unemployment on engineering graduates at the time of recession. In today's arena the most common word we come across is recession. Recession leads to a decreased demand for goods and services, which in turn leads to a decrease in production, lay-offs and rise in unemployment. Engineering graduates passing out from educational institutions have to fulfil modern and high standard requirements that are needed by the industry.

G.Swamy, says that the importance of communication skills as well as employability skills in order to empower the rural learners. In addition to the academic knowledge, the students are expected to have the employability skills to meet the challenges of the corporate sector. The study concludes that there is an immediate, need of modification of teaching and learning process. On the other hand the teacher centered methodology should be replaced the learn-centered methodology. Finally, the English teacher should always notice that teaching English language with employability skills is merely constructing the castle in the air.

Siddhi Parekh et al.,(2016)reports that generating query specific reports of the academic performance of a group of students or a student in particular which helps in evaluating student's potential strengths and weakness with respect requirements of various companies for placement, which assists in understanding of placement trends. Dashboard representation provides a platform to prospect the overall performance of the system.

III. Method of Study

A survey design was adopted because the study examined variables upon which data can be collected through responses to questions by way of questionnaire and records inspection. The study population comprised graduates in public and private colleges in Kanchipuram, Chennai and Sriperumbudhur. A sample size of 300 was selected across 5 colleges and participants were selected from each college through simple random sampling.

A. Method of Data Collection

The researcher collected the needed data through the use of questionnaire and its administration in the selected faculties. The administrations of the questionnaire were carried out by

the researcher. A total of 500 forms have been sent to elicit responses from the graduates and retrieved on the spot by the researcher. A Sample of 300 students was taken for the present study. These 300 students were taken from 5 engineering colleges in Kanchipuram, Sriperumbudhur and Chennai.

B. Frequency Tables

	Frequency	Percent	Valid Percent	Cumulative Percent
>8CgCGPA 8	34	11.3	11.3	11.3
6CGPA	10	3.3	3.3	14.7
6-7CGPA	145	48.3	48.3	63.0
7-8CGPA	111	37.0	37.0	100.0
	300	100.0	100.0	Total

Table 4.1: CGPA of engineering graduates

Above table shown frequency analysis of CGPA. CGPA means Cumulative Grade Point Average.

	Engineering branch	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	AERONAUTICAL	2	.7	.7	.7
	Automobile	3	1.0	1.0	1.7
	Biomedical	1	.3	.3	2.0
	CIVIL	15	5.0	5.0	7.0
	CS	73	24.3	24.3	31.3
	ECE	54	18.0	18.0	49.3
	EEE	42	14.0	14.0	63.3
	EIE	6	2.0	2.0	65.3
	IT	34	11.3	11.3	76.7
	MECH	69	23.0	23.0	99.7
	Production Engineering	1	.3	.3	100.0

Table 4.2: Engineering branch

	Frequency	Percent	Cumulative Percent
1-2 lakhs	69	23.0	23.0
2-3 lakhs	106	35.3	58.3
3-4 lakhs	96	32.0	90.3
4 & above	29	9.7	100.0
Total	300	100.0	

Above table shown frequency analysis of Salary received by the graduate per annum.

C. Hypothesis and Testing

It is inferred that there exists significant association between the engineering branch and working specialization at 0.05 level. Maximum number of graduates were working in irrelevant fields where CIVIL, IT and CS are somewhat related to their stream. So the hypothesis is accepted.

It is inferred that there exists significant association between the engineering branch and students placed during college campus at 0.05 level. So the hypothesis is accepted.

It is inferred that there is no significant association between the engineering branch and satisfaction with their job profile at 0.05 level. Even the graduates working in irrelevant stream also have their job satisfaction. So the Hypothesis is rejected.

It is inferred that there exists significant association between the graduates Working on the Specialization and job satisfaction at 0.05 level. Graduates Working on the Specialization are mostly satisfied with their job profile. So the hypothesis is accepted

It is inferred that there exists significant association between the CGPA of a student and placement opportunities in campus interview at 0.05 level. Maximum number of graduates were placed when the CGPA is 6-7 and 7-8. So the hypothesis is accepted

It is inferred that there exists significant association between Salary received per annum and satisfied with job profile at 0.05 level. Maximum number of graduates are satisfied with their job when the salary is about 2-3 lakhs and 3-4 lakhs. So the hypothesis is accepted.

Attributes	Hypothesis
Engineering Branch and the working specialization.	Ho accepted
Engineering Branch And Students placed in campus interview.	Ho accepted
Engineering Branch And job satisfaction of an employee.	Ho rejected
Graduates Working on the Specialization and job satisfaction.	Ho accepted
Placement opportunities in campus interview and CGPA of a student .	Ho accepted
Salary received per annum and satisfaction with job profile.	Ho accepted

Table 2: Testing Hypothesis

D. Attribute Selection using Weka Tool

Attribute selection searches through all possible combinations of attributes in the data and finds which subset of attributes works best for prediction. Attribute selection methods contain two parts: an attribute evaluator and a search method. The evaluator such as correlation-based, wrapper, information gain and chi-squared are determines what method is used to assign a worth to each subset of attributes. The search method such as best-first, forward selection, random, exhaustive and ranking are determines what style of search is performed.

E. Select Attributes

Select attributes is to rank the attributes. Attribute selection involves searching through all possible combinations of attributes in the data to find which subset of attributes works best for prediction. To do this, two objects must be set up: an attribute evaluator and a search method. The evaluator determines what method is used to assign a worth to each subset of attributes. The search method determines what style of search is performed. In this study, ChiSquaredAttributeEval and the search method is Ranker used. Then, select another set of data to find ranker. The top 13 attributes for this study.

Chi-squared Ranking Filter

Ranked attributes:

Chi square Att.Name

Value

39.6298 lack of practical training
25.8822 government must Improve this for better placement
23.7414 quality of infrastructure facilities faculty are Compromised by college
20.7169 strict compliance of Quality of infrastructure Facilities faculty maintain
19.9605 college must improve this for better placement
19.0965 workshops conducted by industrial experts
17.8686 students have to be trained to attend placement
17.4307 Number of eng seats Avail more than required
14.0176 bef choosing career
12.42 most eng graduates prefers
9.3562 insufficient training to meet placement
7.0306 syllabus to be updated as per industry requirement
Selected attributes:
1,12,3,8,11,6,7,4,9,10,2,5 : 12

Here output percentage for the given data is clearly seen that much influencing factors are lack of practical training in colleges 39.6298

F. Clustered Instances

0 52 (17%)
1 53 (18%)
2 59 (20%)
3 58 (19%)
4 78 (26%)

1) CLUSTER 0:

Cluster 0 is classified by the conditions as follows, If working in the specialization and waiting for the specialization are NO. Then, Job satisfaction and placed during the campus are YES. It is classified under the cluster 0.

2) CLUSTER 1:

Cluster 1 is classified by the conditions as follows, If all the conditions working in the specialization, waiting for the specialization, Job satisfaction and Placed during the campus are YES. It is classified under the cluster 1.

3) CLUSTER 2:

Cluster 2 is classified by the conditions as follows, If working in the specialization, Job satisfaction and Placed during the campus are NO. Then, waiting for the specialization is YES, It is classified under the cluster 2.

4) CLUSTER 3:

Cluster 3 is classified by the conditions as follows, If working in the specialization, waiting for the specialization, Job satisfaction are YES. Then, Placed during the campus is NO. It is classified under the cluster 3.

5) CLUSTER 4:

Cluster 4 is classified by the conditions as follows, If working in the specialization, Job satisfaction are NO. Then, waiting for the specialization and Placed during the campus is YES, It is classified under the cluster 4.

G. Association Rule: Apriori

If salary received per annum is 3-4 lakhs, working in the specialization is Yes and can wait for job in their specialization is yes then the graduates are satisfied with their job profile.

If salary received per annum is 3-4 lakhs, working in the specialization is Yes and expected salary is < 5 lakhs then the graduates are satisfied with their job profile.

If working in the specialization is Yes, can wait for job in their specialization is Yes and Placed during the college campus interview is Yes then the graduates are satisfied with their job profile.

IV. Conclusion

Having considered the current situation of the engineering educational system and the quality of all its individual components it can be noticed that the awareness of the importance of education as a foundation for the growth and development of the country is not strong enough. Engineering graduates passing out from educational institutions have to fulfil modern and high standard requirements that are needed by industry. Need to focus on developing employability skills in our engineering graduates.

V. Recommendations

Government should bring in strict norms about regulations for university affiliations. This will improve the quality of institutes at the same time remove the ones which do not meet certain standards from the system. Unemployment is because of too many institutes which degrade the quality of education and this will also reduce the number of engineers producing every year, well to some extent at least. Bring in more industry, including some core research work to help us innovate in short term and create more jobs in the long run. Create jobs for graduates from other fields, so that students also get more interested in joining the fields they like the most.

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