

A SYSTEMATIC REVIEW ON DIFFERENT TECHNIQUES APPLIED FOR EMPLOYABILITY PREDICTION

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Abstract

Employability issue is a major issue faced by the students. In spite of gaining knowledge and having higher education degree most of the students are unable to gain employment. As the issue is of concern to students it is of similar concern to the educational institutes. The name and fame of education institute lies in the quality education they provide to students as well as the manner in which the student development is made by the institute and very important is the percentage of placements that institute has offered to the students. The prediction of employability of students can be done by various ways. There are various factors on which the employability of students depends on. Due to the ever changing job market, the higher expectations of employers it is crucial for the students to possess generic employability skills. The possession of such type of skills will increase their chances of employability in the global, diversified market. This paper analyses the different approaches used by conducting a systematic literature review.

Keywords: Employability, Employability skills, Systematic literature review, prediction.

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Introduction

The literature offers varied definition of Employability. It is argued that the 'narrow' usage can lead to 'hollowing out' of the concept of employability [2]. The way in which the concept of employability is understood by different stakeholders is the ability and skills possessed by an individual, but this is a constricted way of defining employability, to understand the term completely a broader view should be used so that we get an idea about the term expectation by the employer. This broader view will also enable us to understand the different corners of the term and also able to solve the gap between the industry expectation and students and institute perception of employability. Employability means the development of skills and adaptable workforces in which all those capable of work are encouraged to develop the skills, knowledge, technology and adaptability to enable them to enter and remain in employment throughout their working lives (HM Treasury, 1997, p. 1). Skills possessed by an individual contribute to predicting employability. These skills not only focus on academic or technical skills but also on non-technical skills. To be competent in today's global market one should be good in overall skills and abilities so they should possess generic employability skills [4]. There is a gap between the employer's perception and student perception, understanding this gap and working on the gap is need of the hour [3]. Designing a practical framework for the students to understand which skills are important to them and taking steps forward accordingly is also important [5].

Objective

Employability prediction is important for an educational institute. To know the skills which are required by the employer and developing students in that manner is the need of the hour. To develop students in each and every aspect so that they are fit for getting placed is an important aspect. The main objective of this study is to:-

- i. To explore literature and study term Employability in a broader way and understand Employability skills.
- ii. To study different techniques used in literature to predict employability.

Methodology

This paper focuses on the literature available through scholarly publications. The various types of research papers, review articles related to the topic are searched from Google by using special keywords like employability, employability skills, employability prediction, machine learning, data mining. The focus is given on research papers related to employability and employability skills. Also the literature based on use of different models for prediction are also explored.

i. To explore term Employability and skills required for gaining employability in a broader way

Research Paper/Article	Contribution	Reference
The Concept of Employability	This paper discusses a broader view of employability concept which not only focuses on individual skills and attributes like basic skills, transferrable skills, job seeking abilities, ICT skills but also discusses how external factors and personal circumstances affect employability.	Ronald W. Mc Quaid, Colin Linday
Employability skills for engineers in the global market	Skills which should be exhibited by an individual should be a perfect blend of Communication skills, Technical skills, Social Behavior, Positive Attitude, Curiosity, Everlasting enthusiasm, Healthy lifestyle and Self-confidence. These all qualities should be imbibed in student's right from the first year of his course study.	P. Prakash, Bellapa S.
Needs of employability skill characteristics based on employers' perception	The study investigates employers perception on employability skills based on Personal qualities, Core skills and Subject Knowledge, After data analysis it was found that Subject knowledge was rated highest by the employer as compared to Core skills and finally rating was to Personal qualities	Wipanee Pengnate
Practical framework of employability skills for engineering graduate in Malaysia	In this study a practical framework is been referred. The framework provided can be a guideline to engineering students to become employable. The framework considers technical and non-technical skills along with personal attributes, personal skills and skills required according to the knowledge applicable with respect to the engineering subjects.	Azami Zaharim Mohd Zaidi Omar, Yuzainee MdYusoff, Norhamidi Muhamad, Azah Mohamed, Ramlee Mustapha
IEEE student quality improvement program: To	The pilot study aimed at creating students who are more likely to be employable. It was found that majority of students lack communication skills and very few students undergo internship programs or are even	Shahul Hameed, Nileena G.S.

improve the employability rate of students	reluctant to apply for the same. The study found that providing training in soft skills and technical skills is likely to increase the chances of internship.	
Importance of Non-Technical Skills for Employment Opportunities: A Gap Analysis of Students and Employers Perception Importance of Non-Technical Skills	There is a gap in perception of students and employer with reference to employability. This study tries to find common platform for better understanding and deciding policy. It is found that the perception at which student rate different non-technical skills is completely different as perceived by employer. While preparing for the interview process if the student is aware about what is the order of the skills considered important by employer it would help to develop the skills and increase their chances of employability.	Dr. Suhail M Ghouse, Dr. Monica Chaudhary, Sumit Garg
Education Vs Employability- The Need to Bridge the Skills Gap among the Engineering and Management Graduates in Andhra Pradesh [1]	Three major key skills are communication skills, technical skills and problem solving skills. It is found that students who are good at communication lag in either technical or problem solving skills. The study found that inspite studying engineering the students majorly lacked behind in problem solving abilities. Focus should be given more on problem solving abilities. Soft skills should be embedded in teaching and learning process.	Padmini

The expectation of the employer is dynamic it depends on the current situation or the situation while hiring an individual. Employability skills and attributes can be seen as broadly covering the essential attributes like basic social skills, reliability, etc.; personal competencies as diligence, motivation, confidence, etc.; basic transferable skills; key transferable skills ie:-problem-solving, communication, adaptability, work-process management, team-working skills; high-level transferable skills including self-management, commercial awareness, possession of highly transferable skills; qualifications and educational attainment; work. Employability is also dependent on demographic characteristics, health and well-being factors, also skill of job seeking is equally important, external factors are also important for gaining employability. In general we can say that to sustain and perform well in this changing world and global competitive environment one should be expert in overall qualities i.e.:-Students should possess generic employability skills to gain employment[4].There are different employability skills considered as important for securing employment. A perfect blend of all the skills is necessary. Bringing substantial changes in teaching and learning process can also help to mold the students according to the requirement of the current industry. Reducing the gap between Industry 4.0 and Education is a need of the hour. Understanding the perception of employer, the view of employer plays an important role while making students industry ready and placement ready. The perception of employer should be understood by the education institutes so that proper planning and guidance with respect to skill up gradation can be provided. [7]. Exploring the requirement of technical as well as non-technical

skills by employer is equally important. Also one of the important skill is Communication which plays a crucial role in gaining employment. Different teaching and learning activities related to improvement of communication and problem solving skills is important. These type of enrichment will help in improvising their skills and abilities of communication and problem solving which are counted as a major attribute in global competitive market [8]. Practical knowledge of the subject is very important while working. The students should not only focus on theoretical concepts but be clear in applying the knowledge practically. The students should be provided with internship program which will help increase the chances of employability [6]. While building a prediction model features play an important role. Selecting appropriate features using feature selection algorithm is critical [11]. Selection of optimal features by adopting different algorithms and increasing the prediction accuracy of the model can be a way to achieve accurate result [14].

ii. To explore different approaches applied to predict employability

Research Paper/ Article	Contribution	Reference
Predicting Students' Employability using Support Vector Machine: A SMOTE-Optimized Machine Learning System	SVM algorithm outperformed out of the other selected machine learning algorithm with a good prediction accuracy. The overall result claimed that this is one of the best algorithm which can be used for employability prediction system	Cherry D. Casuat, Enrique D. Festijo, Alvin Sarraga Alon
A Comparative study of Students Employability Prediction Model using Data Mining Techniques	The study used Communication skill, Aptitude record and technical record to find the status of employability using different machine learning algorithm. The aim was to find how these attributes related to targeted variable employability.	Tejal M Vasani, Kirti Kumar J Sharma, Dr. N C Chauhan
Student's Employability Prediction Using Data Mining	Data is analyzed using decision tree algorithm where features like Academic record, Extracurricular activities, Personality development, and Technical skills. The study concludes that Decision tree algorithm is the best for prediction.	Madhavi Girase, Suchita Lad, Prerna Pachpande
An Efficient Data Mining Approach to Improve Students' Employability Prediction	The proposed CSFS and the HMM-SVM employed on the obtained features through the collected data using the questionnaire manner. For selecting the features we are using Chi-Square, Gini Index, information gain and correlation coefficient methods and the CSFS algorithm is used for the best feature selection.	Nancy Kansal, Vineet Kansal
A Comparative of Predictive Model of Employability	Different machine learning algorithms were tested for the dataset prediction of student's employability. It was investigated that Neural Network algorithm outperforms as compared to other algorithms. To improve the algorithm	Kian Lam Tan, Nor Azziaty Abdul Rahman, ChenKim Lim

	in a better way more feature selection techniques can be applied.	
Prediction of employability index for college students by deep neural network	Model is built using CNN to predict the market for graduates. CNN which is used for image recognition is applied for the student dataset to find the employability index.	Dan Wu
An intelligent hybrid deep belief network model for predicting students employability	A hybrid model is used for prediction which uses deep belief network and soft max regression. Also to enhance the prediction accuracy crow search algorithm which is a feature selection algorithm is used.	Anita Bai, Swati Hira
Optical fog assisted smart learning framework to enhance students' employability in engineering education	It uses a smart learning framework which considers different users i.e.:- students, university/college, learning centers and company. By making use of an algorithm clusters are found out of students who lack in different skill sets.	Sandeep K. Sood, Kiran Dipak Singh

Employability is one of the major indicator of performance for higher education system. By using different features it is possible to predict employability. Machine learning technique is used as an approach for prediction. Different machine learning techniques are employed for doing prediction. Support Vector Machine is found to be one of the best algorithm for prediction. [1]. Neural Network has also achieved best results in terms of prediction when compared with other algorithms [12]. The prediction model build considers different attributes for employability prediction. Selection of proper dataset of attributes is a great challenge. Studying the different factors and finding the most dominant factors is also very important aspect. Choosing the appropriate technique for prediction and testing the accuracy of the model is equally important. Making use of dominant factor for prediction will effect in accurate prediction of employability [9]. Already a lot of data is available in education institute with respect to performance of students. Making use of this data in a correct manner and giving the feedback analysis of the status of employability prediction to the students so that they can improve themselves is needed. This will increase their chances of employability and also increase the overall percentage of placements of the institute. Integrating the data required from different sources and stakeholders can make the prediction system more strong. The training and placement cell data can be utilized for prediction [10]. Finding the areas in which students lack and provide them the skill enhancement program in that area can improve their employability status. [15]. Studying the use of different deep learning algorithms for employability prediction is an area which can be explored further. Applying these different algorithms for Educational data mining purpose can make wonders in the field of education [14].

Proposed Methodology

There is lot of literature available with respect to employability skills and prediction of employability. Finding an ideal solution for prediction of employability is a challenge. There are various aspects which should be considered so as to make prediction accurate. The proposed model

will be helpful to all stake holders in education. The model can achieve best accuracy by making use of intelligent deep learning algorithm. The proposed methodology should follow a systematic procedure so that it will lead to correct prediction status.

1. To study the different factors affecting employability prediction.
2. To find and select the dominant factors affecting prediction
3. To collect data by using the appropriate instrument for data collection.
4. To build a model using the best algorithm for prediction.
5. Testing the accuracy of the model.

Advantages of Proposed Methodology

The proposed methodology will benefit all the stakeholders of the education institute. The methodology will target at increasing the percentage of placements of students. It will help students, to understand their level of skills. This feedback from the system can further result in providing the skills through skill enhancement programs to the students. The model will benefit the students, help to identify cluster of students who lack a particular skill and help to develop these skills through proper planning of skill based training program by the institute and thereby increase their placement percentage.

Conclusion

Predictive analytics is applied in various areas. Education sector is also one of the emerging field in which application of predictive analytics algorithms will be helpful. Designing a model which will predict the employability status of the students and providing feedback to the students at the initial stage will result in finding out the areas where the students are lagging. Once the students receive feedback they can work on their weak areas and develop these areas so that it will increase their chances of employability.

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