
Analysis and Optimization of Employability for Engineering Graduates in Ethiopia**Dr.ChalaWata Dereso¹ , Dr.X.Felix Joseph² ,Sara Ezhil Helna Edwin³ , A.Clement raj⁴**

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¹ College of Education and behavioral Science,Bule Hora University, Ethiopia.² College of Engineering and Technology, Bule Hora University, Ethiopia.³ College of Health and Medical Sciences, Bule Hora University, Ethiopia.⁴ College ofEngineering and Technology , Bule Hora University, Ethiopia.**Article History:** Received: 10 January 2021; Revised: 12 February 2021; Accepted: 27 March 2021; Published online: 16 April 2021**Abstract:**

Higher education and universities are required to play a critical role in any country's technological transition and growth. The university based descriptive cross sectional study will be conducted from the graduates passed out from two universities and an optimization study has been done how the employability rate has been decided in Ethiopia using Ant colony Optimization (ACO). The optimized employability rate was calculated using information gathered from graduated students' responses to Google forms sent to their respective email addresses. The study includes 1100 users from 1500 graduate from engineering and technology students of Bule Hora and Hawassa universities,Ethiopiagraduated from 2018 and 2019 GC. The results shows around 75% of the graduates were employed and in that majority (90%) of them in their respective field of study. The 80% of the graduates suggested internship is useful to get their jobs and 90% wants to improve the practical skill of the students in the universities. The results gives the optimized employability rate is decided first by Grade earned and location near to their home town secondpractical knowledge of the student, and third skill development in the university, and Internship experience.

Keywords: Employability rate, unemployment, job search, Engineering College graduatesPlacement, Ant colony Optimization**1. Introduction**

The Higher education plays a significant role in every country's effort to produce the best graduates in their country. Employability is one of the key factors to improve the economy in any country. One of the strategies to improve the economy of any country is by increasing the human resources of the country. The human resources are the backbone of a country's economy. The human resources are largely depends on theircountry's education system. If the country consider the employment opportunities by implementing new policies in the Higher education and Industrial sector to maximize the employability rate of the graduates passing out from different universities. Developing nations such as Ethiopia which hasAfrica's second fastest growing economy[1] depend on young graduates from 44 government universities Which are under the Ministry of Higher Education (MOHE) [2]. The numbers of students under these universities are increasing every year and so it is the biggest responsibility of the universities to create a skilled graduate into the job market. The Engineering graduates in Ethiopian universities build the country in all field of specialization like Civil Engineering, Mechanical Engineering, Electrical and Computer Engineering, Chemical Engineering, Automobile Engineering etc.

In this paper we made a survey from the graduated students passed out from Bule Hora and Hawassa universities in the year 2018 and 2019 GC. Our goal is to determine the obligations of Ethiopian universities in producing not only trained but graduates but also professionals and entrepreneurial graduates who are essential for the county's economic growth. We have done a optimization [3] to get the best employability rate of the engineering graduates passed out from these two universities. The optimization problem has been modeled by data collection from graduated students response of the two universities by sending Google forms to their respective emails.The questionnaire are mainly in the form of 1 to 4 answers by least and best importance to curriculum and courses studied , grade earned, internship experience ,practical skill gained from the respective department and other skills. This study helps the universities to analyze and improve their capability by giving importance to studentsemployment. It also indirectly helps the country's economic growth by imparting skilled graduates from the universities.

2.Literature Review

The literatures witnessing the employability rate depends on government policy decisions and universities enthusiastic steps for career development of the students. The higher education in any country (Benet et.al 2009) wants to do betterment of the student's perspective and learning with development of skills make them better to easily survive in the job market of the country.The career development (Bhaerman, R., & Spill, R. 1988), is the best way for increasing student employment and what are the ideas to be taught at the undergraduate level and each university must implement it. The successful transition of undergraduate students (Bridgstock, R. 2009) intolabor market is very crucial role for every university in the country where the recruiters are ensure that they

keep the graduates only they have skills to succeed in the job. Barak and Dori (2005) analyzed and found the students' four categories of understanding chemistry by the analysis of projects done by the students, in the classroom learning, and interviewing the students. The report and modification follow-up in curriculum development is also important to update the knowledge of the students (Curriculum Development Council of Hong Kong (CDCHK), 2016).

The industrial sector in Engineering (Bloomfield, G. (2017).) changes day by day and the engineering graduates are familiar with the new platforms those going to face in the job market. Borrego, M., & Bernhard, J. (2011) considers that this is a pioneering study in engineering education; the target is based on facilitating and understanding the concepts by generalizing the placement. Mostly, our student is considered as talent based and so they are focused to be worked in a industry based environment.

The engineering experience (Brophy, S., Klein, S., Portsmore, M., & Rogers, C. (2008)) was initiated differentially at ecosystem level (university studied) and pathway should be given by the universities to the students through internship and industrial visit.

The engineering education should be properly administered by the authorities from the department level to the college level by improving the quality in teaching, conducting practical sessions and proper continuous assessment.

2.1 Statement of the problem:

Significantly high youth unemployment rates have become a prominent economic and social feature around the globe. The situation from an Ethiopian perspective has reached critical stages with continuously high and increasing number of unemployed youth contributing to excessive poverty and inequality levels. Whilst concerns surrounding their inability to access decent employment opportunities have become prominent, the longevity of the cohort's failure to secure work has undoubtedly become the leading trepidation for the country's economic development objectives.

Academic discourse surrounding the issue has continuously emphasized the potential scarring effects for young people, reiterating the loss of valuable future human capital levels as well as the risk of social exclusion. Despite these concerns, evidence, especially from developing regions, as to what drives long-term unemployment among the cohort still remain novel, necessitating analyses on both the demographic and work-related factors contributing to the situation. The primary objective of the study to improve the employability skills of We aim to start this study to find the possibilities to improve Bule Hora University College of Engineering and technology graduated students' skills are suitable to meet the employer's expectation. The study help the teaching community of BHU to change their teaching learning methods and curriculum according to the development of the employability skills of each student in the college of Engineering and Technology. This study also helps BHU management to improve the students skill in terms of other universities in Ethiopia. We have chosen Hawassa University for our comparative study which is one of the first generation universities in Ethiopia.

3. Methods and Materials:

3.1 Study area and Period:

A cross sectional design was used to determine the employment rate of graduates of Bule Hora University 470km away from Addis Abba capital of Ethiopia. The study will be conducted in Bule Hora, and Hawassa universities. The target population of the study consists of two consecutive graduates' cohorts who had completed their undergraduate or bachelor's degree in 2018 and 2019 in regular programs. The data of the graduates will be collected from their respective universities of delivery dept. The questionnaire has been sent through Google form (https://docs.google.com/forms/d/e/1FAIpQLSch97GzEc8gzP8A5NdmeopFxV92khMDL-JlLeZbw1saaHZOng/viewform?usp=sf_link) to each student email and collected their employment details.

3.2 Ant Colony Optimization:

Ant colony Optimization is one of the modern techniques to do the optimization using approximations. The real ants in colony are the inspiration of Ant Colony Optimization. ACO is specifically the behavior of ant's foraging behaviors. The ants are having their own indirect communication which makes them to route the shortest path to find their nest and food. The ACO algorithms are used for solving discredited problems. ACO algorithms are depending and belonging of different classes of approximate algorithms. It is clearly identified from the artificial intelligence (AI) approach, ACO algorithms have the determinant of swarm intelligence. The main aim of swarm intelligence is designing intelligent level of multi-agent by using the inspiration of the cooperative behavior of more social insects such as ants, termites, bees, wasps, and other animal societies such as flocks of birds or fish schools.

On every iteration, global ants are generated by the ACO and their fitness is calculated. The regions having weak edges and pheromone trails are updated after each iteration. If there is a significant increase in the fitness, then the local ants are moved to these regions and if there is no increase in fitness, a new search direction is

selected and the iteration continues. By taking the transition probability into consideration, the local ants take the best solution as they move towards the latent region. For a region n, the transitional probability is defined as:

$$P_k(t) = \frac{q_k(t)}{\sum_{j=1}^n q_o(t)}$$

where $q_k(t)$ is the total pheromone count at k^{th} region and the total number of global ants is represented by n. At each iteration, the pheromones are updated using the equation

$$q_i(t + 1) = (1 - r)q_i(t)$$

where r is defined as the evaporation rate of pheromone.

The training using ACO is presented as a flowchart in Figure 1

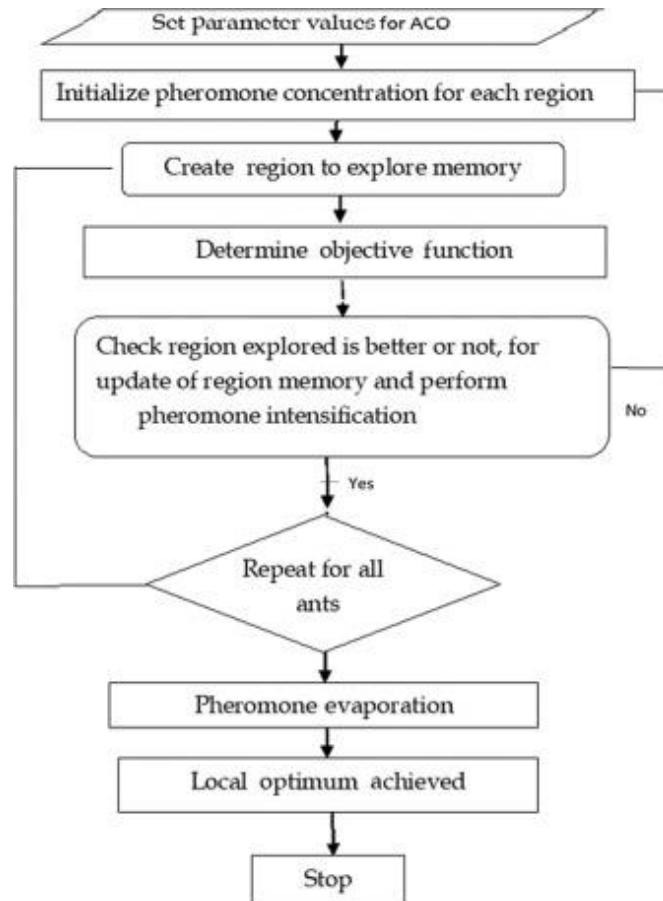


Figure 1: ACO Training Steps

In this research work, consider for example, the iteration that starts with the CGPA of a student followed by the field in which the student is currently working on and then the extent of the student’s skill based on the course he/she has studied can be applied to the present job has earned more accuracy and fitness than other iterations which used different paths such as age coming first, then the CGPA, and so on.

5.Results:

The results of the study shows the 90% of the students are graduated and they got their job in the respective field of study.In the total population of the study was graduates from college of Engineering and Technology from Bule hora and Hawassa universities (1800 for 2018 and 2000 for 2019).The questionnaire around 90% of them are returned from the graduates and all of them are employed.The confusion matrix for the prediction using ACO is as shown in figure 2. The total number of True negatives obtained from the confusion matrix is 54 for a particular iteration and the corresponding false negatives is zero. Whereas the False positives came to 2 compared to the True positives of 10.The corresponding ROC curve for the classification is presented in figure 3.

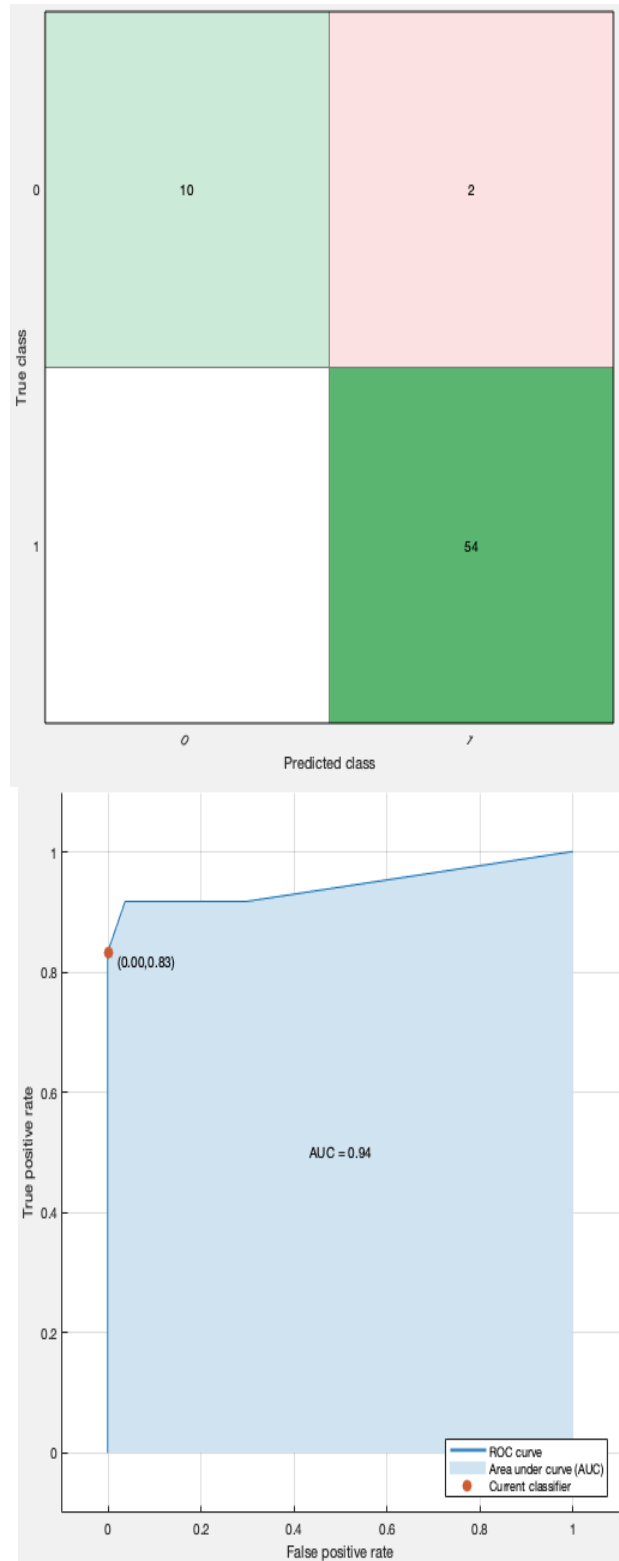


Figure 2 and 3: Confusion Matrix and ROC curve with AUC =0.94

The Best cost vs number of iteration graph is presented in figure 4 where the cost function decreases with increase in number of iterations.

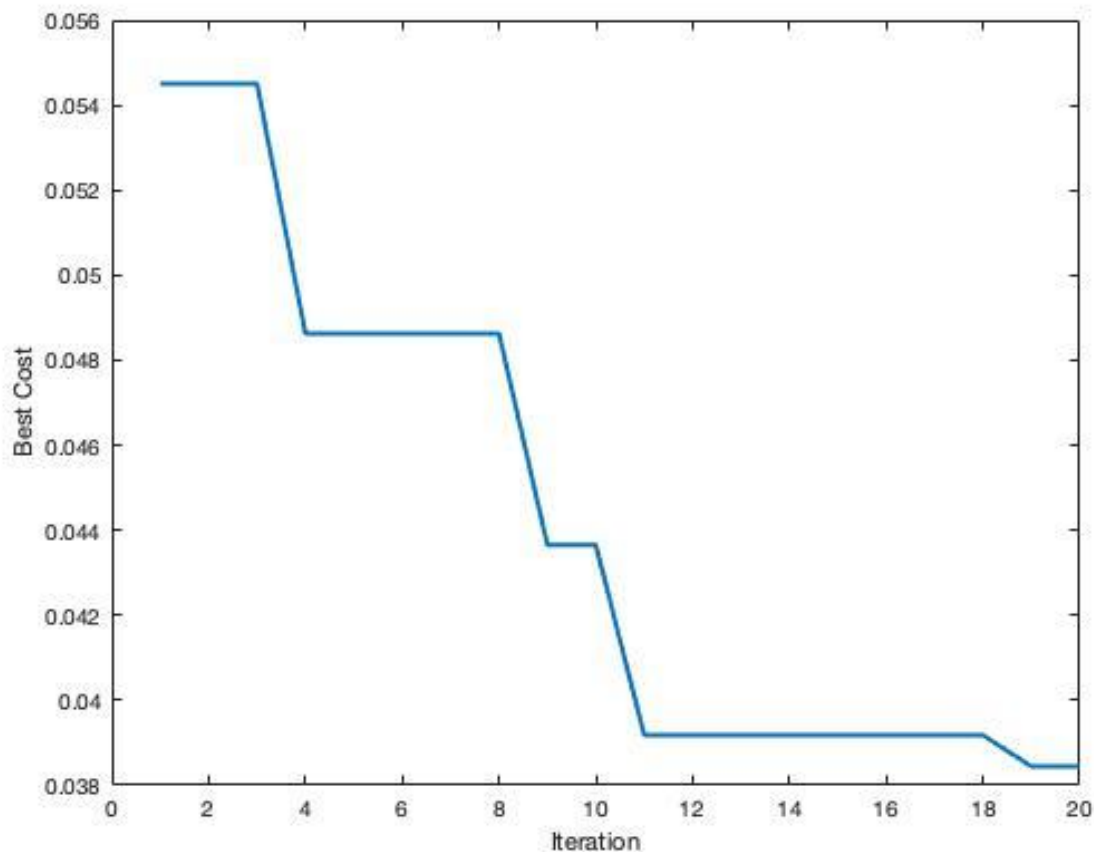


Figure 4: Best cost Vs Iteration

Conclusion:

The study shows the following conclusion to improve the employability rate in Ethiopian Universities. The universities must concentrate the practical training in all the Engineering courses and all the fields of study in college of Engineering and Technology. The universities must conduct skill development programs such as Aptitude skill and interview skills and group discussion skills which make the student to confident enough to face the job market not only in Ethiopia but also all over the world. The universities must depute faculties from English department to the college of Engineering and Technology to improve the English speaking skills of the students by conducting language lab for the students.

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