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Competency Prediction of Engineering Undergraduate Students

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ABSTRACT*:* Companies always thrive to achieve best whether that be in the quality they offer or the freshers they recruit. Organizations recruit students who are effective and efficient in work and they have different techniques to determine this. This ability of being effective and efficient is known as competency. Various researchers have understood its importance and defined Competence from time to time. According to [1]Chan and her team (the University of Hong Kong)(2019) has defined competency as- the holistic competency is an umbrella term inclusive of different types of generic skills (e.g. critical thinking, problem-solving skills), positive values and attitudes (e.g. resilience, appreciation for others) which is essential for a student's life long learning and whole person development. Knowing one's Competency level is not an easy task. It needs a 360 degree view to understand it. Till now there is not a specific way of determining it. And graduates don't know their competency level until they face the recruitment process. Knowledge of competency level at an early stage is necessary for students to improve and invest their time to become more competent so as to get a job in their core field. To overcome this problem we are designing a system which would predict the competency level of the computer science engineer and related graduates. To build this system we are using unsupervised machine learning algorithms. The predicted competency level could be used by students to understand how hard they need to work so as to get a job in their core field.

KEYWORDS: Competence, Competency Level, Machine Learning, Unsupervised machine learning algorithm

I.INTRODUCTION

Nowadays getting a job in the core field of studies is not easy because of the gap between a student's knowledge and company's expectations. Students have knowledge and many skills but they don't know how good they are. Few students who score good marks lack the knowledge of their competency level, hence are not able to get a job in their core domain of study. On the other hand students who score average marks fail to acknowledge their competency level thus they lack confidence which again results in not getting a job. Thus having a regular check and keeping track of information gain and understanding is a must.

The approach used in this project uses machine learning algorithms to predict the competency level of the user. The 4 main steps involved in the implementation are as follows : Train Dataset, Data preprocessing, feature extraction and competency prediction. At the end the user will get his predicted competency level.

II.MOTIVATION

By trying the competence-based approach instead of the "most traditional approach", IT companies started to think of students as having abilities and potentialities instead of having just marks with a particular set of activities they will be able to do inside the organization where they will work in future.

In this competitive world, the organizations are focusing on the skills and knowledge rather than just focusing on marks.

So competency is the key for organizations nowadays.

III.RELATED WORK

The authors proposed model for the representation of competences able to support a wide range of scenarios where it is fundamental to model, organize and represent competences. The main subset of this model may beadopted to represent competencies of the students of undergraduate engineering students who are currently in their second or third year or maybe in first year. The authors defined a strategy to identify, manage and take advantage of competencies in the IT field to find out how suitable or capable the students are to work in IT sector in terms of their problem solving skills.

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The authors defined a scenario of the the underlying individual competencies. In such sense, competence modelling, namely the use of modelling techniques for capturing existing and describing desired individual competencies of students, offered an exhaustive number of study cases. The authors presented an examination of characteristics of competence modelling and recommendations and lessons learned from these cases for the practice of competence modelling. The authors presentedcompetency representations an individual competence model. In particular, the individual competence model includes IT industry competency where students will get to know how competent they are in the current IT industry and how much practice they need to be more competent to survive in the IT industry and get a job. The suggested approach has proved that it is possible to capture capabilities of individuals with different educational background.

In an effort to provide idea regarding the role of students in promoting their own individual effectiveness, authors said that attaining the goal of sustainable high performance inIT sector depends on developing skills based on individual learning. All this requires appropriateinstitutional and other platforms for skill practices to operate. In particular, in Public as well as in private IT organizations, the competency-based performance is expected from students accordingly to organizationalstructures and requirements, values and goals may lead learning programs, so students must prioritize them in order to improve effectively and efficiently their skills and getting higher performance.

A. The adopted competency model

The key points of the adopted model are the terms competence and competency. A competency represents all the forms of knowledge, skill, attitude, ability and learning objective described in learning, training or professional areas. Thus, a competency is an element part of the competence. Acompetency is knowledge, skill or attitude (KSA). Theknowledge means the information that a person may apply todo a task. The skill is the experience, the practical ability andthe easiness in doing the task. The acquisition of a skillincreases the ability of a person in doing action automaticallyand unconsciously. The attitude is the inclination of a personin doing actions as a response in particular situation.
It includes affective and cognitivecomponents that allow the individual student to recognize and opportunely deal with the situation and how to improve their skills accordingly.

IV.LITERATURE SURVEY

Title	Author	Year
Improving Electronics Engineering Students' Skills By Projects' College Competition	Moath Awawdeh, Tarig Faisal, Fatima Fadhel, and Aysha AlHamadi	2018
Boosting professional competences and IT companies' innovation in aMaster Degree in Informatics Engineering	F. Badia1, F. Gine, Josep L. Lerida, M. Molt´o and M. Valls	2018
How to Train Tomorrow's Corporate Trainers – Core Competences for Community Managers	Alexander Clauss	2018
EdTech competence ofengineering university professors	Farida T.Shageeva, Inna M. Gorodetskaya	2015
Formation of Scientific and Research Competenceof Future Electrical Engineers	Tamara Poyasok ,Olena Bespartochna , Tetyana Dniprovska.	2019
A smart competence-based prioritization for learning programmes	Matteo Gaeta1, Antonio Marzano2 , Sergio Miranda2, Kurt Sandkuhl3	2015
Information technology to assess the level of competence in the educational process	Gusyatnikov Viktor Nicolaevich , Bezrukov Alexey Iosifovich , Sokolova Tatyana Nikolaevna , Kayukova Inna Victorovna	2015

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Self-Assessment as a Key Criterion for Increase of Quality of Higher Education in Modern Conditions	Kristina Berzina, Inga Zicmane, Jevgenijs Kuckovskis	2017
Academic Competence of Computer Science Graduate Degree from the Employer's Perspective	Joni. Suhartono, J. Sudirwan	2016
Development of Procedures to AssessProblem-Solving Competencein Computing Engineering	Jorge Pérez, Carmen Vizcarro, Javier García, Aurelio Bermúdez, and Ruth Cobos	2016

V.PROPOSED SYSTEM

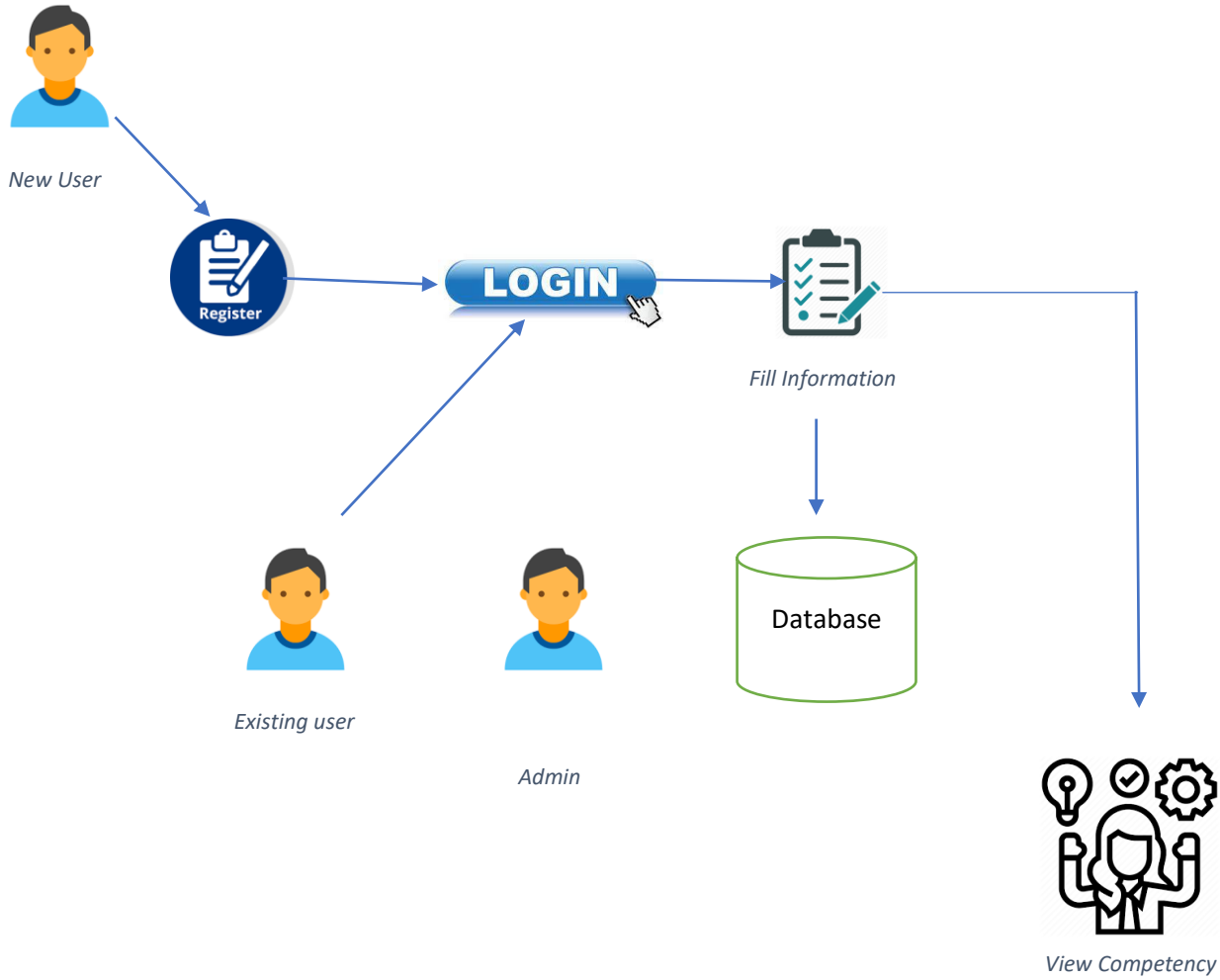

Fig 1: Proposed System

Predicting competency of students is a great way to make students aware of how much they are competent in this competitive world and how they can improve their skills in order to get their dream job.
After registering in the system, students are able to login to the system, if students are already registered then they can directly login to the system.
Once students are logged into the system then they have to fill the information like their education details, technical skills, internship details, coding platforms on which they practice coding, knowledge in technical subjects, etc.
After filling information by the students, it is then stored in the database. The database can be managed by the admin of the system. Whenever there is change in some inputs by the students, the changes are updated in the database.
Then the competency is predicted by applying clustering machine learning algorithms to the data set.

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A. Identifying and analysing individual student's skills and knowledge based on various technical aspects
Firstly, the information required is collected from students through Microsoft forms circulated among them. The information contains SSC and HSC percentage, their interest in their respective course, etc.
B. Extracting some important technical skills from the information provided by students
The data collected through Microsoft forms is visualized, preprocessed and the important features are extracted on which the output will be mainly dependent.
C. Evaluating the competency of students by using different unsupervised machine learning algorithms
The various machine learning algorithms are then applied on the preprocessed data and the competency will be evaluated.
D. Assigning the rating for competencies on the scale of 5
After evaluating the data then the rating is given for competencies on the scale of 5. 5 is the highest rating while 1 is the lowest one.
E. Giving suggestions to individual student
After determining competencies, the suggestions are given to individual student to improve the competency of students.

ALGORITHM:
As the dataset contains unlabeled data and we cannot predict the output in advance before actually implementing it, so unsupervised machine learning algorithms are used. There may be students having similar skills so they should be grouped in order to determine competency. Hence clustering algorithms are used for grouping similar data purpose. Various algorithms are applied and compared

A. k-means clustering
k-means clustering is the simplest and effective method if we know the numbers of clusters in advance. The K-means clustering algorithm is used to find groups which have not been explicitly labeled in the data. This can be used to confirm business assumptions about what types of groups exist or to identify unknown groups in complex data sets.
The number of clusters are five since we want competency on the scale of 5.

B. Hierarchical clustering
To define hierarchies .

C. BIRCH algorithm
It is used to perform hierarchical clustering and to accelerate the performance of k-means clustering.

SURVEY

The table shows the survey conducted among 100 students to know whether they want to know their academic performance or competency. 70 out 100 opted for competency.

Student	Marks	Competency
1		•
2	•	
3		•
4		•
5		•

The survey shows that most of the students are interested in knowing their competency rather than their academic marks. By taking into account the feedback of students, competency model is implemented.

VI.CONCLUSION

At a time of high interest in competence-based education, reliable and valid devices to assess competency is needed.
The experiment is very helpful for students in second year and third year of engineering program to know their competency at early stages only so that they can start their preparation and improve their skills before appearing for their campus placements.

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VII.LIMITATION

A clear limitation of this study is that the student sample is very small, and this limits the generalization of its results. With a sample of this size, only classic psychometric analyses could be performed. A broader sample would allow analyses based on item response theory, which would provide more detailed data on each item, such as the information it adds to the test and the error it introduces. However, authors have been able to carry out these analyses with other student samples.

The results show that the intermediate scoring levels (2,3 and 4) need to be carefully defined. In other words, the best and worst performance levels seem easy to identify, but the intermediate levels are fuzzier and should be defined more clearly.

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