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Intelligent Recommendation System for Skill Upgradation Based on Behavioral Analysis

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ABSTRACT: Information of major IT industries is made available to the candidates, using which candidate can select desired organization. An intelligent system is built using machine learning approach so as to judge the candidate's current strengths and weaknesses in the context of industry requirement. Here, based on the past information of the candidate and current analysis a behavioural survey is done and proper suggestion is given to the candidate. This may increase the candidates skill set and enhance his chances of getting into the desired organization.

KEYWORDS: Adaptive algorithm, Classification, Computing methodologies, Fuzzy classifier, Information Systems, Knowledge based recommender system, Machine learning, Naive Bayes, Recommender system, Randomized algorithm, Retrieval tasks and goals, Selection and assessment, Supervised learning.

I. INTRODUCTION

The scenario over the past few years in IT sector has dramatically changed. In the earlier years, IT organizations used to recruit more number of graduates, in anticipation of getting good number of development work. But, today this has become uncertain because the unpredictable scene in technology growth / development. Also, another important factor contributing this shift is due to imbalance in the supply-demands ratio. There are more challenges to the job seekers and also for industry to recruit candidates due to changing technologies. It is therefore required to have complete knowledge of technology and problem domain in which the particular organization works. There might be the need for skill upgradation. Candidates do not have exact knowledge of required skill by the organization and which of these skills need to be upgraded. This may reduce the opportunity of the candidate being selected for the job. This leads to basic requirement of proper and well guided information to the candidate. This will provide proper direction to the candidate in order to have fair chance of getting into dream organization.

There are some means to acquire knowledge about skills as using some online questionnaires or by appearing for some skills related exams. These sources provide the grading and at most suggest the correct answer. However they do not address:

Why the candidate might have made mistake?
Was candidate require to read again the related part?
Was candidate having casual approach?
Was candidate dreaming too big without having adequate subject knowledge?

In the current content the above mentioned questions have greater significance, in order to give the proper input to the candidate. Also, this analysis will vary person to person.

A recommendation system which aims at providing personalised recommendation based on the candidates attributes such as basic knowledge, inclination to learn, studiousness and his back history. The proposed system consists of an adaptive algorithm used to create dynamic questionnaire which displays question at a time and based on candidates previous answers next question is given to judge his level. Fuzzy rule based classifier is used for classification and proper recommendation. The recommendation as in upgradation of the skills and / or learning new technologies and / or improvement in analytical and logical reasoning, is the outcome of the proposed system. As the proposed system is

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taking many parameters along with academic performance the system is expected to provide more accurate suggestions.

An adaptive algorithm is an algorithm that changes its actions at run time, based on information available and on a priori defined reward mechanism or some criteria. In machine learning and optimization, many algorithms are adaptive or have adaptive variants which usually means that the algorithm parameters are automatically adjusted according to the gained statistics at that instance.
Fuzzy classification is the process of grouping elements together into a fuzzy set whose membership function is defines by the truth value of a fuzzy propositional function. It is the process of grouping individuals having the same characteristics into a fuzzy set. A fuzzy classification corresponds to a membership function which indicates whether an individual is a member of a class, given its fuzzy classification predicate.

The term rule based classification can be used to refer to any classification scheme that make use of IF-THEN rules for class prediction. The IF part is known as the condition and the THEN part is known as conclusion. There could be many rules based on the system requirement. There is the One Rule Algorithm where each value of the attribute is a part of some particular class. There could also be many attributes considered at a time. But the rules to be selected should have convergence as well as accuracy.

II. RELATED WORK

A learning style questionnaire was presented to the students. Based on the results using Felder-Silverman learning style model, individual learning style of the student was predicted by authors S. Graf, Kinshuk, Tzu-Chien Liu, in the paper "Identifying Learning Styles in Learning Management Systems by Using Indications from Students' Behaviour" [2]. In this Rule based mechanism was used with some limitations such as only specific learning styles were considered.

In the paper "Advanced Adaptivity in Learning Management Systems by Considering Learning Styles" by authors S. Graf and Kinshuk [3] adaptive learning mechanism which provides students with courses that best fit their individual learning style was provided where the technique Adaptive generic mechanism is used where constant track has to be maintained as the learning style of students changes.

Authors Y. Li and Z. Wang used Fuzzy sets to represent students' knowledge level and to dynamically update user stereotypes in the paper "Adaptive reinforcement Q-Learning algorithm for swarm-robot system using pheromone mechanism" [4] . Fuzzy Knowledge State Definer technique is used but here the change in the performance is dependent only on the systems elements.

Records of jobs are learned to establish user demand models such as job-resume matching model is achieved by authors Z. Wang and X. Tang in the paper "A Resume Recommendation Model for Online Recruitment" [6]. Genetic algorithm technique is used but performance and interest of the candidate are not considered.

In the paper "User Behavior Analysis and Commodity Recommendation for Point-Earning Apps" by authors Y. C. Chen, C. C. Yang, Y. J. Liau, C. H. Chang [7], several methods— including a traditional classifier, heuristic scoring, and machine learning—to build a recommendation system and integrate content-based collaborative filtering for a hybrid recommendation system using Co-Clustering with Augmented Matrices (CCAM) are used. Crawler is used to acquire regular customers' purchasing information, which can helps to enhance prediction performance. The recommendation is done based only on user consumption and other factors such as time, region are not considered.

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III. PROPOSED ALGORITHM

A. *Adaptive Algorithm*

Input: 25 questions each for the selected domain.
Output: Single question appears on the page based on previous answers.
Begin:
Step 1: Call the function GetQuestions (userID, domainID, domainLevel ,domainMarks)
Step 2: Initialize domain to the current session's domain
Step 3: Initialize questionLevelMedium to the current session's questionLevelMedium
Step 4: Initialize questionLevelHard to the current session's questionLevelHard
Step 5: Initialize domainMarks to the current session's domainMarks
Step 6: For all the selected domains
domainMarks (domainID)= domainMarks + marks
domainQuestionLevel (domainID) = questionLevel
ifquestionLevel equal to 0
questionLevel = questionLevelEasy
else if questionLevel equal to questionLevelEasy
{
if marks are greater than 0

questionLevel = questionLevelMedium
else
questionLevel = questionLevelEasy
}
else if questionLevel equal to questionLevelMedium
{
if marks are greater than 0
questionLevel = questionLevelHard
else
questionLevel = questionLevelMedium
}
else if questionLevel equal to questionLevelHard
{
if marks are greater than 0
questionLevel = questionLevelHard
else
questionLevel = questionLevelMedium
}
Step 7: Get userID, domainID, domainQuestionLevel, domainMarks
Step 8: End

B. *Fuzzy Rule Based Classifier:*

Input: selectedDomainName, allDomainMarks, B.E.Marks, 12thMarks, 10thMarks, extraCurriculum, address
Output: Fields to be worked on
Begin:
Step 1: Get candidateID
Step 2: Retrieve selectedDomainNames, all domainMarks, B.E.Marks, 12thMarks, 10thMarks, extraCurriculum, address, all domainQuestionLevel from database based on candidateID

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Step 3: Initialize low, medium, high, zero
Step 4: For each selected domain
Get domainName, domainID, domainQuestionLevel, domainMarks
if marks < low
WorkNeeded = hardWork
else if marks < = medium
WorkNeeded = mediumWork
Step 5: Recommend the work required on particular domain
Based on extra curriculum and companys skill requirements recommend extra skills upgradation required
Based on company location and address recommend if there is migration needed
Based on the time required to answer the questions and other background information candidate's behavior as confidence, introvert, thinking etc can be predicted
Step 6: Get fields to be recommended
Step 7: End

C. *System Architecture*

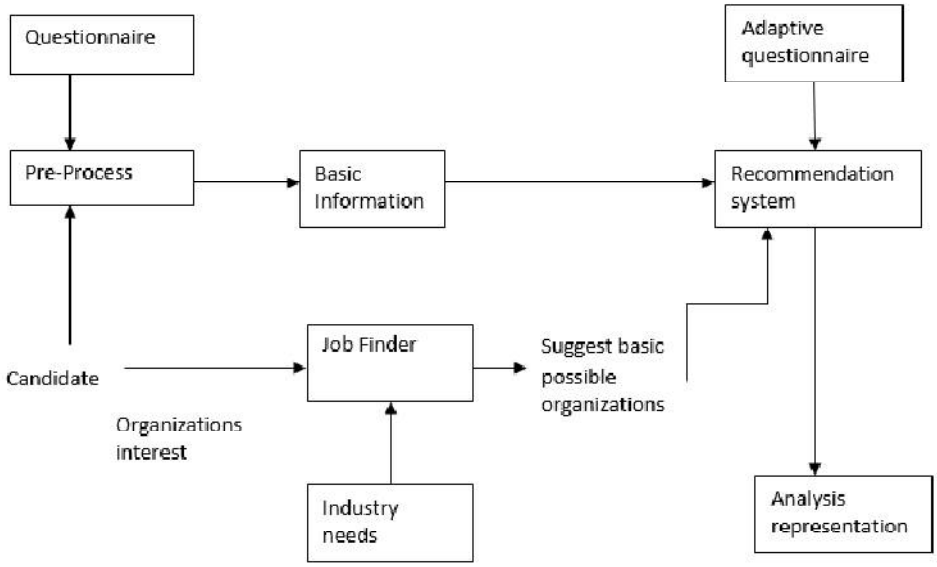

Fig.1. System Architecture

The FIG 1, shows system architecture of proposed system. In proposed work input is taken in form of text content. This collected data is then processed to get candidates knowledge and behavioral information. An adaptive questionnaire is presented to the candidates. Based on the candidates answer next question is prompted to find out the knowledge of candidate in that particular field.
Based on candidates performance on questionnaire and his behavior list is made of the skills the candidate needs to work on. This list is presented to the candidate in form of recommendation.

IV. PSEUDO CODE

Step 1: Start
Step 2: Authenticate the user using Login and start interface between view and controller

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Step 3: Start database and collect candidates resume and basic information
Step 4: Collect candidates expected companies, domain and other skillset information
Step 5: Present questionnaire to the candidate
Step 6: Fetch new questions using adaptive algorithm based on previous answers
Step 7: Recommend the skills which need upgradation based on the time taken for answering, sensitive attributes found in answers and score of the test
Step 8: End

V. ILLUSTRATIVE RESULTS

There are three users opting for company ABC which requires candidates with good programming skills and sporty behavior.U1, U2 and U3 are three system users who are the candidates and each has individual score. Response Time, Programming skills, Curriculum skills and Behavioral appearance is considered for final recommendation purpose.

Users	Response Time	Programming Skills	Curriculum Skills	Behavioural appearance	Recommendation
U1	40 sec	12	Sporty	Hard working	Increase focus on programming skills
U2	20 sec	14	Creative	Easy Going	Work on programming skills
U3	50 sec	18	Studious	Sincere	Work on other curriculum skills

Fig.2. Table of Illustrative Example

VI. CONCLUSION AND FUTURE WORK

Many systems which are used for the recommendation purpose are sometimes complicated and confusing. Hence we develop a system that is easy to understand and gives quick and accurate results. In this system we use two algorithms for recommending the candidate as which area he needs to work on and improve his skills. The algorithm produces adaptive questionnaire which is based on candidate behavior for personal and individual assessment and improve precision and accuracy of recommendation.

REFERENCES

1. P. Montuschi, F. Lamberti, “A Semantic Recommender System for Adaptive Learning”,It Professionals, 2015, IEEE, vol. 17:5, pp. 50-58.
2. S. Graf, Kinshuk, T. C. Liu, "Identifying Learning Styles in Learning Management Systems by Using Indications from Students’ Behaviour",Eighth IEEE International Conference on Advanced Learning Technologies, 2008, pp. 1-5.
3. S. Graf and Kinshuk, "Advanced Adaptivity in Learning Management Systems by Considering Learning Styles", 2009 IEEE/WIC/ACM International Conference on Web Intelligence and Intelligent Agent Technology - Workshops, pp. 235-238.
4. K. Chrysafiadi, M. Virvou, “Fuzzy Logic for adaptive instruction in an e-learning environment for computer programming”, IEEE Transactions on Fuzzy Systems, 2014, pp. 1-21.
5. Y. Li; Z. Wang, “Adaptive reinforcement Q-Learning algorithm for swarm-robot system using pheromone mechanism”, International Conference on Robotics and Biomimetics (ROBIO) Shenzhen, China, December, 2013, IEEE, pp. 952 – 957.

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6. Z. Wang , X. Tang, " A Resume Recommendation Model for Online Recruitment", 2015 11th International Conference on Semantics, Knowledge and Grids, IEEE, pp. 256-259.
7. Y. C. Chen, C. C. Yang, Y. J. Liau, C. H. Chang, "User Behavior Analysis and Commodity Recommendation for Point-Earning Apps", The 2016 Conference on Technologies and Applications of Artificial Intelligence, IEEE, pp. 170-177.
8. G. F. Ming, "Course-Scheduling Algorithm of Option-based Hierarchical Reinforcement Learning",2010 Second International Workshop on Education Technology and Computer Science, IEEE, pp. 288-291.
9. I. Portugal, P. Alencar, D. Cowan, "The Use of Machine Learning Algorithms in Recommender Systems: A Systematic Review", Expert Systems With Applications (2017), pp. 1-30.
10. F. Sarro, F. Ferrucci, M. Harman, "Adaptive Multi-objective Evolutionary Algorithms for Overtime Planning in Software Projects", IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, VOL. 43, NO. 10, OCTOBER 2017, pp. 1-21.
11. X. Liu, P. Wang, "An Adaptive CU Size Decision Algorithm for HEVC Intra Prediction based on Complexity Classification using Machine Learning", IEEE Transactions on Circuits and Systems for Video Technology, 2017, pp. 1-11.
12. https://www.datasciencecentral.com/profiles/blogs/top-9-machine-learning-applications-in-real-world
13.https://www.analyticsvidhya.com/blog/2017/01/introduction-to-reinforcement-learning-implementation