

E-RECRUITMENT SYSTEM THROUGH RESUME PARSING, PSYCHOMETRIC TEST AND SOCIAL MEDIA ANALYSIS

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Abstract- Job Recruitment is considered as a major activity of human resource which is a very difficult task to find the productive talent. Recruiters require large financial expenditure, time, and effort to select the best candidates. Similarly, it is difficult for the job seekers to get the information about the opening or the requirements by the companies. As the approaches for sketch parsing uses regular expressions, unitization, keyword based on good example, entity recognition model has several drawbacks, this approach uses deep learning models. Text is extracted from resumes which are of image and document formats. This methodology disentangles and computerize the recruitment process with an extra psychometric test. There is huge impact of mixer media on everyone's life, this scheme appraisal their emotional aptitude by breaking down the web-based life information, while proficient qualification is checked through the ingress. Along with this, system will recommend the job seekers skills and requirements that are necessary for them to get into their desire company. Adhering to the recruiters needs of skill set, this system works on providing the companies according to their demand.

Keywords- Deep Learning, Resume Parsing, Psychometric Test, Text Mining, Web Scraping, Social Media Analytics

I. INTRODUCTION

Formation requires to employ the suitable nominee who can work along with them to accomplish their objectives. Association looks for candidate for the potential workers through the enlisting procedure. Knowledge workers have to vexation about losing their full sentence well paid jobs and it is arduous to find similar job elsewhere and for formation its time taking and tedious to identify the prospect with right required trait. Improving the caliber of recruitment would

assign the deserved person to the appropriate position which would shuffling the employees to accomplish greater work performances and significantly reduce the employee breeding cost. To make the process more effective and less time consuming, the e-recruitment process has been introduced. Our approach is consisting of 4 stages, first stage is to get the data (resume) and convert them into structured format and then perform the analysis using deep learning technique. Second step includes the psychometric test where the text mining is used to generate scores for each candidate. In third step web scraping is performed on various social media sites to get the additional information about the candidates. Then the system recommends suitable job for the candidates. In fourth step system recommends the skills and requirements which were lacking to be recruited in the desire company.

Firstly, data is preprocessed, in which data cleaning is done by removing spelling mistakes, null entries etc. Candidates resumes will be parse using deep learning approach. Data might be semi structured or unstructured, which will be converting into the structured format and extract the required information from it. Then deep learning approach is used to analyze the resumes. Along with that psychometric test is used to test the knowledge of the candidates on various required subject matters, which helps to get the right party for the right business.

Candidates are also evaluated based on their emotional aptitude which will be taken through the social networking sites, since organizations want more information about the nominees outside the resume and application forms. As it is necessary to hire the employee which good ethics and attitude for the growth of the company. Hence web scraping is used to get the information from the social media. Considering all the analysis and test result list of candidates will be generated and the company as well as the candidates will be approached. Our approach will also recommend the candidates about the skills and requirement which they are lacking or can be improved to be recruited in the wished company. This approach is less tedious and time consuming and more efficient for both recruiter and the candidates.

II. RELATED WORK

Ayishathahira, Sreejith and Raseek [1] proposed a work which focuses on using convolutional neural network, Bi-LSTM and conditional Random field for parsing of resumes. It includes the steps like retrieval of plain text and information, pre-processing and segmentation. Deng, Lei and Lin [2] proposed a work which focuses on a neural network model to predict an employee's future job details, which includes position name, salary and company scale on the basis of online resume data. Sawleshwarkar, Rangnani, Mariwalla and Halbe [3] proposed a work which focuses on Through the proposed model which simplifies and automates the process of recruitment with psychometric tests. They are used in checking the aptitude, identity and aspects of candidates for the applied jobs. Word mining is operated on the responses that gives a waitlist for the jobs. Suen and Chen [4] proposed a work which focuses on examining reactions of people questing for jobs. Employers can access to further knowledge on the candidates through social media like Facebook due to the rapid growth and usage of social media websites. Dar and Dorn [5] proposed a work which focused on ontology-based classifier for classification of jobs. More jobs were taken from various websites.

Lau Siong Hoe and Amr Elchouemi [6] has proposed a work which focuses on the impact of social media on higher education marketing in terms of student recruitment. The results that were expected from this research indicates that there are several approaches that are to be used to recruit the students in an effective manner Mindia, Piana Monsur, and Md Kazimul Hoque [7] focuses on multinational organizations as population in e-recruitment activities. Data is collected from various respondents who are jobseekers. Then the sample is drawn based on this data and statistical analysis is conducted in order to prove the significance of e-recruitment. It recommends to use e-recruitment process for hiring candidates. Romy Newman and Georgene Huang [8] proposed a work which recognises the significance of belonging to organisations such as Women in Engineering. The surveys operated says that women approach differently in job searching than men. M. Vaclavkova and J. Bohacik [9] proposed a work which emphasizes on recruiting the employees for security companies whose qualities depends on the employees which needs refined approaches and tools. Nafia Sultana and Nahida Sultana [10] has proposed a work which focuses on how organizations are dependent online and the human resource activities. The key focus is to address the online recruitment and to overcome its difficulties.

Haddadi, Tali Mohammed, Bouarab-Dahmani and Berkane [11] proposed a work which gives importance on recruitment regarding the massive online courses. It creates a list of profiles making it easy for organisations. Yang Ming [12] focuses on solving the problem between business talent shortage and their selection by designing a talent oriented online recruitment system. M. Menon and Rahulnath H A [13] proposed a structure which validates their ability to get selected. An application on web is done to allow employers to post new job openings. Laurent Nguyen and Daniel Perez

[14] proposed a unique system that analysis the resumes in form of video. They represent a way to study impression from behavioral standpoint. Michael Guedj [15] proposed answer for the recruitment problem of weighing the skills of the user. The proposed answer suggested is semantic matching, which combines annotation using the controlled vocabularies with the background knowledge about a certain application domain.

Li, Sun, et al. [16] proposed an algorithm for the recommendation of jobs on documented report of the graduates and their job date and correlation degree. Matli, Walter, and Mpho Ngoepe [17] proposed a system in which organisations and recruiters provide access to information services. The main aspect of the paper is to understand finding of jobs and not depending on traditional ways such as newspapers. Meng, Qingxin, et al. [18] focused on salary benchmarking which is based on fine-grained data. We need to analyse benchmarking problem as a matrix work. Phaphuangwittayakul, Aniwat, et al. [19] proposed a system to understand the skills needed to analyse for labour market. To overcome this problem of skill mismatch, we make use of approaches like, keyword extraction, web scraping and data visualisation. Almutairi, Mona Masad, and Mozaherul Hoque Abul Hasanat [20] proposed on reliable predictor of skill matching of IS students and that of Saudi. They were based on data collected from recruiters and students.

III. METHODOLOGY

SpaCy a natural language processing library of python does deep learning and machine learning; this library creates pipelines. We take resume dataset in JSON format of dataturks convert them to spacy. This data is now used for training a spacy model by creating a blank model first. This trained model can be used to extract necessary details from resumes like skills, etc.

Initially we have resumes in formats like JPG, PNG, DOC, DOCX and PDF. These resumes are opened and text is extracted from the resumes. This text is preprocessed in which punctuations, ascii character are removed then we lemmatize the data, numbers are converted to texts this is auto corrected. We preprocess the data so that we do not miss out the required information. We extract fields like name, email, phone number, skills, education, experience and graduation from the resume.

We provide psychometric test and calculate scores using text mining. We have a module which web scrapes from social media sites using Beautiful Soup which is used for parsing the html and xml web pages. This data is used to evaluate a person better. Finally, we assign and notify the person a relevant job and we also recommend the lacked skills and requirements.

IV. NEED FOR PROPOSED METHODOLOGY

Recruitment has become a very time and cost consuming process, which many are trying to automate. We need to

automate recruitment to reduce time and cost, we also need to assign a right person to right job and vice-versa. On the process of automating recruitment, we have come up with our model.

Our model creates a deep learning model which can extract data like skills from resume, rather than normal text matching or regular expression we have our deep learning model which is better than other models. We also have psychometric test so that we can know knowledge of a person and is aptitude level. Psychometric test can evaluate a person better and has proven too well suit a person for a job. To also better know a person, we can extract data from social media sites. This will surely give the recruiter a far idea about a person.

V. PROPOSED METHODOLOGY

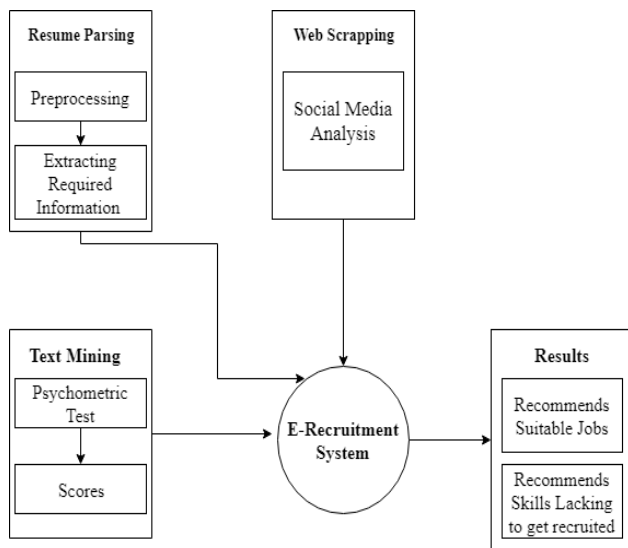


FIG 1. Architecture of E-Recruitment System

E-Recruitment System aims to find the impact of traditional recruitment system on finding the potential candidate and required time, effort and money spent on this process. This system architecture as designed in FIG 1 is proposed to improve the quality of the recruitment by finding the potential candidate having skills and requirements that are needed to get recruit in a desired company. It helps in assigning a right job to the right candidate and it saves the time, effort and money of the recruitment process. Organization always search for best talent to recruit which can help them to achieve their strategic goals. Our system uses deep learning approach to find the skills and requirements of the candidates.

This flowchart of the system as shown in FIG 2 consists of 4 modules:

A. Resume Parsing

In this module candidates will upload their resumes into the system and once the resume has been uploaded by the candidate that resume will be parsed by the system in order to extract the potential and required information about the candidates from the resume which will help the recruiter to get some details about the candidate.

B. Psychometric Test and Text Mining

In this module psychometric test will be conducted by the system for each candidate and scores will be generated from the system. And, text mining is conducted on the answers given by the candidate that will generate a scores. Both the scores of the candidate will be stored in the database for further steps.

C. Web Scrapping

In this module web scrapping is performed on the candidate. Since, organization needs additional information outside from the resume. web scrapping is conducted to get the additional information about the candidates from the social media like Facebook, LinkedIn, Twitter etc. This information will be stored in the database.

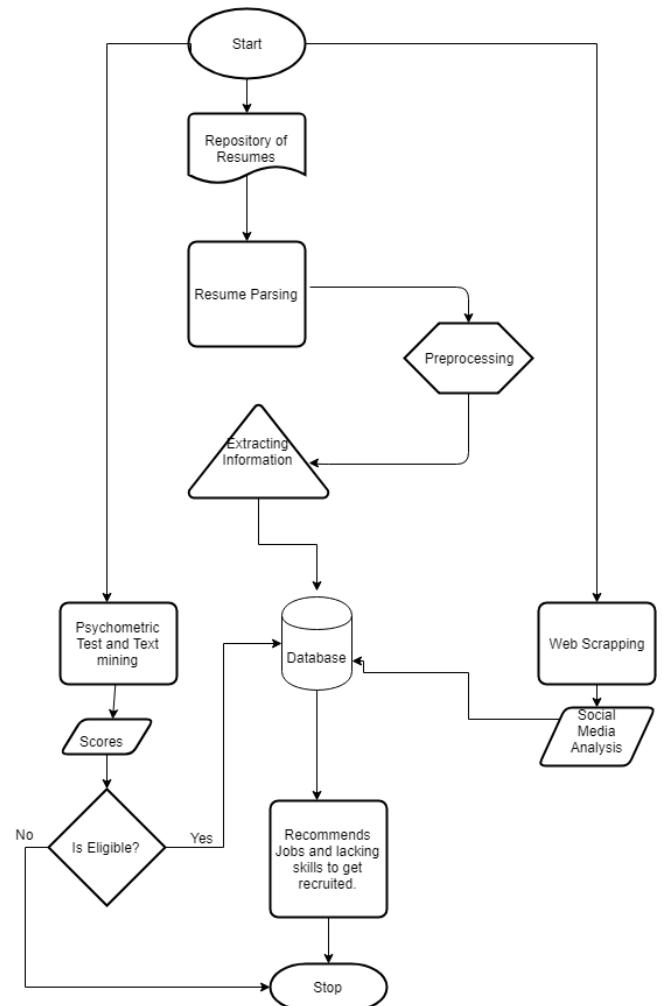


FIG 2. Flow Chart of E-Recruitment System**A. Results**

In this module the system will gather all the information about the candidate from the database and it will try to match that information with the company criteria, based on that the system will recommend jobs for the candidates and our system will recommend the required skills that the candidates are lacking behind to get recruited in desired organization.

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Starting iteration number 73
{"ner": 127.93181968409577}
Starting iteration number 74
{"ner": 123.0556109524577}
Starting iteration number 75
{"ner": 88.24946464661431}
Starting iteration number 76
{"ner": 112.11843867316156}
Starting iteration number 77
{"ner": 132.93904181135298}
Starting iteration number 78
{"ner": 151.96260281602258}
Starting iteration number 79
{"ner": 149.4694954705371}
Starting iteration number 80
{"ner": 95.16537990076539}

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Email Address:
Phone:
Companies worked at:
Accreditation:
College Name:
Inch:
Designation:
Application Development Associate
Degree:
B.E in Information science and engineering
Skills:
< Less than 1 year, Database (Less than 1 year), Database Management (Less than 1 year), Database Management System (Less than 1 year), Java (Less than 1 year)
Name:
Mishalsh Sha
Location:
Bengaluru

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II. CONCLUSION AND FUTURE WORK

Our approach is to make the work of companies and candidates easier and effective. Our approach consists of 4 stages, first stage is to get the data (resume) and convert them into structured format and then perform the analysis using deep learning technique. Second step includes the psychometric test where the text mining is used to generate scores for each candidate. In third step we will perform web scraping on various social media sites to get the additional information about the candidates and recommend suitable jobs to them. In fourth step, system will recommend the skills and requirements in which the students are lacking and also helps them to get recruited in the desired company.

In future, this system can be made more versatile in which wide ranges of Psychometric tests are added. Resumes in the form of videos can also be included.

III. REFERENCES

- [1] C. H. Ayishathahira, C. Sreejith and C. Raseek, "Combination of Neural Networks and Conditional Random Fields for Efficient Resume Parsing," *2018 International CET Conference on Control, Communication, and Computing (IC4)*, Thiruvananthapuram, 2018, pp. 388-393. doi: 10.1109/CETIC4.2018.8530883
- [2] Y. Deng, H. Lei, X. Li and Y. Lin, "An improved deep neural network model for job matching," *2018 International Conference on Artificial Intelligence and Big Data (ICAIBD)*, Chengdu, 2018, pp. 106-112. doi: 10.1109/ICAIBD.2018.8396176
- [3] S. Sawleshwarkar, N. Rangnani, V. Mariwalla and A. Halbe, "Simplified Recruitment Model Using Text-Mining on Psychometric and Aptitude Tests," *2018 Second International Conference on Electronics, Communication and Aerospace Technology (ICECA)*, Coimbatore, 2018, pp. 586-589. doi: 10.1109/ICECA.2018.8474769
- [4] H. Suen and H. Chen, "Screening Passive Job Seekers on Facebook," *2018 1st International Cognitive Cities Conference (IC3)*, Okinawa, 2018, pp. 262-263. doi: 10.1109/IC3.2018.000-5
- [5] E. ul haq Dar and J. Dorn, "Ontology based classification system for online job offers," *2018 International Conference on Computing, Mathematics and Engineering Technologies (iCoMET)*, Sukkur, 2018, pp. 1-8. doi: 10.1109/ICOMET.2018.8346340
- [6] Xiong, Liangyun, et al. "Rise of Social Media Marketing: A Perspective on Higher Education." *2018 13th International Conference on Computer Science & Education (ICCSE)*. IEEE, 2018.
- [7] Mindia, Piana Monsur, and Md Kazimul Hoque. "Effects of E-recruitment and internet on recruitment process: An Empirical study on Multinational companies of Bangladesh." *International Journal of Scientific Research and Management* 6.01 (2018)
- [8] Prives, Leslie. "Finding Fairygodboss: Helping Women Navigate the Job Market." *IEEE Women in Engineering Magazine* 12.1 (2018): 12-15.
- [9] Vaclavkova, M., and J. Bohacik. "Creation of a Software Tool in Project Based Teaching for the Recruitment of Employees Into Security Companies." *2018 16th International Conference on Emerging eLearning Technologies and Applications (ICETA)*. IEEE, 2018.
- [10] Sultana, Nafia, and Nahida Sultana. "Analyzing the Effectiveness of Online Recruitment: A Case Study on Recruiters of Bangladesh." *Asian Business Review* 7.2 (2018): 79-84.

- [11] Lynda, H., El Amine, T.M., Farida, B.D. and Tassadit, B., 2017, December. E-recruitment support system based on MOOCs. In *Mathematics and Information Technology (ICMIT), 2017 International Conference on* (pp. 234-238). IEEE.
- [12] Ming, Y., 2017, May. Analysis and Implementation of Key Technologies in E-Business Talent Online Recruitment Platform. In *2017 International Conference on Smart Grid and Electrical Automation (ICSGEA)* (pp. 701-704). IEEE.
- [13] Menon, V.M. and Rahulnath, H.A., 2016, September. A novel approach to evaluate and rank candidates in a recruitment process by estimating emotional intelligence through social media data. In *Next Generation Intelligent Systems (ICNGIS), International Conference on* (pp. 1-6). IEEE.
- [14] Nguyen, L.S. and Gatica-Perez, D., 2016. Hirability in the wild: Analysis of online conversational video resumes. *IEEE Transactions on Multimedia*, 18(7), pp.1422-1437.
- [15] Guedj, M., 2016, August. Levelized Taxonomy Approach for the Job Seeking/Recruitment Problem. In *Computational Science and Engineering (CSE) and IEEE Intl Conference on Embedded and Ubiquitous Computing (EUC) and 15th Intl Symposium on Distributed Computing and Applications for Business Engineering (DCABES), 2016 IEEE Intl Conference on* (pp. 448-451). IEEE.
- [16] Li, Sun, et al. "An Employment Recommendation Algorithm Based on Historical Information of College Graduates." *2018 9th International Conference on Information Technology in Medicine and Education (ITME)*. IEEE, 2018.
- [17] Matli, Walter, and Mpho Ngoepe. "Employment Information Services Adoption of Innovations." *2018 Open Innovations Conference (OI)*. IEEE, 2018.
- [18] Meng, Qingxin, et al. "Intelligent Salary Benchmarking for Talent Recruitment: A Holistic Matrix Factorization Approach." *2018 IEEE International Conference on Data Mining (ICDM)*. IEEE, 2018.
- [19] Phaphuangwittayakul, Aniwat, et al. "Analysis Of Skill Demand In Thai Labor Market From Online Jobs Recruitments Websites." *2018 15th International Joint Conference on Computer Science and Software Engineering (JCSSE)*. IEEE, 2018.
- [20] Almutairi, Mona Masad, and Mozaherul Hoque Abul Hasanat. "Predicting the suitability of IS students' skills for the recruitment in Saudi Arabian industry." *2018 21st Saudi Computer Society National Computer Conference (NCC)*. IEEE, 2018.