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# Recommendation System for Skill based Service Providers

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**Abstract:** *Our Country has a vast population. Amongst this Population, many Skill Based Services Providers are present in the Society. These People are usually less educated but have Skills. These People find it difficult for finding Customers for themselves given their less Knowledgebase. Existing service recommendation system considers only well-educated people and is also biased based on Ratings. Our System considers such People and tries to find them Customers based on the Customer Requirements for that service which is provided by Person. In short, we recommend such Skill Based People to the Customers who want to Avail their Services.*

**Keywords:** *Skill Based People (SBP), Job Recommender Systems (JRSs), Skill Based Service Providers (SBSP), Type of Services (ToS), India Labor and Employment (ILE), Server-Client, Recommendation System, Classifier*

## I. INTRODUCTION

Unemployment is the greatest economic challenge faced by India. What is our current unemployment situation? Is it improving or deteriorating? Virtually all the major economic policy issues derive from this central challenge. Can the government crack the unemployment problem, or will the problem crack the government first? [12] The India Labor and Employment (ILE) Report 2016 of the Institute for Human Development (forthcoming, Oxford University Press, henceforth the report) presents compelling evidence of how the employment situation has improved during the 21st century. Also, it emphasizes the challenge of unemployment that is still faced by us. [12]

People in a Developing country like India find it difficult to get a job even when they are Highly Educated, let alone Less Educated people. Less Educated People in this context refers to those People who either have Less Education or Less Digital Knowledge to expand their Business or even both. The major challenge here is getting customers for such Skill Based People (SBP). Current systems are Biased, i.e. based on ratings of the Person and are commercial systems (intended to make profits) and hence fall short of transparency and rationalism. India is a home for many Service Providers like Tailors, Mechanics, Beauticians, Drivers, Carpenters, Artisans etc. Such people have their Traditional Business from ages and continue the same. However, due to Industrialization, Automation, Outsourcing and Exporting, their business has taken a huge hit and now these People lack jobs. Such people have less education so they cannot switch over to other jobs as well. current system doesn't help such people, which is one of the reasons for slow growth of the nation.

With the rapid developing of the Internet technology, more and more job seekers release their own personal information whereas enterprises post the jobs on the Internet. [5] Because of the advancement of Web 2.0 technology, there is a dramatic increase in job seekers' personal information and enterprises' recruiting information. [5] As a result, the information becomes overloaded, which lead to the low utilization rate. [5] Recently, job recommendation has attracted a lot of research attention and has played an important role on the online recruiting website. Different from traditional recommendation systems which recommend items to users, job recommender systems (JRSs) recommend one type of users (e.g., job applicants) to another type of users (e.g., recruiters). [4] The job recommender system, which is the online recruiting system with personalized recommendation, has been proposed to handle the issue for job seekers and enterprises.[5] As a recommender system, the job recommender system can retrieve a list of job positions that satisfy a job seeker's desire, or a list of talent candidates that meet the requirement of a recruiter by using the recommendation technology, for example, content-based recommender and collaborative filtering recommender which have shown success in different recommender systems. [5]

But these Types of Job recommendation cannot be implemented as it is while suggesting Service Providers to Customers. As the Job Recommendation systems, up till now only considers Educated People or requires complex form filling and document submitting to get registered into the system. There is a need to revise such system so that it benefits not only the Customers but also the Service Providers i.e. the Ones providing the Services. An Unbiased and Rational system is the need of the hour.

The recommender systems are being used in every possible system for example, clothes recommendation, book recommendation etc. However, the type of recommendations provided may be different according to the domain of its use. [1]

## II. LITERATURE SURVEY

According to literature survey after studying various IEEE and some other Journal papers, we collected some related papers and documents. Some of the points described here are:

### A. Job Recommendation System Using Profile Matching and Web-Crawling. [1]

1) Authors: Deepali V Musale , Mamta K Nagpure, Kaumudini S Patil, Rukhsar F Sayyed

In this Paper, two matching methods are used: semantic matching, tree-based knowledge matching and query matching. Based on profile similarity degree, preference lists of companies and students are generated. These methods are integrated as per the representations of attributes of students and companies, and then the profile similarity degree is acquired. Also, web crawling is used to obtain information from the Internet.

### B. Matching People and Jobs: Bilateral Recommendation Approach. [2]

1) Authors: Jochen Malinowski, Tobias Keim, Prof. Dr. Oliver Wendt, Prof. Dr. Oliver Wendt

In this paper, it is highlighted that that a good match between persons and jobs needs to consider both, the preferences of the recruiter and the preferences of the candidate. Based on this requirement for modelling bilateral selection decisions, they have proposed an approach applying two distinct recommendation systems to the field to improve the match between people and jobs.

### C. A Job Recommender System Based on User Clustering. [4]

1) Authors: Wenxing Hong, Siting Zheng, Huan Wang\*

In this paper, they have provided a comprehensive investigation of four online job recommender systems (JRSs) from four different aspects: user profiling, recommendation strategies, recommendation output, and user feedback. Also, they have summarized the pros and cons of these online JRSs and highlight their differences. And have also discussed the challenges in building high quality JRSs (Job Recommendation Systems).

### D. Job Recommender Systems: A Survey [5]

1) Authors: Zheng Siting, Hong Wenxing\*, Zhang Ning, Yang Fan

In this paper, the introduction of some basic concepts of user profile and some common recommendation technologies based on the existing research is done. Also, the survey of some typical job recommender systems which has been achieved. Also, a general comprehension of JRSs is then presented.

### E. Machine Learning Algorithms for Recommender System - a comparative analysis of machine learning algorithms [6]

1) Authors: Satya Prakash Sahu, Anand Nautiyal, Mahendra Prasad

Here the authors have compared Content Based Filtering, Collaborative Based Filtering, Hybrid Content-Collaborative Based Filtering, k-mean clustering and Naïve Bayes classifier and have exploited these algorithms to their extreme to achieve the best possible precision and have presented a comprehensive comparative analysis by also considering the Cold Start Problem which usually occurs in the starting phase of any Recommendation Systems.

## III. PROPOSED SYSTEM

### A. Algorithms to be used

1) *Naïve Bayes*: Naïve Bayes classifiers are highly scalable, requiring many parameters linear in the number of variables (features/predictors) in a learning problem. Naïve Bayes is a simple technique for constructing classifiers: models that assign class labels to problem instances, represented as vectors of feature values, where the class labels are drawn from some finite set. Maximum-likelihood training can be done by evaluating a closed-form expression, which takes linear time, rather than by expensive iterative approximation as used for many other types of classifiers. In machine learning, naive Bayes classifiers are a family of simple probabilistic classifiers based on applying Bayes' theorem with strong (naive) independence assumptions between the features. It is not a single algorithm for training such classifiers, but a family of algorithms based on a common principle: all naive Bayes classifiers assume that the value of a feature is independent of the value of any other feature, given the class variable. For example, a fruit may be considered an apple if it is red, round, and about 10 cm in diameter. [11] A naive

Bayes classifier considers each of these features to contribute independently to the probability that this fruit is an apple, regardless of any possible correlations between the color, roundness, and diameter features. [11]

- 2) *k* - nearest neighbour : In pattern recognition, the k-nearest neighbors algorithm (k-NN) is a non-parametric method used for classification and regression. [10] The k-NN algorithm is among the simplest of all machine learning algorithms. k-NN is a type of instance-based learning, or lazy learning, where the function is only approximated locally and all computation is deferred until classification. [10]

For both classification and regression it is a useful technique that can be used to assign weight to the contributions of the neighbors, such that the nearer neighbors contribute more to the average than the contributions made by more distant ones. In both cases, the input consists of the k closest training examples in the feature space.

The output of this algorithm depends on whether k-NN is being used for classification or regression: In k-NN classification, the output of the algorithm would be a class membership. An object is classified by a majority vote of its neighbors, with the object being assigned to the class most common among its k nearest neighbors (k is a positive integer, typically small). If k = 1, then the object is simply assigned to the class of that single nearest neighbor. [10] In k-NN regression, the output is the property value for the object. This value is the average of the values of its k nearest neighbors. [10]

The neighbors are chosen from a set of objects for which the class (for k-NN classification) or the object property value (for k-NN regression) is already known by us.

This can be imagined as the training set for the algorithm, although no explicit training step is required. For example, let's consider a common weighting scheme in which each neighbor is given a weight of  $1/d$ , where d is the distance to the neighbor. A peculiarity of the k-NN algorithm is its sensitivity to its local structure of the data. This algorithm should not be confused with k-means which is another popular machine learning technique.

### B. System

The Proposed is a 3-tier architecture based Server- Client System. This system considers both the Customers requirements and the Service Provider's need/demands.

Here from Customer's point of view we consider

- 1) Type of Service Needed
- 2) Estimated Budget
- 3) Location Preference
- 4) Availability
- 5) Type of Service preferred (Home Delivery or not)
- 6) Timings etc.

And from Service Providers point of view we consider

- 7) Need for Job/Customers
- 8) Time Flexibility
- 9) Availability
- 10) Expected Salary for each Service
- 11) Preferred Location of work (for Drivers, Maids, etc.)
- 12) Part Time/Full Time etc.

Considering all such factors from both the Customers as well as Service Providers point of view helps building a much more Rational, Efficient and Unbiased Recommendation System. Such system is not commercial based and it does not require any ratings to work.

This System considers most of the Real-Life Factors as Feature sets. The Input for this System will be the Customer Preferences for the Type of Service (TOS). We will then use a Classifier based on K-NN and Naïve Bayes to suggest a suitable Service Providers to the Customer. This Classifier will also consider Service Provider's demands as well to become more Robust. Finally, the Output of the system would be a list of all those people i.e. the Service Providers who are eligible to meet the Customer's needs.

This way our system will be recommending the eligible and suitable Service Providers to the Customers. This System will be Robust as it considers real life factors, unbiased and rational as it doesn't consider ratings.

#### IV. SYSTEM DESIGN

The following is the design of the Proposed system. The Customer Needs are taken using a GUI based device. The Classifier are built using both Naïve Bayes and K-NN and merged for better results. Data Preprocessed is fetched by these Classifiers. The result would be a list of the eligible service providers. The list is then directed to the System.

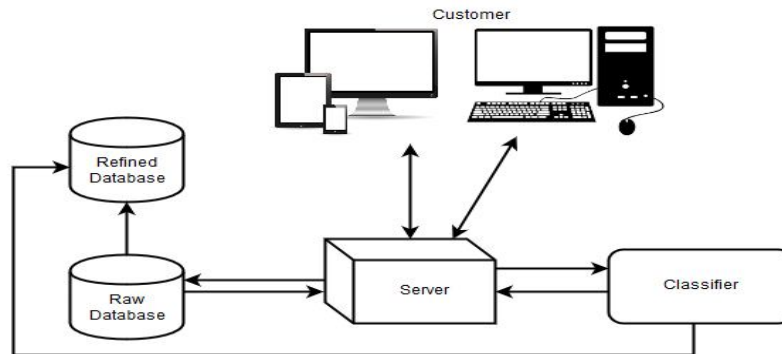


Fig 1: System Architecture of the Proposed System

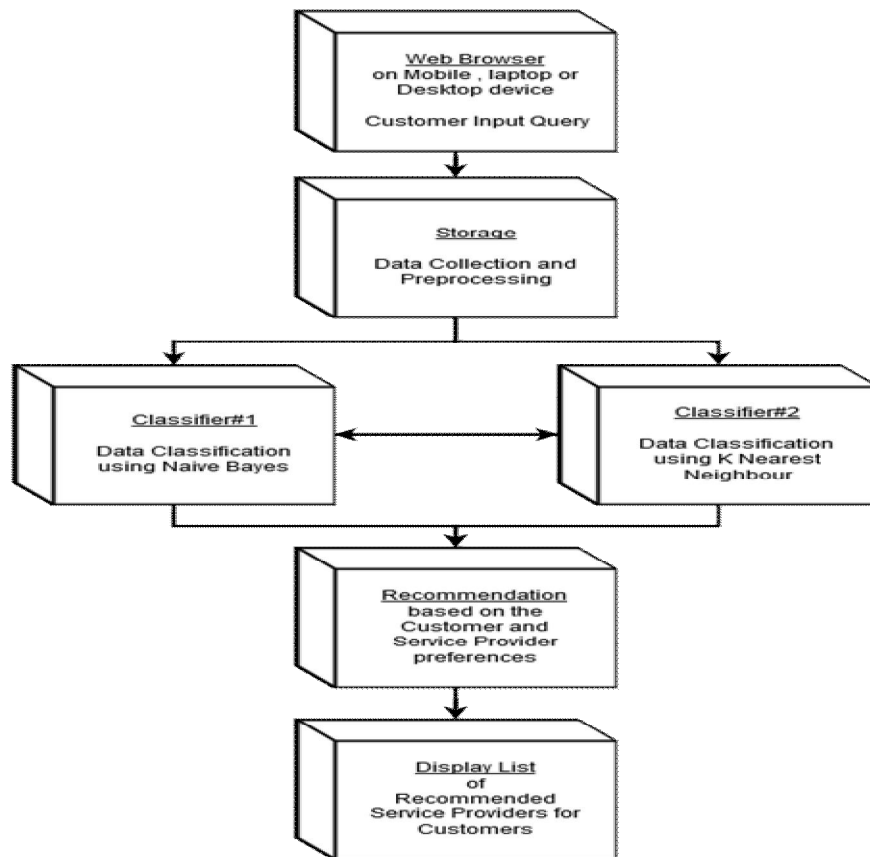


Fig 2: Phases of the System

#### V. SYSTEM DESIGN

The Proposed System has the following edge over the current system

- A. Unbiased and Rational
- B. Real Life Factors considered while building classifier
- C. Simple and Efficient to use even for less educated.
- D. Considers even Service Providers needs and demands.

## VI. CONCLUSION

This system would benefit those categories of people who rely on their traditional profession as their source of income. Customers will be benefitted too and would get a chance to explore their locality and the Services available in their locality. Also, it would help their grow and expand their business. This System would become more and more accurate with more features set. Also, use of native language support can be implemented as well to attract more people to use this System.

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