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Review on HR Assistance Tool

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Abstract - *In the recruitment process, there is a huge workload on the Human Resource (HR) department to select the right candidate for a particular job profile from the number of applicants. This leads to a decrease in the efficiency of the HR person, which indirectly results in the selection of candidates not suitable for that job profile. So our aim with this paper was to overcome this problem, with the help of a proposed system that tries to design a tool to integrate the Job Characteristics Model into the HR system. The proposed system also contains the module which assists the Manager person to analyze the performance of employees. The system would be used for predicting suitable candidates according to business requirements, thus reducing the workload of the Human Resource department.*

Key Words: **OCEAN Model, Personality Prediction, Naïve Bayes, K-Nearest Neighbor (KNN), Support Vector Machine (SVM), XGBoost**

1. INTRODUCTION

Today there is a growing interest in the personality traits of a candidate by the organization to better examine and understand the candidate's response to similar circumstances. In this system HR can add some criteria like personality required, roles and responsibilities, etc. and the system automatically examines whether the candidate fits for a job role or not. So the primary aim of the system is to conduct a personality prediction test that determines the personality of the candidate. Finally, it presents the results of the candidates to the recruiter who then evaluates the top candidates and shortlists them for the next rounds of the process. The system also contains a facility to send auto-generated emails to the top candidates. For personality prediction, the system uses the Big Five personality traits, namely Openness to experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism, forming the abbreviation (OCEAN).

2. LITERATURE SURVEY

Evanthia Faliagka, Athanasios Tsakalidis, Giannis Tzimas [1] proposed an E-recruitment system which is based on Analytic Hierarchy Process (AHP), a ranking algorithm. It ranks the candidates depending on the features extracted from the Linkedin account.

Linden, Dimitri and te Nijenhuis, Jan [2] proposed the methodology using the General Factor of Personality (GFP) which occupies the top hierarchical personality structure and it is highly related to the supervisory-rated job performance.

Manil Vaidhya, Bikash Shrestha, Bishal Sainju, Kiran Khaniya and Aman Shakya [3] proposed the system that predicts the personality of the Facebook users based on the user's status updates by using K-Nearest Neighbor (KNN) and Support Vector Machine (SVM) algorithm along with the Big Five personality model.

Michael M. Tadesse, Hongfei Lin, Bo Xu, and Liang Yang [4] proposed a paper that investigates the predictability of personality traits of Facebook users based on various features. Uses the Personality project dataset to examine the presence of structures of social network and linguistic features relative to personality interactions. By comparing four machine learning models and performing the correlation between each of the feature sets and personality traits, concludes that the prediction system built on XGBoost classifier gives average performance for all the feature sets.

Dr. S. F. Sayyad, Shrushti Bhingardive, Preeti Ghatnekar, Kajal More, Prashant Rajendran [5] proposed the system which conducts automated resume extraction for selecting candidates based on their knowledge.

3. Analytic Hierarchy Process (AHP)

Analytic Hierarchy Process (AHP) is a decision-making technique. It is used for managing problems that involve the consideration of multiple criteria simultaneously. In this method different sets of evaluation criteria along with a set of alternative options are considered among which the best decision is to be made. It provides a numeric scale for the measurement of quantitative as well as qualitative performance.

This method consists of three steps:

1. Break the problem and structure into a hierarchy of subproblems
2. Collect and measure the data through pairwise comparisons of the criteria
3. Calculate priority weights for each criterion Criteria with a higher weight is considered to be the most important one.

4. K-Nearest Neighbor (KNN)

KNN is of great help for personality classification [3]. KNN is the supervised machine learning algorithm used for both classification and regression problems. This algorithm assumes that things with similarities between them exist in close proximity. KNN is a non-parametric algorithm and it does not make any assumptions based on the underlying data.

KNN uses 'feature similarity' to predict the values of new data points which further means that the new data point will be assigned a value based on how closely it matches the points in the training set. It determines the class of a data point by the majority voting principle. The K closest points in the training data are considered and then a new point is placed in the class with higher votings. For this it uses distance metrics to define proximity between any two data points. Some of these distance metrics are Euclidean distance, Mahalanobis distance or Hamming distance.

5. Support Vector Machine (SVM)

The support vector machine is a Supervised Machine Learning model. It is used for both classifications as well as regression. However most commonly it is used for the classification problems in machine learning. It is proven to be useful for the classification of trait score which helps in the personality prediction [3].

Support vector machine (SVM) use a mechanism called kernels, which essentially calculate the distance between two observations. It takes data points as input and outputs the hyperplane that best separates the classes. This hyperplane is a decision boundary. The hyperplane which gives maximum margin is considered as the best hyperplane. SVM considers the extreme points/vectors for creating the hyperplane. These extreme cases are called support vectors, and hence algorithm is termed as Support Vector Machine.

6. XGBoost

The study has shown that XGBoost gives the highest personality prediction [4]. It stands for e**X**treme **G**radient **B**oosting. It is an open-source software library that primarily focused on computational speed and model performance. XGBoost is an ensemble learning method. XGBoost is one of the implementations of the Gradient Boosting concept. To control overfitting, XGBoost uses a more regularized model formalization that makes it unique. So, it helps to reduce overfitting.

It implements machine learning algorithms under the Gradient Boosting framework. It provides a parallel tree boosting that solve many data science problems in a fast and accurate way. Also for computing the best split, it uses a pre-sorted algorithm & Histogram-based algorithm. Automatic feature selection is possible with the help of XGBoost.

7. Naïve Bayes Classifier

Naïve Bayes classifier works on the probabilistic predictions which makes it highly scalable and very reliable for personality prediction based on the trait score. It assumes that all the input features are independent of one another and so it is called "naive". It is based on the Bayes Theorem which finds the probability of an event occurring given the probability of another that has already occurred.

In the Bayesian analysis, the prior and the likelihood are used to form a posterior probability in the final classification using the Bayes' rule.

Table -1: Algorithms Comparison

Approach	Merits	Demerits
AHP	It allows multi criteria decision making	Difficult to use if number of criteria is high i.e., more than 7
KNN	1. Simple to implement 2. Flexible to feature/distance choices	1. Large search problem to find nearest neighbors 2.Large storage
SVM	1.Robust against overfitting, especially in high-dimensional space 2. Can model non-linear decision boundaries, and there are many kernels to choose from	1. memory intensive 2. For larger datasets, don't scale well
Naïve Bayes Classifier	1. Prediction of the class of test data set is easy and fast. 2. Multi class prediction can also be performed	If the category in the test data set is not present in the training data set, then it gives 0 probability for that category and will be unable to predict the class
XGBoost	1.Easily interpretable, are relatively fast to	If predictors with many categories occurs then faces

	construct. 2. Can deal with both continuous and categorical data	problem of overfitting

8. CONCLUSION

In this paper, we offer a brief review of the different approaches used for personality prediction. Personality prediction is very useful to ease the work of the Human Resource (HR) team. And also due to the prediction of personality, the right candidate can be chosen for a particular job. For this, different methods and approaches can be used and each one has its own advantages and disadvantages. So a lot of work is still to be done which can be accomplished by choosing the right algorithm and then developing the model accordingly.

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