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A Predictive Model using Personality Traits

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ABSTRACT: Finding the right career is an important task, but with so many new career options and opportunities appearing every day, it can be difficult. According to the CSIR, over 40% of students select the incorrect profession as a result of their misunderstanding. As a result of poor selection, students become less productive. It is essential to choose the right profession at the appropriate age in order to prevent undesirable results brought on by making the wrong decision. Choosing a vocation is a key duty for the generation of today as the world grows more technical. The students who are interested in various areas are most impacted by this issue. Nobody ever asks the youngster what he or she is interested in; everyone wants their kids to be engineers or doctors. In addition, parents frequently worry about the future of their kids. Therefore, this software has advantages for both parents and pupils.

KEYWORDS: Language Models, Personality Prediction, Psycholinguistic Features, NLP, MBTI.

I. INTRODUCTION

Apparently are many new job prospects in every subject due to the growth of research and study in several domains. This makes choosing a job for pupils who are concentrating in 10th or 12th grade much more difficult. Self-incapacity and self-character features ignorance, ignorance of the different possibilities available, comparable premiums in many professions, a lack of presentation, an overload of advertisements, planned public actions, peer pressure, etc. are some causes of this perplexity. These problems may cause the understudy to choose a job that is not a good fit for them, which could result in work disappointment, poor performance, stress, and other undesirable results, such as social negligence. Therefore, the understudy's interest in and ability to work in a certain subject need to be given the necessary supervision.

Recruiters use prediction systems to evaluate candidates for various roles, such as Database Administrator, Business Process Analyst, Developer, Testing Manager, Networks Manager, and Data Scientist. These systems analyze skills, talents, and interests to place candidates in the right job. These systems are used in third-party performance evaluation portals like Co-Cubes and AMCAT, which consider factors like technical abilities, psychometry, sports abilities, academics, hobbies, interests, competitions, skills, and knowledge. Due to the large number of input parameters and output classes, advanced machine learning algorithms like SVM, Random Forest decision tree, OneHot encoding, and XG boost are used.

Our career is one of the most important things that will affect our future. A number of new work opportunities have emerged as a result of modernization, but on the other hand, an increasing number of graduates graduate each year, increasing competition. It is also vital to be aware of their hobbies, abilities, and shortcomings in order to offer the best profession option that fits their personality and talents. Since we live in an era of information, data is continually expanding in a wide range of fields. Useful knowledge is gathered from this data and used to a variety of changes.

A. *Personality Traits:*

The phrase "personality traits" refers to a group of comparatively consistent thought, feeling, and behaviour patterns that have been connected to a number of key life choices and outcomes. Particularly, personality traits have frequently been connected to interpersonal results (such as relationship satisfaction), social institutional outcomes (such as profession choices, work success), and personal outcomes (such as happiness, psychopathology). Since internet data on human behaviour and preferences (i.e., digital footprints) can be used to automatically predict people's levels of personality traits, there is growing interest in developing such models.

Need of Personality Traits?

1) Recommender systems

2) Product and service personalization

3) Career Analysis

4) Job screenings

5) Social network analysis

6) Sentiment analysis

B. *Career Analysis:*

Once a one-time event, choosing the greatest university or college no longer signifies the end of career planning. It keeps going till we locate the appropriate job and a rewarding work profile. After completing their degree, people frequently select a path based on their previous greatest accomplishment. Students that score in the top 90 percentile in science, as well as in commerce and all other courses, aspire to become engineers or physicians. The majority of the time, it turns out to be a hasty or bad choice. The standards by which we evaluate our profession choice are still flawed.

Most Common Factors that Influence the Career Choice Among Students:
Parents' Desire/Parental
1) Pressure Peer Persuasion
2) Past Performance
3) Potential
4) Placements
5) Personality Driven
6) Affordability

C. *MBTI:*

An introspective self-report questionnaire called the Myers-Briggs Type Indicator (MBTI), which is employed in personality typology, identifies different psychological tendencies in how people interpret the world and make judgments. It is regarded as pseudoscience by the majority of people while being widely acknowledged by the scientific world. The four areas that the test attempts to rate are extraversion or introversion, sensing or intuition, thinking or feeling, and assessing or perceiving. One letter from each group is chosen to form four-letter test results like "INTJ" or "ESFP."

Fig.1. MBTI Types

II. LITERATURE REVIEW

Ashutosh Shankhdhar Et al. [1], the study aims to improve career recommendations by analyzing a student's personality traits, interests, and readiness to enroll in courses. It recommends the best universities based on location and tuition costs. Academic performance is assessed to determine a student's skills for a specific vocation. Factors like gender, nationality, age, class attendance, extracurricular activities, attention, and online course capabilities are also considered.

Data-driven techniques like KNN, Neural Networks, K-means clustering, and D-Tree are used to predict careers. The system functions as a career counseling tool, requiring students to submit academic records, take an aptitude test, and provide information about interests, grades, and other factors.

Vignesh S Et al. [2], This article proposes a career system that uses objective tests to predict the best department for individuals based on their skills. The system automatically selects the correct course after an online evaluation, reducing the failure rate due to incorrect career choices. The system uses various datasets, appropriate career analysis, and improved visualization. Techniques like HTML, CSS, Flask-API, Neural Networks, and K-means clustering were used. The success rate in each cluster is calculated for department recommendation purposes. The web-based application for career guidance was developed after extensive research.

Yash Mehta Et al. [3], The researchers developed a new deep learning model for predicting language-based personality traits using language model embeddings and psycholinguistic features. They found that psycholinguistic characteristics that model language typically outperform those that don't. The BERT-base + MLP model outperformed BERT-large + MLP in predicting Big Five personality traits and MBTI dimensions. The models performed better on the Essays dataset and Kaggle dataset, outperforming existing models by 1.6% and 1%, respectively. The results partially align with earlier psychological studies.

Kartikey Joshi Et al. [4], A system has been developed to help students decide the best career path for their future, enhancing their performance and allowing them to focus on their desired job. The system is based on a test that students take, and based on their responses, it provides a summary of the artificial intelligence methods used to forecast student success. The system also focuses on identifying attributes in student data using prediction algorithms. This technique is beneficial for educators, educational institutions, and students. However, the system has flaws, such as the absence of a personality test and accuracy based on specific features. The system uses terms like SVM, Decision Tree, Artificial Intelligence, and Student Career Prediction.

Md. Yeasin Arafath Et al. [5], The study used classification to analyze survey data on successful alumni and forecast the careers of final-year students based on desirable characteristics. The data was analyzed in terms of academic, technical, and interpersonal aspects of the alumni's undergraduate careers and current work. The models were trained using the responses of running students who finished their third year, using the same quality criteria as test sets. Various classification methods were used, and performance metrics like accuracy, precision, recall, and f-measure were assessed. To increase diversity, multiple datasets were used. The study suggests that more machine learning methods, such as ID3, Random Forest, and Cart, could be used.

Chanchal Suman Et al. [6], A paradigm has been developed to predict a user's personality from videos using background, facial, and audio features. The big-five personality traits, Extraversion, Neuroticism, Agreeability, Conscientiousness, and Openness, are commonly used. This framework has practical applications in forensics, recommender systems, and personalized services. The system uses a publicly available dataset in Chalearn-16 to assess its performance. Experiments show that using a small number of video photos yields better results than using the entire collection. The Fac-model visual architecture is similar to Ambvisual's model architecture for extracting features.

Madhura Jayaratne al. [7], The authors used natural language processing and machine learning techniques to estimate HEXACO trait values from textual material. They found that term frequency-inverse document frequency (TF-IDF) with Latent Dirichlet Allocation (LDA) themes performed best, with an average correlation of r=0.39. IBM's Personality Insights service and Facebook messages-based inference of Big 5 personality showed an average correlation of r=0.31. The study used information from over 46,000 job applicants who participated in an online chat interview and a personality questionnaire based on the six-factor HEXACO personality model.

Zhanming Guan Et al. [8], Personality2vec is a network representation learning model that uses semantic, personality, and structural data in users' messages to predict Big Five personality ratings. It uses a biased walk algorithm and skip-gram method to train on the network, producing a personality vector for each user. Experimental results show that Personality2vec outperforms seven widely used approaches, which primarily focus on grammatical and semantic content. Recent years have seen the emergence of deep learning and NLP technology, which combines semantic features with linguistic features for personality prediction. The model outperforms other techniques in this area.

Z. Mushtaq al. [9], The article proposes a method for analyzing user data from social media sites by combining two existing machine learning methods, K-Means Clustering and Gradient Boosting, to identify user personality type. The study also contributes to the analysis of the relationship between a user's personality and the data they post on social media. The Myers-Briggs Type Indicator (MBTI), developed by Swiss psychiatrist Carl Jung, is used in the analysis. This tool is a well-known personality assessment tool used to determine a person's personality type, areas of strength, and personal preferences. However, the system may be erroneous as it requires consumers to fill out questionnaires for personality insights.

Hans Christian Et al. [10], A new prediction model has been developed that uses pre-trained language models like BERT, RoBERTa, and XLNet, along with a deep learning architecture. The model uses bidirectional context features and extraction methods to predict attributes from social media data sources like Facebook and Twitter. The model achieves a maximum accuracy of 86.2% and a 0.912 f1 measure score on the Facebook dataset, and 88.5% and a 0.882 f1 measure score on the Twitter dataset. The model uses tools like BERT, RoBERTa, XLNet, NLP Features, and the Big Five personality model. The model is often used as the de facto standard for personality evaluation.

III. PROPOSED ALGORITHM

A. *Problem Statement:*
Aim of the proposed algorithm is to implement a Predictive Model for the Career Analysis using MBTI Trait and psycholinguistic features.

B. *Problem Elaboration:*
The set of pertinent skill criteria, interpersonal dynamics, and academic variables truly determine how accurate a prediction is. This system functions as a career counselling system in which students provide their academic records, take an aptitude test, and fill out information about their hobbies, grades, and other interests. The system then makes a recommendation for a suitable vocation for that student. This approach is useful in identifying the student's intrinsic characteristics, which are taken into account while choosing a career.

C. *Proposed Methodology:*
The system will allow the user or learner to complete a questionnaire to predict their personality before presenting them with a job that matches them while also taking into consideration specific choices or preferences expressed. However, SVM, OneHot encoding, Decision trees, and XG boost are employed in this instance. We evaluate the algorithm that produces the best accurate results after training and testing the data with it when processing it further. Therefore, the first goal is to forecast the output using all of the techniques mentioned above. The results are then analyzed, and the task is then continued using the most accurate approach. Finally, this study discusses a number of cutting-edge machine learning algorithms that combine categorization and prediction in order to increase the accuracy of predictions, reliability, and performance evaluation.
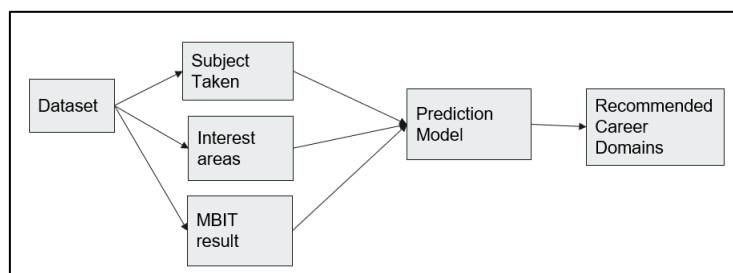

Fig.2. Proposed system Block Diagram

III.C.1 *SVM:*
Support Vector Machine is an acronym. It is a supervised machine learning technique that is typically applied to issues involving classification and regression. Various categorization issues are where this is mostly applied. The standard algorithmic step is to plot each data point in an n-dimensional space, where n is the

number of features and each feature's value corresponds to a certain coordinate value. The following step is to categorize by obtaining the hyper-plane that sharply divides the two classes. Practically speaking, kernels are used to implement SVM algorithms. There are three different forms of SVMs, and the linear SVM hyperplane is computed or discovered by using linear algebra to the issue. The realization is that the inner product of two observations may be used to rewrite SVM. The inner product of two vectors is the total of all input pair multiplications.

The equation for dot product of a input xi and support vector xi is:

$f(x) = B0 + sum(ai * (x,xi))$.

Instead of using the dot-product, a polynomial kernel can be used, for example:

$K(x,xi) = 1 + sum(x * xi)^d$

And not only that a more complex radio kernel is also there. The general equation is:

$K(x,xi) = exp(-gamma * sum((x – xi^2))$

III.C.2 *XG Boost:*

It is a supervised machine learning technique that is typically applied to issues involving classification and regression. Various categorization issues are where this is mostly applied. Extreme Gradient Boosting is referred to as XGBoost. The XGBoost putting gradient boosting methods into practice. It is accessible in a variety of formats, including tool, library, etc. It primarily concentrates on computational efficiency and model performance. It significantly shortens the time and significantly improves the performance of the model. Scikit-Learn and other functionalities are included in its implementation. R implementations have recently added features as well similar to regularization. Gradient boosting using both L1 and L2 type regularizations is referred to as regularized gradient boosting. The following are the key benefits that the algorithm's implementation offers: handling missing data automatically with sparse aware implementation, and it offers block structure to encourage parallel tree generation and ongoing training that helps further enhance an already fitted model on new information. Using a technique called gradient boosting, new models are created that may anticipate the flaws or remnants of older models, which are then combined together to get the final forecast. For the purpose of minimizing loss when adding new models, they employ gradient descendent techniques. They help problems involving categorization and regression. Typically, an objective function is specified in the training portion. Create an objective function, then work to improve it.

$obj = i=1 \sum l(yi, yi^{(t)}) + i=1 \sum \Omega(fi)$

III.C.3 *Decision Tree:*

Decision trees are quite well-liked and one of the straightforward and categorization issues with machine learning that are simple to implement. Many sophisticated algorithms, like bagging, gradient boosting, and random forest, have their roots in decision trees. The more sophisticated variation of the XG Boost algorithm is such a broad decision tree. the standard judgment trees are CART, C4.5, C5, and ID3 types. Assuming that the input variable (X) exists, a node represents a split on that variable is a number. The leaf, also known as the terminal Nodes in the tree have a crucial output variable (y) to be predicted.

A decision tree often chooses a root node as the initial step in its process. Before the split, figure out the information gain or entropy for each node. Decide which node has less entropy or higher information gain. Repeat the operation by splitting the node once more. The procedure is repeated until there is no chance for splitting or the entropy is at its lowest point. The metric used to gauge data uncertainty or unpredictability is called entropy. The metric used to gauge the amount of entropy reduction from before to after splitting is called information gain.

$$H(S) = \sum_{x \in X} -p(x) \log_2 p(x)$$

$$IG(A,S) = H(S) - \sum_{t \in T} p(t) H(t)$$

IV. IMPLEMENTATION

A. *Data Collection:*

Data collection is one of the most significant and vital responsibilities of any computer learning initiatives. because data is the input, we provide the algorithms. Consequently, the effectiveness and Accuracy depends on how well and accurately the data is gathered. The result will be the same as the data. Many factors, such as student performance, are necessary for student career prediction academic standing across a range of disciplines, specialties, ability in programming and analysis, memorization, and personal information about a relationship, hobbies, interests, sports, contests, seminars, certificates, hackathons, and books that are plenty more. All of these characteristics are taken into account since they are crucial in determining how far a student will advance in a certain vocational field. Many methods exist for gathering data. Some of the data is gathered from people working for various companies, some is gathered via the LinkedIn API, some is produced at random, and some is gathered from a database of college graduates. A total of around 20,000 records with 36 columns of data are gathered.

Each occupational and personality category uses information from the Kaggle MBTI dataset. This information, which offers a wide diversity of people participating in informal online social contact, was acquired from the PersonalityCafe community. In 8675 records in this dataset, users' most recent 50 website comments are reported together with their MBTI binary personality type. It has a size of roughly 8.7GB. JSON and image formats are both supported. We'll convert the JSON datasets into CSV files. Several domain-related parameters will be present in the suitable dataset.

B. *Data Pre-processing:*

Making the data meaningful is a crucial effort that goes hand in hand with gathering the data. Data gathered through a variety of methods will be stored an there may be many null values, incorrect data values, and undesired data in a disorganized manner. Removing all of this data and substituting them with more accurate or suitable data and replacing missing and empty data with the appropriate values. The fundamental steps of pre-processing involve certain predetermined alternative values of the data. Even acquired data might have entirely useless values. It might not be in the precise shape or manner in which it was intended. To make data relevant and valuable for subsequent processing, all such situations must be checked and replaced with alternative values. Data must be stored in a structured manner.

- Data cleaning had the following goals in mind-
    - Removal of missing data
    - Removal of duplicate entries
    - Remove rows with NaN values

C. *OneHot Encoding:*

OneHot Encoding is a method for converting categorical values from the gathered data into numerical or other ordinal formats so that machine learning algorithms may use them and provide more accurate predictions. Simply Categorical values are transformed by OneHot encoding into a format that is most suitable for feeding as input to various machine learning techniques. Nearly any machine learning algorithm is compatible with this algorithm. Only a few algorithms, like random forest, effectively handle categorical data. In these circumstances, OneHot encoding is not necessary.

Although the OneHot encoding process may appear challenging, most algorithms for machine learning in the present era handle it. Here's a simple explanation of the procedure: In a data, for instance, if Yes and No are examples of values. An integer encoder assigns values. They see it as 1 and 0. As long as we continue this procedure keep the constant values of yes being 1 and no being 0. the time that we Allocate or assign these fixed integers to these specific labels Integer encoding is the term used for this. But consistency in this case is very crucial because if we later reverse the encoding, we should in the event of prediction, back the labels accurately from those integer values.

The following action is to make a vector for each integer value. Let's assume that this vector is binary and has two potential integer values, each with a length of 2. The vector [1,1] will subsequently be used to represent the 'yes' label encoded as 1, with the value 1 being assigned to the zeroth index. Similar to how [0,0] indicates the initial index with

value 0, the "no" label encoded as "0" will be rendered similarly. For instance, [rat, fight, pillow, rat] becomes [0,1,2,1]. This is doing is giving the variable, pillow ret battle, an ordinal attribute. OneHot encoding is necessary for the accurate representation of unique components of a variable since this is ordinarily a characteristic, is typically not required and desirable, and is not typically characteristic. It improves the expressiveness of categorical variable representation.

D. *Training and Testing:*

The final duty is testing, which comes right after data processing and training. Here is where the algorithm's performance. The needed output, as well as the data quality, all seem off. using the massive data collection gathered 20% of the data is set aside for testing, while the remaining 80% is used for training. As previously said, creating the machine to enabling it to learn and develop its capacity for future forecasts depending on the instruction it received. As opposed to testing, which is already having a predetermined data collection and already labelled output. Then the model is evaluated to see whether it is functional or not, and whether it is making the correct forecast. If the majority of forecasts are accurate, the model will have a high accuracy rate and be trustworthy to use moving forward; otherwise, it would be best to update the model. The dataset will continue to grow in strength and accuracy as fresh sets of inputs and the model's predictions are continuously added.

V. SIMULATION RESULTS

All three algorithms were trained and evaluated on the data, and SVM performed the best, with an accuracy rate of 90.3%, followed by XG Boost's 88.33%. Since SVM had the best accuracy, it was decided to use it for all subsequent data predictions. As a result, a web application is created to receive the student's input parameters and then build and present the final forecast. SVM is the background method in use, and fresh predictions are continuously added to the dataset for increased accuracy.
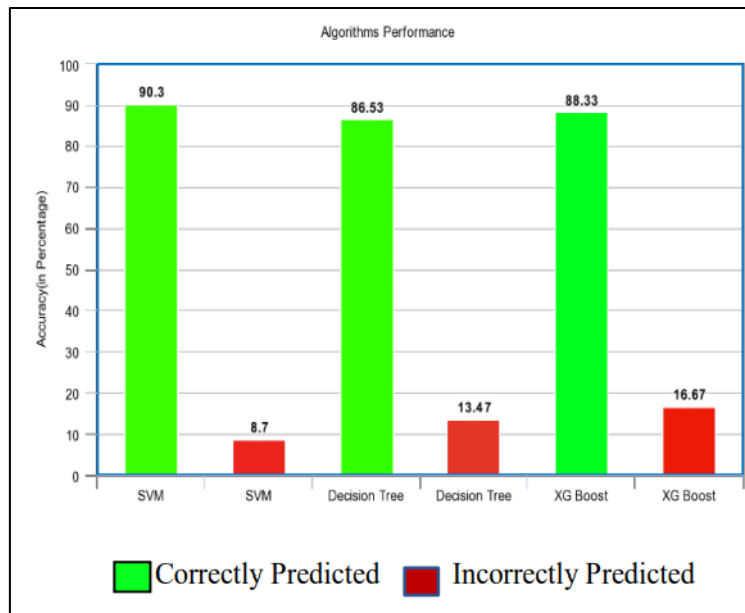

Fig.3. Final Output Graphs

VI. CONCLUSION

The suggested career system would evaluate the data and match a student with the best job option based on their ability after they complete a test and submit information about their grades and hobbies. Additionally, it considers their personality features, outcomes from aptitude tests, and area of interest. Based on exams and records, this website predicted vocations and acted as a career counsellor. This would not only save time and effort, but would also provide a truer portrait of the individual and their career possibilities.

VII. FUTURE WORK

It is possible to create a more potent online application by using student parameters rather than direct inputs to evaluate students using a variety of assessments and examinations. Tests that are technical, analytical, logical, memory-based, psychometric, general awareness, interest-based, and skill-based may be created, and parameters are gathered through them so that findings are more likely to be correct and the system is safer to use.

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BIOGRAPHY

Rutuja Tarale, is currently pursuing M. Tech from VJTI COE, Mumbai. She has done her B.E. (Computer Engineering) from Xavier Institute of Engineering, Mumbai.

Prof. Pramila M. Chawan, is working as an Associate Professor in the Computer Engineering Department of VJTI, Mumbai. She has done her B.E.(Computer Engineering) and M.E.(Computer Engineering) from VJTI College of Engineering, Mumbai University. She has 32 years of teaching experience and has guided 80+ M. Tech. projects and

100+ B. Tech. projects. She has published 140+ papers in the International Journals, 20+ papers in the National/International Conferences/ Symposiums. She has worked as an Organizing Committee member for 21 International Conferences and 5 AICTE/MHRD sponsored Workshops/STTPs/FDPs. She has participated in 14 National/International Conferences. She has worked as NBA Coordinator of the Computer Engineering Department of VJTI for 5 years. She had written a proposal under TEQIP-I in June 2004 for 'Creating Central Computing Facility at VJTI'. Rs. Eight Crore were sanctioned by the World Bank under TEQIP-I on this proposal. Central Computing Facility was set up at VJTI through this fund which has played a key role in improving the teaching learning process at VJTI.

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