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VRUTTI - ALIGNING CAREERS WITH PERSONAL PASSION

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Abstract: Career selection is essentially the process covering the main decision that profoundly affects one's career trajectory and overall happiness with life. Traditional career guidance procedures are generalized psychometric tests together with human counseling, which never usually provide specific recommendations. This paper presents Vrutti, an AI-powered career guidance and counseling system that uses the Ikigai framework to offer personalized career insights. The system employs machine learning algorithms, real-time analysis, and user data-led analytics and thus enables the correct mix of individual interests with skills and market opportunities. Vrutti looks at an individual's strengths, passions, and career aspirations and, based on dynamic industry needs, provides career path recommendations. This paper is set to highlight the architecture, methodologies, and evaluation metrics of Vrutti while demonstrating its efficacy in providing a more holistic and data-driven career path that ought to go in line with contemporary counseling approaches.

Index Terms - Career guidance, Machine learning, Ikigai framework, Career recommendation system, AI in career counselling

I. INTRODUCTION

Career guidance systems have traditionally relied on static psychometric tests, professional counseling, and academic record analysis to offer career advice. However, usually do not take into consideration real-time labor market trends, changing industry requirements, and personality dynamics of the individual, leading to limited adaptability and personalization. To address these limitations, our research presents a data-driven approach to career guidance.

This paper introduces a career recommendation model that integrates predictive analytics and real-time job market insights to provide personalized career suggestions. Our system employs machine learning techniques and well-crafted frameworks like Ikigai—a Japanese philosophy used to explain the overlap of passion, mission, vocation, and profession to offer a holistic career discovery experience. Unlike conventional career counseling, which predominantly relies on generic aptitude-based assessments, our proposed model incorporates dynamic labor market analysis, skill-matching algorithms, and evolving industry requirements to align user preferences with emerging career opportunities. Studies show that the Ikigai framework provides a cognitive motivational model that helps individuals find purpose in their careers [1].

The psychological well-being associated with career choices has been extensively researched. Findings suggest that aligning one's career with personal values and interests significantly improves mental health, emphasizing that career satisfaction is directly linked to overall well-being [2].

With the advancement of artificial intelligence, career guidance systems now leverage machine learning algorithms to provide more accurate recommendations. Research has demonstrated that ML-based career guidance systems analyze user profiles and suggest optimal career paths based on skill sets and preferences [3].

Recent studies have proposed smart career guidance systems that integrate real-time labor market analysis, ensuring that users receive updated career suggestions based on current industry demands [4]. Predictive analytics also plays a crucial role in career recommendations, where machine learning is used to forecast suitable careers based on students' academic performance and personal interests [5].

Online career counseling platforms have been designed to enhance career decision-making by providing structured guidance and digital tools for informed choices [6]. Additionally, predictive models using machine learning have been implemented to suggest careers based on academic records and personal interests [7].

Data mining techniques are also applied in career prediction, where past academic records are analyzed to predict future career success [8]. Science-based career guidance systems have been developed to assist students in STEM fields by utilizing structured career-matching frameworks [9].

Automated career guidance systems integrating handwriting analysis, aptitude tests, and personality assessments have shown promising results in personalizing career suggestions [10]. Personalized career recommender systems tailored for engineering students provide career mappings based on academic performance and industry trends [11].

Furthermore, customized career guidance models have been developed specifically for IT students, considering regional industry needs and skill requirements [12].

The remainder of this paper is structured as follows: Section 2 discusses the literature review. Section 3 describes the methodology for career guidance. Section 4 presents results and discussions.

II. LITERATURE REVIEW AND ANALYSIS

This section presents a thematic analysis of the reviewed literature, offering a comprehensive understanding of existing research on career alignment and the application of machine learning in personalized career guidance.

2.1 An Intelligent Career Guidance System using Machine Learning

Vignesh S, Shivani Priyanka C, Shree Manju H, Mythili K
Date: 2021

This document presents an intelligent career guidance system that, based on machine learning, will help 18-year-old students in choosing engineering careers. The system evaluates a student's skill through an objective assessment and obtains predictions of suitable departments based on students' strengths. The system comprises three main modules: that of skill assessment, of prediction using machine learning algorithms, and of results analysis, giving detailed performance insights. The prediction module is aimed at achieving near-perfect results when K-Nearest Neighbors algorithm on classification is utilized. With the grouping of departments, K-Means Clustering allows students to receive both secondary and tertiary recommendations. This system was developed using Python, Flask API, and web technologies, training with a custom dataset with upward of 500 entries. This system offers an innovative way in combining assessment of skills along with machine learning to provide data-driven recommendations, thus promoting enlightened decision-making from industry-relevant angles and strengths that all students need to consider [3].

2.2 Career Guidance System using Machine Learning

Date: May 5, 2021

The paper "Career Guidance System Using Machine Learning" introduces a system designed to help 11th and 12th-grade science students select appropriate careers based on their aptitude, emotional quotient, and personality traits. It comprises a web portal built with HTML, CSS, Bootstrap, MySQL, and PHP, where students take IQ, EQ, and personality tests. The collected data is analyzed using machine learning algorithms, including Naive Bayes, K-Nearest Neighbor, and Random Forest Classifier, with the latter showing the highest accuracy in career recommendations. The system's primary limitations are the reliance on the quality and quantity of the training dataset, the complexity of accurately capturing human personality, and the

dependency on internet access. Regular updates and maintenance are also necessary to keep the system's recommendations relevant and accurate [13].

2.3 PCRS - Personal Career Path Recommender System for Engineering Students

Date: November 20, 2020

The PCRS project aimed at assisting Palestinian secondary school students in university selections focused mainly on engineering. This project included a bouquet of research, data-gathering work, and fuzzy logic with the MBTI system to evaluate students' grades, personalities, and extracurricular capabilities. They built PCRS as a mobile app and tested it with 177 engineers, which led to very little correlation between suggestions and the actual fields of participants. Yet, the project had many limits. These included a tiny test group use only in one area, and looking at just a few factors. It also lacked long-term data to check how well the system worked over time and didn't prove its fuzzy logic part. The study also ignored user input, growth potential ethical issues cultural aspects, and how advisors shape career choices. These gaps show we need more research to make the system better at guiding Palestinian high school students' career picks [11].

2.4 Smart Career Guidance System Using Machine Learning

Date: June 6, 2024

This paper examines how machine learning can assist students in career guidance systems to make well-informed job choices. The system outlined helps students explore their interests and find potential career paths that match their preferences. It gathers and examines relevant data applying machine learning methods to forecast students' strengths and weaknesses, which reveals their areas of expertise. The system uses machine learning to suggest suitable careers for students based on their abilities, interests, and personality traits. This allows students to explore and learn about various job paths that suit them best. The career counselling encourages individuals to think about their passions, goals, skills, qualifications, and more. It helps connect educational routes and job markets to personal self-understanding.

2.5 An Intelligent Career Guidance System Using Machine Learning

Date: March 20, 2022

The paper titled "An Intelligent Career Guidance System using Machine Learning" introduces a web-based application aimed at helping students navigate their academic choices. By leveraging cutting-edge technologies such as Optical Character Recognition (OCR) and machine learning algorithms, this system tackles the uncertainty students often face after finishing secondary education. It does this by objectively assessing their skills. Using the K-Nearest Neighbours (KNN) algorithm for classification and K-Means Clustering for organizing skill sets, the system delivers tailored recommendations that align with each student's strengths. Unlike traditional counselling methods, this innovative approach offers real-time, personalized career suggestions, which not only boosts decision-making accuracy but also helps lower failure rates and ease career-related stress. The paper outlines three main components of the system—Skill Set Assessment, Prediction, and Result Analysis—and measures the model's effectiveness through performance metrics like precision, recall, and the confusion matrix. The authors highlight the system's promise to deliver cost-effective, efficient, and precise career guidance, marking a significant improvement over conventional method.

III. RESEARCH METHODOLOGY

Vrutti is an AI-powered career guidance system that leverages machine learning algorithms to provide personalized career recommendations to users. The methodology for developing this system involves several key steps, including data collection, feature engineering, model training, and evaluation. The first step in the development of Vrutti was to collect relevant data from various sources. This included student profiles, academic records, personality assessments, and job market data. The team curated a comprehensive dataset that encompassed a wide range of variables, including skills, interests, academic achievements, and personality traits. Once the data was collected, the team engaged in feature engineering to identify the most relevant attributes to predict the appropriate career paths. The dataset initially held different value types; one featured text values, while the other comprised numeric values represented as percentages and other factors. To align them for compatibility, the dataset was normalized, converting the values into categorical data. For our model, the training and testing data are partitioned in 80:20 ratio to facilitate effective training and

evaluation. Feature selection techniques were applied to identify the most relevant attributes for career prediction, reducing noise and improving model performance. Machine learning algorithms, including Naïve Bayes, Decision Trees and Random Forest were trained on the processed dataset. The models were evaluated using performance metrics such as accuracy, precision and recall determining the most effective approach for generating personalized career recommendations.

For prediction, the Decision Tree algorithm is used. It works by organizing choices and their possible results into a tree-like structure. The idea behind decision trees is recursive partitioning, which divides the dataset into subgroups at each stage according to a feature that is most important for classification. Both category and numerical data can be used with this highly interpretable and adaptable model. Until a class label is obtained, nodes in a decision tree's structure make decisions. The Decision Tree Algorithm is used in the backend to process user-provided data, and its accuracy is 72%. We developed a website where users can submit data, get predictions and view results.

The framework uses the Flask Application Programming Interface (API) to facilitate communication between the frontend and backend. Through the Flask API, the machine teaming model receives the scores from the discover assessment module. When the model produces a result, the user can examine the predictions in the front-end interface when the Flask API returns the response. Real-time predictions and a fluid user experience are made possible by this architecture, which guarantees a smooth integration between the machine learning model and the user interface.

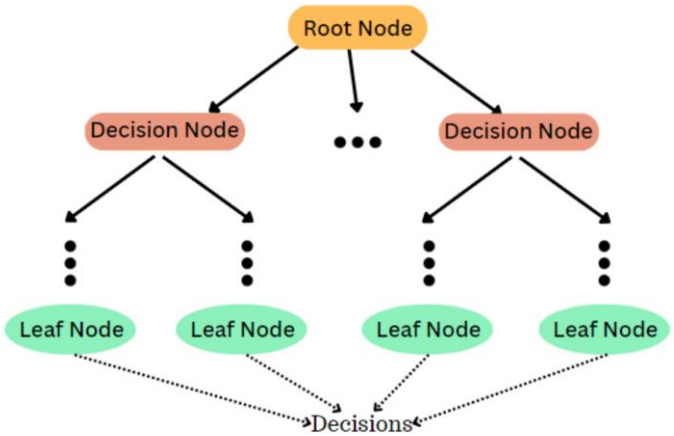


Fig 3.1 Decision Tree Machine learning model

IV. RESULTS AND DISCUSSION

4.1. Machine Learning Model Accuracy

An essential component of our research was evaluating the precision of our machine learning models. With an accuracy rate of roughly 72.63, the Decision Tree model proved to be successful in forecasting appropriate career routes from user input. Despite performing marginally worse, the Random Forest model had an accuracy of 61.63. The Naïve Bayes model, on the other hand, produced an impressive accuracy of 64.70. These results suggest that although our models can detect possible career alignments, their prediction power might be enhanced. The insights produced, however, can nevertheless provide insightful advice for people making career decisions. The detailed accuracy results in Figure 2, 3, 4.

4.2. The Web Application's User Experience

The React-developed online application functioned as a platform for users to enter their interests, talents, and other pertinent data. A smooth user experience was made possible by the application's integration of machine learning algorithms, which let users get tailored job recommendations based on their specific profiles.

4.3. Strengths of the Research

A significant advantage of our research is the web application's extensive design, which is made to support a wide range of users, including those with different professional and educational backgrounds. The application's careful design guarantees that, once it is live, the knowledge gained from our research will be useful to a large audience. Additionally, using machine learning models in our analysis provides a sophisticated framework for spotting patterns and trends that can be difficult to spot using conventional research techniques. In addition to deepening our research, this method establishes the foundation for upcoming testing and verification of the application's efficacy in practical situations. A useful resource for future research, the theoretical underpinnings developed in this study also adds to the body of knowledge already available on career alignment and satisfaction.

4.4. Limitation

However, it's critical to acknowledge some of our research's shortcomings. Due to individuals' differing levels of self-awareness regarding their interests and abilities, the use of self-reported data may introduce biases. Furthermore, even though the sample size was sufficient for our research, our findings may not be as broadly applicable as they may be because it might not accurately reflect the diversity of the broad population. Larger and more diverse user bases could help future research projects make their findings more reliable and applicable.

Decisiontree

```
dtree = DecisionTreeClassifier(random_state=1)
dtree = dtree.fit(x_train, y_train)

y_pred = dtree.predict(x_test)
cm = confusion_matrix(y_test,y_pred)
accuracy = accuracy_score(y_test,y_pred)
print("confusion matrics=",cm)
print("  ")
print("accuracy=",accuracy*100)
```

```
confusion matrics= [[0 0 0 ... 0 0 0]
 [0 3 0 ... 0 0 0]
 [0 0 0 ... 0 0 0]
 ...
 [0 0 0 ... 0 0 0]
 [0 0 0 ... 0 4 0]
 [0 0 0 ... 0 0 4]]

accuracy= 72.63427109974424
```

Fig 4.1. Decision Tree algorithm

```
print(f"Naive Bayes Accuracy: {nb_accuracy * 100:.2f}%")
```

```
Confusion Matrix = [[0 0 0 ... 0 0 0]
 [0 3 0 ... 0 0 0]
 [0 0 3 ... 0 0 0]
 ...
 [0 0 0 ... 0 0 0]
 [0 0 0 ... 0 4 0]
 [0 0 0 ... 0 0 1]]

Accuracy = 64.70588235294117
```

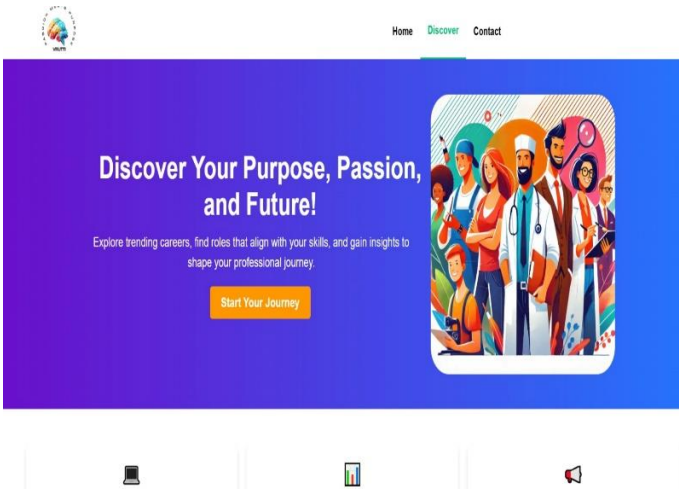
Fig 4.2. Naïve Bayes algorithm

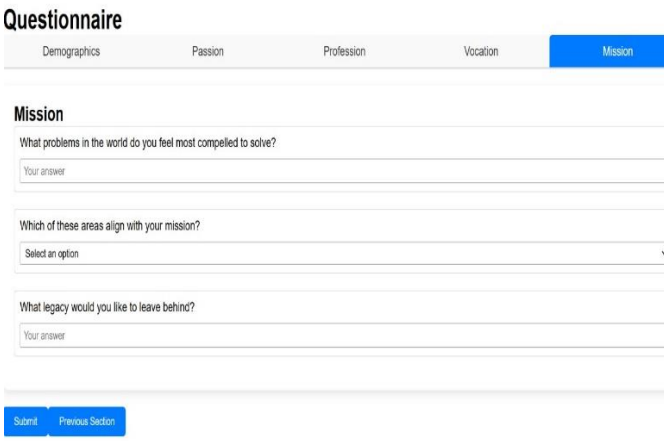
Random forest Ml Algorithm

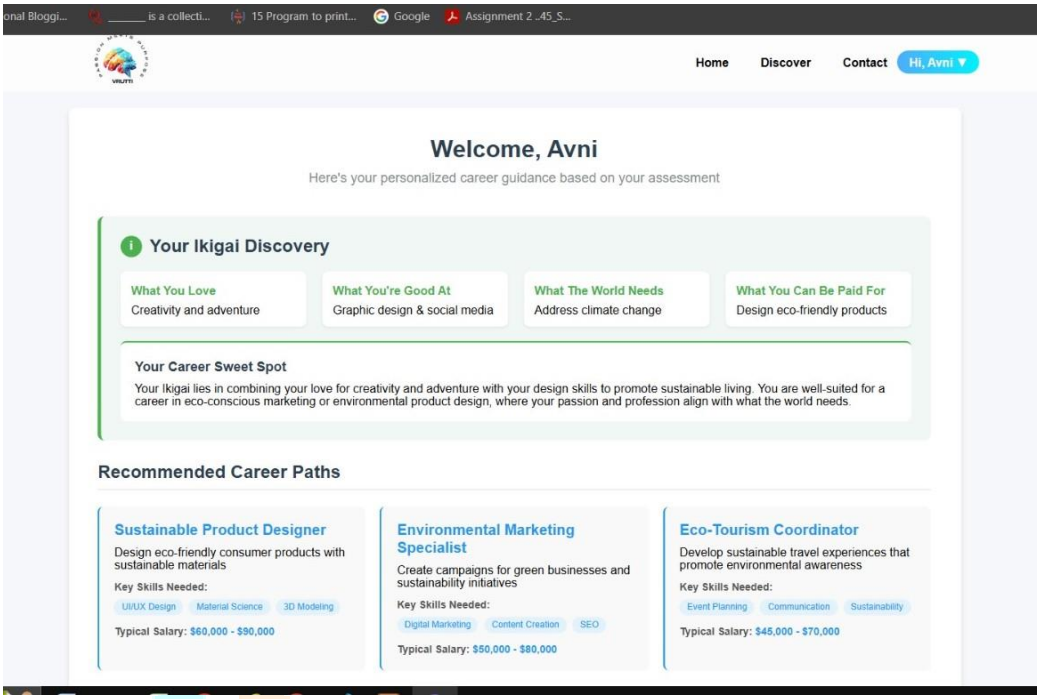
```
rf = RandomForestClassifier(random_state = 10)
rf.fit(x_train, y_train)
rfc_y_pred = rf.predict(x_test)
rfc_cm = confusion_matrix(y_test,rfc_y_pred)
rfc_accuracy = accuracy_score(y_test,rfc_y_pred)
print("confusion matrics=",rfc_cm)
print("  ")
print("accuracy=",rfc_accuracy*100)
```

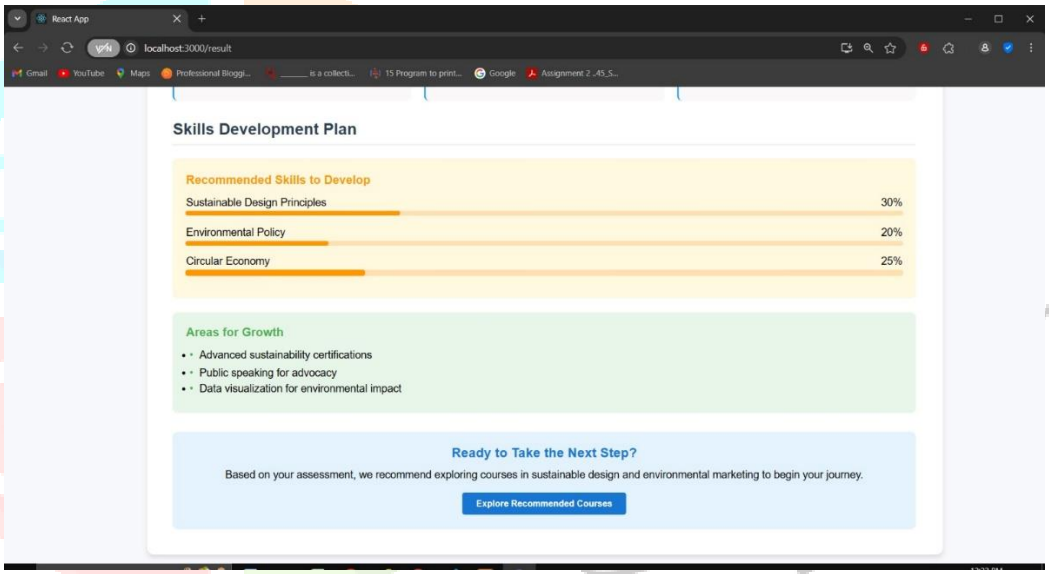
```
confusion matrics= [[0 0 0 ... 0 0 0]
 [0 3 0 ... 0 0 0]
 [0 0 0 ... 0 0 0]
 ...
 [0 0 0 ... 0 0 0]
 [0 0 0 ... 0 5 0]
 [0 0 0 ... 0 0 4]]

accuracy= 61.63682864450127
```









V. CONCLUSIONS

To summarize, the career prediction project effectively employs several machine learning techniques to provide personalized career recommendations, including Decision Tree, Random Forest, in addition to Naive Bayes algorithms. These recommendations are tailored to each person's profile, considering their knowledge, skills, job history and personal attributes. To spot trends and forecast career paths, the models received wide-ranging training through data pre-processing and in-depth analysis. By integrating several algorithms, the system addresses all complex and non-linear relationships within the data, giving users actionable understandings that guide all their career decisions. This project underscores the large potential of machine learning for easing many data-driven career predictions, substantially enabling people to align their strengths and interests with very promising career opportunities. Users can make well-educated decisions. This approach empowers them. Machine learning's wide-ranging transformative role in career guidance, in addition to personal development, is also indicated.

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