ISSN (Online): 2583-648X

IJIRID

International Journal of Ingenious Research, Invention and Development

An International, High Impact Factor, Double-Blind Peer-Reviewed, Open-Access, Multidisciplinary Online Journal

Volume 3 | Issue 2 | April 2024

www.ijirid.in

Skill-Based Job Role Suggestion Using Machine Learning

Abhinav Ingole[1], Amruta Wadurkar[2], Shreyash Chaudhari[3], Bhushan Chavhan[4], Prof. (Dr) A. W. Burange[5]

[1,2,3,4] *Undergraduate Student, Prof. Ram Meghe Institute of Technology & Research, Amravati (MS), India*

[5] *Assistant Professor, Prof. Ram Meghe Institute of Technology & Research, Amravati (MS), India*

Abstract: *As scholars are going through their academics and chasing their courses, they need to impose their credentials and identify their interests so that they will get to know in which career field their interests and credentials will put them. This will help them enhance their performance and motivate their interests so that they will be directed towards their targeted career and get settled in that. Also, recruiters while retaining campaigners after assessing them in all different aspects, these kinds of career recommender systems help them decide which job part the seeker should be kept grounded on his/ her performance and other evaluations. Skill-based job role suggestion systems play a crucial role in modern recruitment processes by leveraging machine learning algorithms to match candidates with suitable job roles based on their skills and qualifications. This paper provides a comprehensive review of existing literature on skill-based job role suggestion systems, focusing particularly on machine learning algorithms and decision tree-based approaches, as well as the K-Nearest Neighbors (KNN) algorithm.*

Keywords: Skill-based Job Suggestion, Machine Learning, KNN, Decision Tree, Python, Pandas, NumPy, Sci-Kit Learn, Pickle, Prediction Model, etc.

I. INTRODUCTION

In today's rapidly evolving technological landscape, the intersection of machine learning and career guidance has given rise to a transformative model that has the potential to revolutionize how individuals navigate their professional journeys. A skill-based job role suggestion model using machine learning represents a cutting-edge approach to assist individuals in making informed and strategic decisions about their career paths. By harnessing the power of advanced algorithms, data analytics, and predictive modelling, this innovative tool provides personalized insights and recommendations tailored to an individual's unique skills, interests, aspirations and the dynamic demands of the job market. This tool serves as a digital mentor, guiding users through the intricate web of career options and helping them make choices that align with their aptitudes and long-term objectives.

Unlike traditional career assessments that often rely on static questionnaires and limited data points, the skill-based job role suggestion model continuously learns and adapts from a vast repository of real-time labour market data, industry trends, and individual user interactions. This dynamic learning process empowers the model to refine its suggestions over time, ensuring that the guidance provided remains relevant and up-to-date. Behind the scenes, this innovative system employs intricate algorithms to analyse an individual's academic background, work experiences, strengths, weaknesses, and preferences.

 DOI: 10.5281/zenodo.11034674

ISSN (Online): 2583-648X

IJIRID

International Journal of Ingenious Research, Invention and Development

An International, High Impact Factor, Double-Blind Peer-Reviewed, Open-Access, Multidisciplinary Online Journal

Volume 3 | Issue 2 | April 2024

www.ijirid.in

By amalgamating this information with a panoramic view of the ever-changing employment landscape, the model generates personalized recommendations that encompass potential career trajectories, skill development pathways, and even suggestions for further education or training. These insights not only streamline the decision-making process but also empower users to proactively take charge of their professional growth.

One of the core strengths of the skill-based job role suggestion model using machine learning lies in its objectivity and data-driven approach. The model transcends biases and prejudices that might inadvertently influence human advisors, ensuring that each user receives unbiased and impartial suggestions. Additionally, its ability to analyze vast amounts of data at incredible speeds allows it to identify emerging industries, niche opportunities, and cross-disciplinary intersections that might otherwise elude human observation. In essence, the skill-based job role suggestion model using machine learning represents a paradigm shift in how we approach the lifelong journey of career development. By harnessing the capabilities of artificial intelligence and machine learning.

Career Guidance System using Machine Learning is developed for Engineering Graduates who have completed their final year (Computer Science), and who are confused regarding which field/path to choose for their career. As there are already many options available for choosing Careers, still making the correct decision is a challenge. So we have considered all the aspects which are important to choose a Career, aspects considered in our project are marks scored in individual subjects, personality-based questions which judge a student not only based on their Academic scores but also based on personality, which is very important for making any decision on Career. We have developed a user-friendly website for our users. The user has to give a test on our website.

The answers given by the user on the front end will be stored in the backend. The Backend will be used to store a classifier model for prediction. Already developed code for classifier prediction is appended with the input given by the user. The classifier (Naïve Bayes) gives us three recommendations based on the top three probabilities. The output is stored in Backend and again displayed to the user in Front-End. The user can check the recommended Career and can choose the best among three choices. The Career with the highest probability is displayed first then second and at last third. Accuracy metrics are used to calculate the accuracy of our Prediction System. A feedback system is also included in our system to make our system more accurate and to get the response from the user about our system. They can rate us on our portal and can also write to us. They can also contact us on our systems email id [10].

II. LITERATURE REVIEW

This research paper by Lubna Mahmoud Abu Zohair et.al. (2019) focuses on predicting student performance in educational settings using small datasets. The aim is to help at-risk students by improving learning resources and retention strategies. The study investigates the feasibility of training a prediction model with a small dataset and identifies key indicators using visualization and clustering algorithms. The research shows that support vector machines and learning discriminant analysis algorithms are efficient in training small datasets and producing reliable classification accuracy rates [1].

ISSN (Online): 2583-648X

IJIRID

International Journal of Ingenious Research, Invention and Development

An International, High Impact Factor, Double-Blind Peer-Reviewed, Open-Access, Multidisciplinary Online Journal

Volume 3 | Issue 2 | April 2024

www.ijirid.in

Anooja S K1 and Dileep (2020) explored the use of Educational Data Mining (EDM) and machine learning to improve student performance. Despite these technologies, there's a rising trend in student failure rates. The study aimed to:1. Identify factors affecting student performance, including socio-economic status, learning styles, attendance, prior academic performance, and demographics.2. Evaluate prediction algorithms like logistic regression, decision trees, support vector machines, and neural networks, assessing their accuracy in predicting student outcomes [2].

Parth Lokhande et. al. (2021) developed a web-based platform using advanced Machine Learning to help students learn computer science basics. Users can quiz themselves on various topics to identify strengths and weaknesses. The platform also suggests career paths and roadmaps based on user preferences, offering a personalized learning experience. This resource empowers students to explore computer science domains aligned with their interests and make informed career choices confidently [3].

Syeda Farheen Batul Zaidi's 2018 study highlighted the significant impact of career selection on job satisfaction in the service sector. With numerous career paths available, choosing the right one has become challenging for students. A Council of Scientific and Industrial Research (CSIR) survey revealed that 40% of students are uncertain about their career choices. This uncertainty can lead to wrong career decisions, affecting productivity [4].

Pratiyush Guleria et. al (2022) explored the role of Machine Learning (ML) and Explainable AI (XAI) in educational data mining for career counselling. Their study emphasizes that ML learns from experiences and inferences to tackle complex queries. Their proposed framework integrates ML and XAI to analyze educational data from students and parents. This intelligent framework aims to assist students in making informed career decisions by understanding, analyzing, and remembering patterns, much like an expert system [5].

Dr D. Haritha et. al (2019) presented a "Smart Career Guidance and Recommendation System" tailored for the Computer Science and Information Technology (CSE/IT) domain. Developed with expert collaboration, this recommender system suggests suitable courses for students based on their academic performance and interests. The system aims to align students' aptitudes and interests with appropriate courses, enhancing their future career prospects. It utilizes algorithms to recommend skill-oriented courses within CSE/IT, drawing insights from questionnaires and skill tests to understand students' interests and abilities [6].

Gita Aulia Nurani (2022) investigated factors influencing career maturity in high school students, comparing vocational and general high schools. The study found that vocational high school students typically exhibit more components of career maturity than their counterparts in general high schools. Key maturity elements identified in vocational students include social attachment, adversity intelligence, emotional intelligence, career interest, motivation, and career aspirations [7].

ISSN (Online): 2583-648X

IJIRID

International Journal of Ingenious Research, Invention and Development

An International, High Impact Factor, Double-Blind Peer-Reviewed, Open-Access, Multidisciplinary Online Journal

Volume 3 | Issue 2 | April 2024

www.ijirid.in

Roy Y. Chan (2020) delves into the challenges facing higher education globally, including the rise of for-profit institutions and increasing demands for diverse skills from graduates. The paper examines the public and private purposes of higher education using Critical Interpretive Synthesis (CIS) and signalling theory. By reviewing 60 peer-reviewed articles and 25 books from 2000 to 2016, the study identifies nine key goals for higher education. While both institutions and students agree on some economic and social benefits, there is a significant misalignment between their perspectives on higher education's purpose and outcomes [8].

This Research paper includes Ala Mughaid et.al (2019). "A Smart Geo-Location Job Recommender System Based on Social Media Posts" addresses the growing influence of social media on job seeking by proposing a smart system that utilizes users' geo-location information from platforms like Twitter and Facebook. By mining social media posts, the system matches job seekers with relevant vacancies based on their location. Unlike previous systems, this approach combines modern recommender techniques, geo-location concepts, and natural language processing to provide practical solutions for real-life problems [9].

This Research paper includes Ankush Daharwal et.al (2020). "Career Guidance System using Machine Learning for Engineering Students (CS/IT)" discusses how in today's world, students struggle with choosing the right career path. They may have skills but are unsure about which domain suits them best. This project aims to address this issue using machine learning techniques. By collecting personal and academic information from the student, we will assist them in determining the best career option and domain based on their abilities. This project aims to guide students towards a specific career path aligned with their skills and interests [10].

III. SYSTEM ANALYSIS

A. Existing System

In the current scenario, the career prediction system works for getting job recommendations. Several platforms such as AMCAT, CoCubes, etc. provide job recommendations. There is no such system exists which takes input and gives recommendations of the suitable job profile.

B. Proposed System

We describe a career guidance system for the students of the CS/IT branch who are confused about their career path. The contribution of this system is to help such students to be guided but a standard system and get to their hidden key skills. We want the student not to get confused between so many fields. We want to make it easy for the student by recommending three fields that are most suitable for them based on their input. Our proposed system takes inputs from GUI processes it and gives three job fields. It also takes feedback from students about their satisfaction with the output so that we will get to know where to improve our system. We are also sending them the mail report of their career choice and will mail them after their graduation to get to know if are they satisfied with their career path. This feedback system will help us to make our system more and more rigid.

ISSN (Online): 2583-648X

IJIRID

International Journal of Ingenious Research, Invention and Development

An International, High Impact Factor, Double-Blind Peer-Reviewed, Open-Access, Multidisciplinary Online Journal

Volume 3 | Issue 2 | April 2024

www.ijirid.in

C. Comparison Table

Table 1: Comparison Table

	Existing system	Proposed System
Main Function	Job Suggestion	Career Path Recommendation
Test	Based on Engineering Subjects	Based on Performance In the test
Feedback System	Consist of job Recommendation result feedback	Consist of Career path recommendation feedback

D. Diagrams

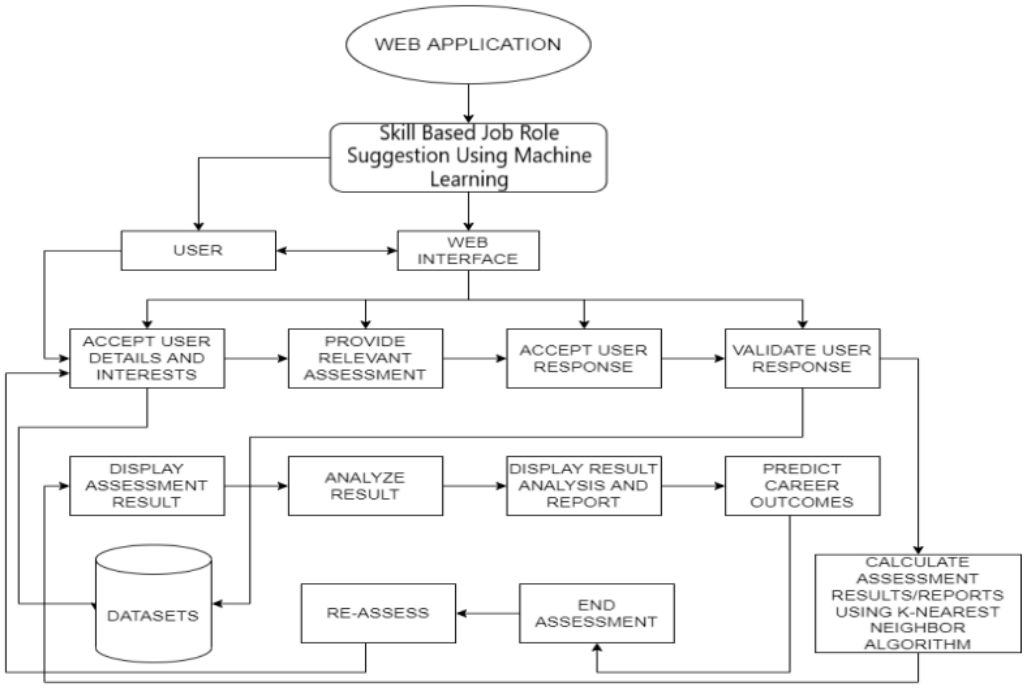


Figure 1: System Architecture

IV. SYSTEM IMPLEMENTATION

A. Collection of Data:

The collection of data is one of the major and most important tasks of any machine learning project for feeding the algorithm with correct data. So, the efficiency and accuracy of the algorithm depend upon the correctness and quality of the data collected. For student career prediction many parameters are required like student's academic scores in various subjects and personality traits like subjects related to roles in databases and tests. As all these factors play a vital role in deciding a student's progress towards a career area, all these are taken into consideration. Data is collected in many ways. Totally 9 thousand records roles of data are collected.

ISSN (Online): 2583-648X

IJIRID

International Journal of Ingenious Research, Invention and Development

An International, High Impact Factor, Double-Blind Peer-Reviewed, Open-Access, Multidisciplinary Online Journal

Volume 3 | Issue 2 | April 2024

www.ijirid.in

B. Data Preprocessing:

Before feeding the collected data into machine learning algorithms, it's essential to undergo a comprehensive data preprocessing step. This involves cleansing the data to remove any inconsistencies, inaccuracies, or missing values that may impact the performance of the algorithms. Additionally, the data was transformed and standardized to ensure compatibility with the chosen machine-learning models. By meticulously preprocessing the data, we aim to enhance the accuracy and reliability of the subsequent analysis, ultimately leading to more robust and effective job role recommendations for engineering students.

C. Label-encoding:

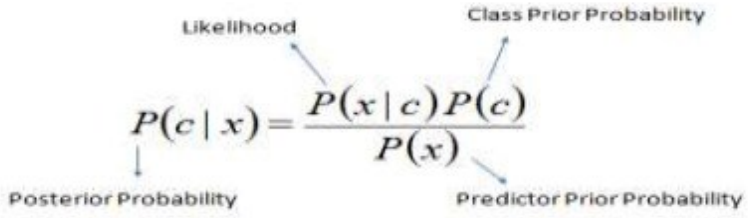
Data collection is an important part yet another important part is data pre-processing. We can't feed our algorithm with raw data. Before sending this data to the algorithm we need to pre-process this data. Label encoding is one of the parts of pre-processing. As our dataset consists of both categorical as well as numerical data we need to convert the categorical data into numerical form. Also, we need to track the conversion as we will need to inverse the transformation of the categorical data. Using LabelEncoder library of sklearn we can convert the categorical data into numerical form and vice versa.

D. Training and Testing:

For training and testing the model is split into k-folds (2-folds) and a huge part of the data is used for training the model. Later the testing part is used for calculating the accuracy of the model. More the Accuracy more is the efficiency of the model.

E. Machine Learning Algorithm Implementation:

In selecting the appropriate machine learning algorithm for skill-based job role suggestion systems, it is essential to consider factors such as scalability, interpretability, and accuracy KNN (K-Nearest Neighbors) algorithms are commonly evaluated due to their distinct characteristics. However, its scalability might be limited, particularly with large datasets. On the other hand, KNN is known for its simplicity and effectiveness, especially with smaller datasets, but it may face challenges with scalability and interpretability. Therefore, the choice between these algorithms depends on the specific requirements of the job role suggestion system, balancing factors like dataset size, interpretability needs, and desired accuracy levels.



$$P(c \mid X) = P(x_1 \mid c) \times P(x_2 \mid c) \times \cdots \times P(x_n \mid c) \times P(c)$$

ISSN (Online): 2583-648X

IJIRID

International Journal of Ingenious Research, Invention and Development

An International, High Impact Factor, Double-Blind Peer-Reviewed, Open-Access, Multidisciplinary Online Journal

Volume 3 | Issue 2 | April 2024

www.ijirid.in

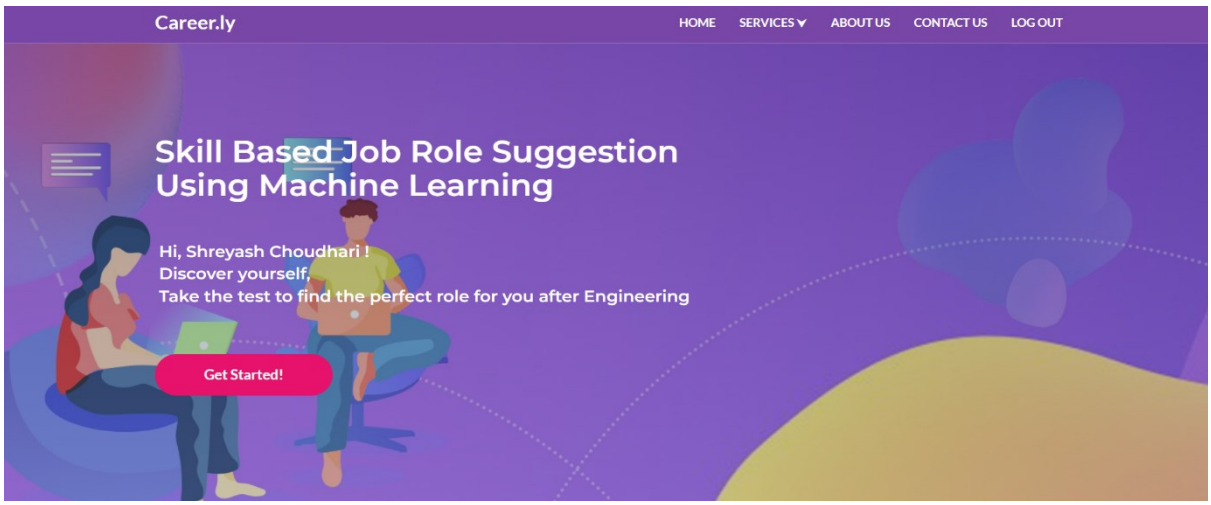
F. Accuracy:

This is where the performance of the algorithm, the quality of data, and the required output all appear. We have calculated the Accuracy of the model based on the number of predicted outputs is 97% and the actual output is to be predicted.

```
= RESTART: C:\xampp\htdocs\INTELLIGENT-CAREER-GUIDANCE-SYSTEM-main\testmodel.py
[[9 1 1 ... 1 1 1]
 [9 2 1 ... 1 1 1]
 [9 3 1 ... 1 1 1]
 ...
 [1 1 1 ... 6 6 9]
 [1 1 1 ... 7 7 9]
 [1 1 1 ... 7 5 9]]
hi
['Database Administrator' 'Database Administrator'
 'Database Administrator' ... 'Graphics Designer' 'Graphics Designer'
 'Graphics Designer']
X_train [[6 6 6 ... 6 6 6]
 [2 2 9 ... 2 2 2]
 [3 3 3 ... 3 3 9]
 ...
 [3 3 3 ... 3 3 3]
 [1 1 1 ... 1 1 1]
 [2 9 2 ... 2 6 6]]
y_train ['Project Manager' 'Application Support Engineer' 'Graphics Designer' ...
 'Software Developer' 'AI ML Specialist' 'Hardware Engineer']
y_pred ['Software Tester' 'Hardware Engineer' 'Customer Service Executive' ...
 'Business Analyst' 'Technical Writer' 'API Integration Specialist']
Accuracy= 97.13144517066085
test file created
>>>
```

G. Result:

The data given by the user is evaluated in the backend using the KNN Algorithm and it gives an accuracy of 97%, so we have developed a website that takes input from the user, calculates the output using the KNN Algorithm and again displays the results back to the user. Further in the future, more E-Learning blogs related to the latest technologies going around the market can be added and linked to websites teaching those Technologies to make it the best platform for Career Prediction.



Result 1: Home Page

ISSN (Online): 2583-648X

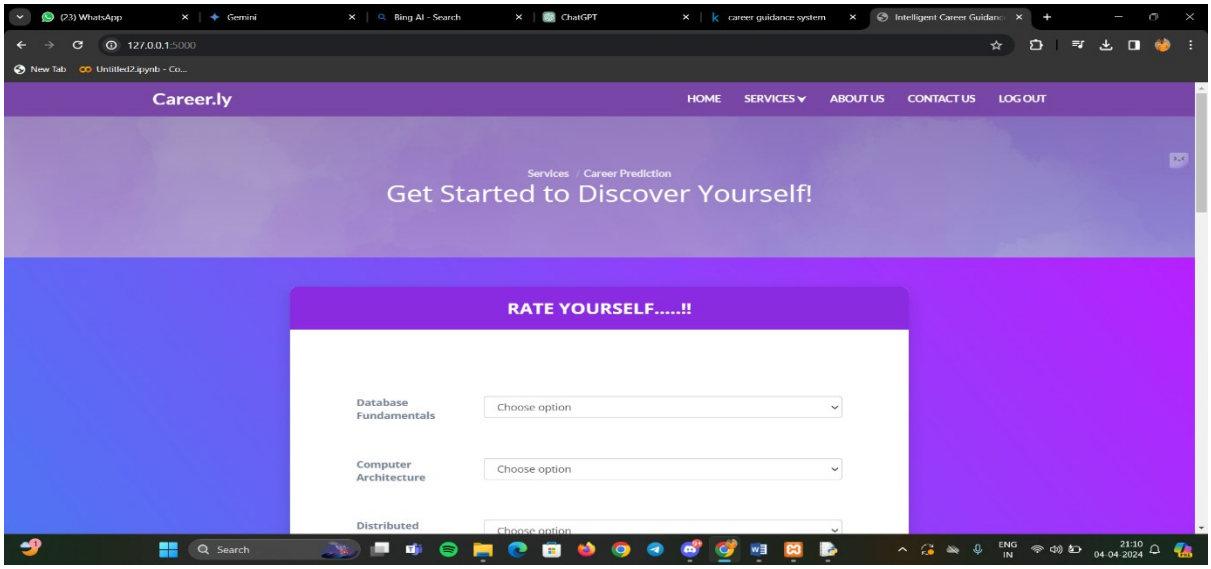
IJIRID

International Journal of Ingenious Research, Invention and Development

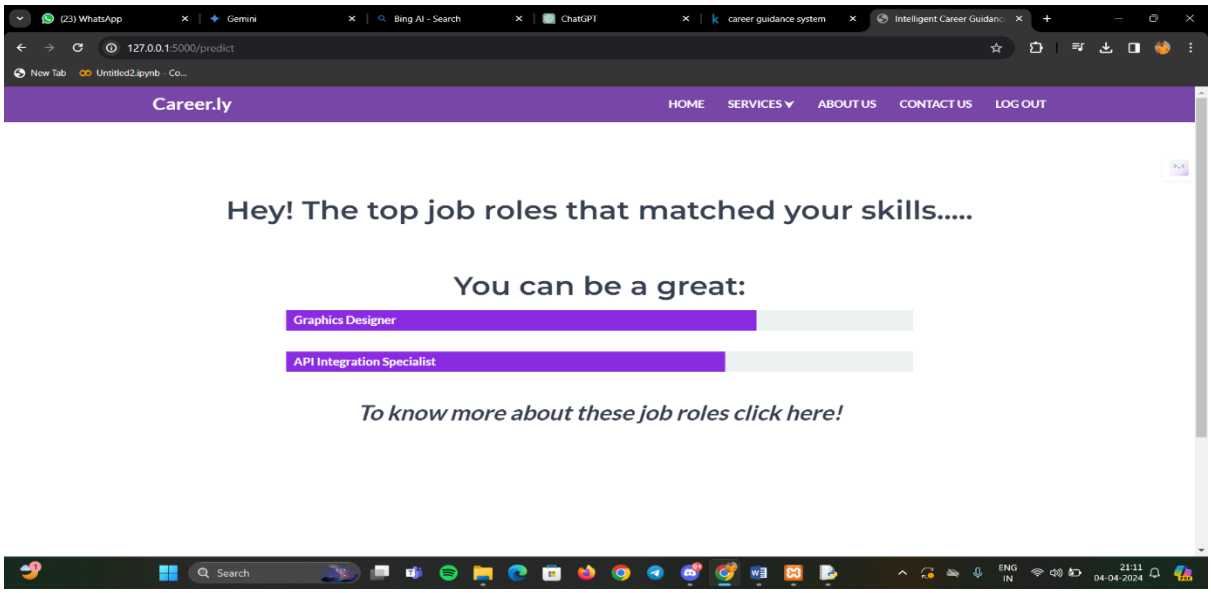
An International, High Impact Factor, Double-Blind Peer-Reviewed, Open-Access, Multidisciplinary Online Journal

Volume 3 | Issue 2 | April 2024

www.ijirid.in



Result 2: Career Prediction Model (Rate Yourself) Page



Result 3: Career Prediction (Result Display)

V. CONCLUSION

In conclusion, Skill-Based Job Role Suggestion Using Machine Learning heralds a transformative era in career counselling, leveraging data-driven insights and automation to empower individuals in navigating today's job market. Its sophisticated algorithms and real-time analysis provide tailored recommendations, fostering informed decision-making and strategic career planning. While it represents a significant advancement, collaborative efforts are crucial to refine its algorithms and user interface. This tool offers a comprehensive view of career paths, fostering exploration and skill development.

ISSN (Online): 2583-648X

IJIRID

International Journal of Ingenious Research, Invention and Development

An International, High Impact Factor, Double-Blind Peer-Reviewed, Open-Access, Multidisciplinary Online Journal

Volume 3 | Issue 2 | April 2024

www.ijirid.in

REFERENCES

[1] Lubna Mahmoud Abu Zohair, "Prediction of Student's performance by modelling small dataset size," IEEE 17th India Council International Conference (INDICON), New Delhi, India, pp. 1-5,2019.

[2] Anooja S K1, Dileep V K2, "A Study On Student Career Prediction," International Research Journal of Engineering and Technology, Vol 07, issue 02, pp 2395-0072, 2020.

[3] Parth Lokhande, Yash Nayakwadi, Manali Umardand, Vedant Araj, Prof. Dheeraj Patil, "A Web-Based Platform for Predicting Student Careers using Machine Learning with Learning Resources for Computer Science Domains," International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 11 Issue 03, pp 2321-9653, 2023

[4] Syeda Farheen Batul Zaidi, "Impact of career selection on job satisfaction in the Service," African Journal of Business Management, Vol 6, issue 09, pp 741–753,2017.

[5] Pratiyush Guleria, Manu Sood, "Explainable AI and machine learning: performance evaluation and explainability of classifiers on educational data mining inspired career counselling, Vol. 02, Issue 8, pp 1081–1116,2022.

[6] Lakshmi prasanna, DR.D.Haritha, "Smart Career Guidance and Recommendation System," International Journal of Engineering Development and Research, Vol. 07, Issue 3 pp 2321-9939,2019.

[7] Gita Aulia Nurani," Factors Influencing Students' Career Maturity in Vocational and General High School," International Journal of Recent Educational Research, Vol 03, Issue 06, pp 2721-852,2022.

[8] Roy Y. Chan, "Understanding the purpose of higher education: An analysis of the economic and social benefits for completing a college degree," Education and Information Technologies, Vol 06, Issue 05, pp 297-822, 2016.

[9] Ala Mughaid, Ibrahim Obeida, Bilal Hawashin, Shadi AlZu'bi, Darah Aqel, "A smart Geo-Location Job Recommender System Based on Social Media Posts," Sixth International Conference on Social Networks Analysis, Management and Security (SNAMS), Vol. 4, pp 978-1-7281,2019.

[10] Ankush Daharwal, Prof. Sandeep Gore, Aishwarya Bhagwat, Shraddha Dethe, Sunny Chavan, "Career Guidance System using Machine Learning For Engineering Students (CS/IT)," International Research Journal of Engineering and Technology, Vol. 07, Issue 06, pp 2395-0072,2020.

