IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 14, Issue 12, December 2025

DOI: 10.17148/IJARCCE.2025.1412113

ProPath: AI-Based System for Skill Mapping and Future Planning

Mrs. Nita Meshram[1], T Venkata Praneeth[2], Rajesh P C[3], Sadhvika Godavarthi[4], and Vandana Basavaraj Patil[5]

Associate Prof., Dept of CSE, K.S.School of Engineering & Management, Bengaluru, India[1]

Student, Dept of CSE, K.S.School of Engineering & Management, Bengaluru, India[2-5]

Abstract: AI-Based System for Skill Mapping and Future Planning is an intelligent digital platform, designed to be simple and personalized for career decision-making by students and young professionals. The system analyzes user resumes using advanced Artificial Intelligence techniques such as Natural Language Processing, BERT-based resume parsing, and Machine Learning models to extract relevant skills, identify existing gaps, and predict suitable career paths aligned with current industry demands. This provides explicit, actionable insights into competencies required for future growth and recommends targeted learning resources through integrated platforms such as YouTube and Udemy. Additionally, the system is embedded with an interactive AI chatbot that will update in real time with career counseling, step-by-step guidance, and motivational assistance, enhancing user engagement and building confidence.

The platform is powered by Python, Next.js, and state-of-the-art ML/NLP frameworks that ensure a seamless user experience with fast processing. It minimizes career uncertainty through automation in resume evaluation, skill-gap detection, course recommendation, and job-role mapping, hence democratizing access to personalized career guidance. ProPath represents a significant stride toward narrowing the gap between education and employability, enabling continuous learning and inclusive, sustainable growth in the professional world.

Keywords: Career tech, AI, NLP, skill mapping, machine learning, recommender systems, chatbots.

I. INTRODUCTION

ProPath is an integrated and cutting-edge career guidance and planning software system using AI for the pursuit and achievement of career path uncovering, defining, and advancing in an effective and assured manner for the betterment and benefits of the targeted group of students and young professionals. Being an advanced and different system as compared to the traditional job search engines available in the market, which only provide access to the listings available for job search and selection, the ProPath system provides a practical and effective application for the students and young professionals to use in defining and pursuing their desired career path in the industry in a more effective and better manner through its own defined mechanism and functionality. Utilizing the benefits and applications of the advanced technological concepts and techniques such as Artificial Intelligence (AI), Machine Learning (ML), and Natural Language Processing (NLP), the system identifies the strengths and weaknesses of the users through the analysis and assessment of their resumes, educational backgrounds, and skill sets in order to align them with the industry requirements and future career trends.

Apart from the provision for basic job information, ProPath is an intelligent career buddy that assists users in their professional pathways. The Career Path Prediction Module, which uses AI algorithms, interprets user inputs and predicts the best possible professional paths based on skill compatibility, industry requirements, and growth. Besides, there is an AI-assisted, interactive chatbot that assists users throughout by answering questions, suggesting ways for improvement in resumes, and motivating users in critical stages of important decision-making. The major features and functionalities of ProPath include a Skill Gap Detection Engine for comparing user profiles with industry requirements for recommendations based upon suitable learning material, intelligent job and course recommendations based on future skill requirements, role-based resume enhancement recommendations for candidate visibility in recruitment processes, and use of real-time data synchronization for recommendations that adapt to industry requirements based on user skill development. The combination of intelligent analysis, personalized support, and adaptive learning in a single system makes it easier for users to confidently transition through their professional paths.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 14, Issue 12, December 2025

DOI: 10.17148/IJARCCE.2025.1412113

II. RELEVANT LITERATURE

A. Skill Mount: Personalized Career Skills Development Using Machine Learning (IEEE, 2024):

Skill Mount helps learners cope with rapidly changing demands in the job market. Utilizing Natural Language Processing, it extracts critical skills used in user resumes and compares them with desired job roles to identify gaps in skill sets. The system uses machine learning models, especially the Random Forest model, which showed 98% accuracy.

These models provide personalized job recommendations and ways of improving one's skills. By incorporating resume analysis, job-role matching, and skill-gap detection into a single platform, Skill Mount shows how NLP and ML together could create adaptive data-driven career mentoring systems that foster continuous learning and professional improvement.

B. Conversational AI for Career Counseling (IEEE, 2024):

This work describes an AI-driven career counseling system to help students identify suitable career options by fusing machine learning with conversational AI. The proposed career prediction model, implemented with the KNN algorithm, obtained the highest accuracy of 97.13% as opposed to other competitive models like Decision Tree and Random Forest, thus recommending career paths based on a student's skills, interest, and academic background.

To this end, the RASA-based chatbot of the proposed system is designed to offer personalized counseling, answer queries, and suggest colleges or courses through natural language interaction. Its conversational design enhances user engagement and supports students who lack access to traditional career counseling. The platform merges predictive analytics with interactive dialogue to offer an accessible and effective solution for informed career decision-making.

C. Career Craft AI: Personalized Resume Analysis and Job Recommendations (IEEE, 2024):

Career Craft AI is an employability AI platform that analyzes skills, gaps, and recommends personalized jobs and courses. It uses NLP, or natural language processing, SVM, and cosine similarity to match user profiles with relevant job roles and skill paths. Integrated with the Level Up e-learning platform, it continuously updates recommendations based on user learning progress, helping individuals upskill and stay job-ready in a fast-changing market.

D. Student Career Guidance Using Generative AI (IEEE, 2024):

This paper proposes a Generative AI-powered system for career guidance that utilizes the Gemini Pro API to suggest personalized career paths considering a student's areas of interest, academics, and skills. Tailor-made suggestions would be given about required qualifications, colleges, exams, and future scope, making career counseling more accurate, accessible, and personalized.

II. SYSTEM DESIGN

ProPath System is an automated system that uses an organised and smart workflow system that helps students and job seekers identify the right career path based on their skills, education, and experience. This system uses web technologies and analytics analysis that is AI-driven.

Fig 1 above shows the layered system architecture of the ProPath Career Guidance Platform. The system architecture is divided into four main layers that include the Presentation Layer, API Layer, AI and Logic Layer, and finally the Database Layer. Every layer is supposed to function independently.

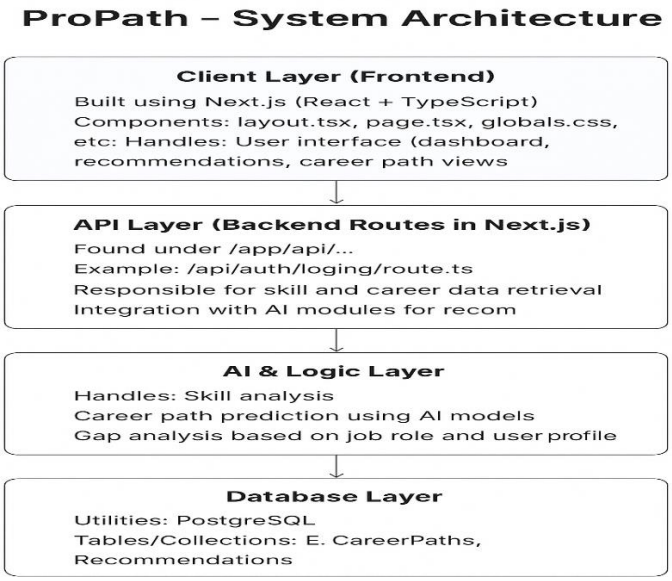


Fig 1. System architecture diagram

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 14, Issue 12, December 2025

DOI: 10.17148/IJARCCE.2025.1412113

A. Presentation Layer:

This level serves as the main interface between the users and the system.

1. **User interface:** Built using Next.js with React and TypeScript, the UI functionality includes user registration and logon, resume uploading, skill evaluation dashboards, career guidance, and learning pathways. The UI is designed to be fully responsive and easy to navigate between modules.

B. API Layer:

The API layer acts as an interface between the frontend and backend intelligent modules.

1. **Frontend Routes:** This layer is implemented with Next.js API routes and is responsible for user login, resume uploading request processing, skills retrieval, and recommendation processing.
2. **Integration Services:** The API layer is used to transfer user information for processing by the AI processing modules in resume evaluation, skills identification, and career path assessment.

C. AI & Logic Layer: This layer constitutes the core intelligence of the ProPath system.

1. Resume Parsing & Skill Extraction: It uses a BERT-based NLP model that performs a higher level of extraction for context information such as education, skills, certifications, and work experiences from a resume that is uploaded.

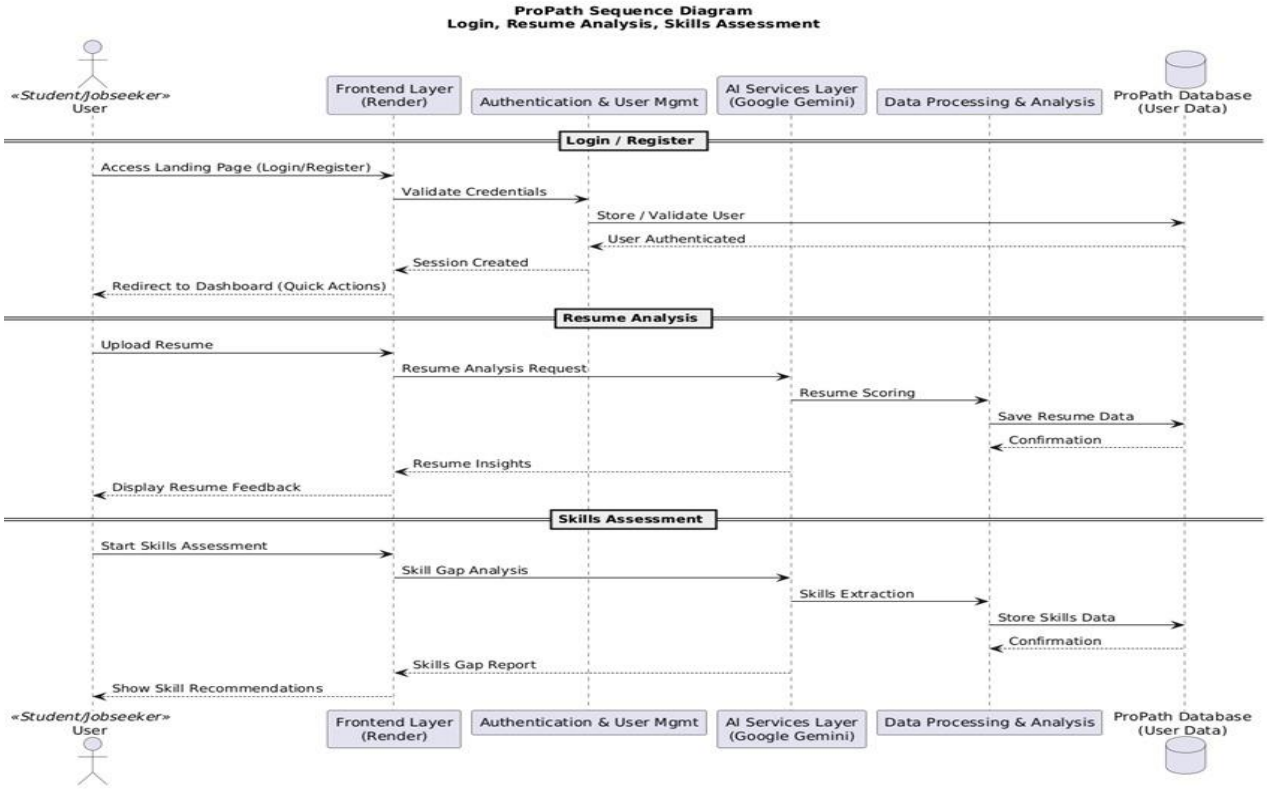
2. Career Prediction & Role Mapping: Machine learning techniques like K-Nearest Neighbors (KNN), Decision Tree, Random Forest, and XGBoost evaluate the skills and match them against job roles to determine the suitable fields based on the predicted skills.

3. Skill Gap Analysis: Missing skills or skills that need improvement in users' profiles are identified based on a comparison between user profiles and job roles, and the needed upskilling is suggested.

4. AI Chatbot Assistance: An AI-based chat robot offers career guidance in real time, responds to queries from the user, and assists in decision-making in career planning.

D. Database Layer: This layer handles data storage and acquisition. PostgreSQL is used for storage purposes to store structured data such as user profiles, skills, career paths, recommendations, and learning progress information. "Model and Embedding Storage" Trained ML models and their respective embeddings are saved for efficient reusage during recommendation analysis.

III. METHODOLOGY



IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 14, Issue 12, December 2025

DOI: 10.17148/IJARCCE.2025.1412113

A. User Authentication and Profile Creation

Users are able to register or log in to the system using secure log in mechanisms. After this happens, there comes the creation of the user profile where professional-related data of the user will be stored in a secure manner since the dashboard will be initiated to enable the user to be able to monitor the results of the resume processing and analysis.

B. Resume Upload and Analysis

The job seekers are required to provide the resume in the supported file formats. After this, the resume is processed using the backend system. Natural Language Processing techniques and BERT models are used while processing the information related to the structure of skills, education, job experience, and certifications. The resume information is then normalized and stored as a result of this processing.

C. Skill Analysis and Gap Identification

The extracted skills are then matched against the skill requirement of different job roles. The system also identifies the skills where the user has some strength, as well as the skills where the user has some deficiencies or lacks skills for their target jobs. Skill gap analysis has been performed.

D. Career Recommendation Generation

Machine learning algorithms such as KNN, Random Forest, and XGBoost have been applied to user profiles and similarity scores of skills. Based on industry demand and user role compatibility, relevant job roles and associated pathways have been identified and ranked. Recommendations have also been created for users to allow for maximum relevance to their careers.

E. Learning Path Recommendation

Learning Path Recommendation On the basis of the skill gaps identified, the recommendations for the courses and the learning content are performed. The system also develops a learning path to achieve the skills. The recommendations are made considering the career objectives and the industry trends. Achieving skills for professional development purposes is facilitated.

IV. RESULTS AND DISCUSSION

The ProPath career guidance system successfully achieved its goals by using AI to parse resumes, identify key skills, and point out gaps with consistent accuracy. By using natural language processing and BERT-based processing, the platform picked up meaningful information from user profiles, presenting clear, structured insights that supported better self-understanding and career planning.

The machine learning models mapped user skills to the appropriate job role and course recommendations using embeddings and cosine similarity. Job and course recommendations were relevant, accurate, and updated in real-time to ensure practicality and ease of use on the platform. Users responded well to the intuitiveness of the interface and the personalized recommendations of the system.

The results altogether indicate that ProPath decreases manual effort during career planning by automatically performing skill analysis, resume evaluation, and predicting career paths. An integrated chatbot further enhanced user experience with speedy, context-aware responses. This system illustrates the ways in which AI can make career guidance more accessible, personalized, and effective for students and young professionals.

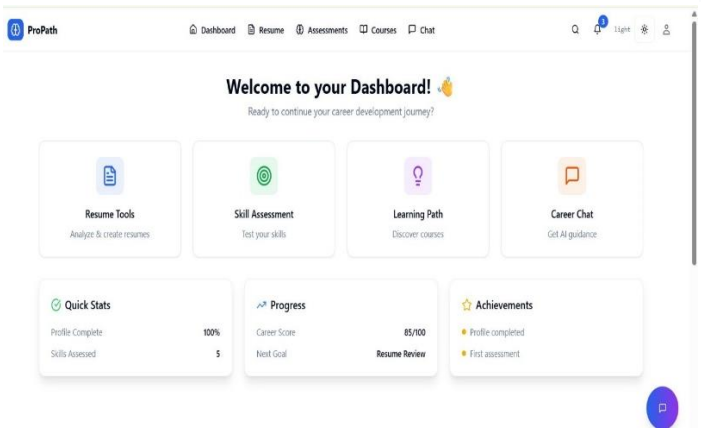


Fig 3. Home page

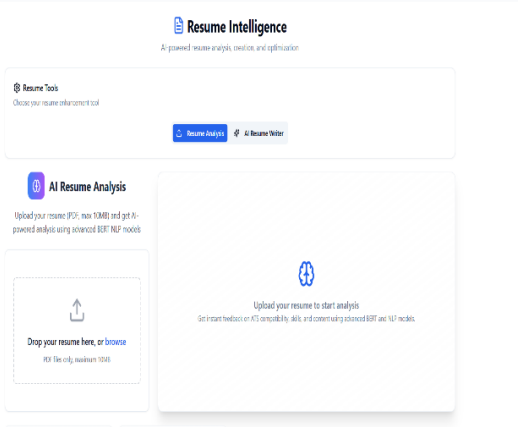


Fig 4. Resume Analysis

International Journal of Advanced Research in Computer and Communication Engineering
Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 14, Issue 12, December 2025
DOI: 10.17148/IJARCCE.2025.1412113

V. CONCLUSION AND FUTURE WORK

The ProPath AI-driven career guidance system has been very effective in improving the access to personalized insight into a student's career and employability. It brings resume analyses, skill evaluations, job matching, and learning recommendations all under one intelligent platform, simplifying career planning for students and young professionals by making it more seamless between users and AI-driven modules. Automation of the analysis pipeline transforms complex user data into clear guidance, reducing confusion and saving valuable time for students and young professionals.

Further development will be targeted at enhancing the robustness and scope of the system. Future plans include enhancing NLP and BERT for more in-depth skill-gap detection, further course and job provider integrations that will extend opportunities, and AI-driven interview preparation for better readiness. Other additions, such as mobile applications, advanced personalization, and real-time performance tracking, are bound to enhance user experience. The developments mean that ProPath will ensure long-term scalability and reliability, continuing to play the role of an accessible and supportive solution for people through their career paths.

VI. ACKNOWLEDGEMENT

We would like to express our heartfelt gratitude to the Department of computer science and engineering, K.S. School of Engineering and Management (KSSEM) for providing us with the facilities guidance and supportive environment needed to carry out this project. we are especially thankful to our project guide and faculty members whose advice, encouragement and feedback played a major role in shaping this work. We also appreciate the technical resources and infrastructure made available by the institution which greatly helped us during the development and testing phases. Finally we wish to thank everyone friends, peers, and mentors who offered support shared ideas or contributed in any way through the course of this research.

REFERENCES

[1]. Moon, Kamelia Zaman, Umma Salma, and Mohammad Shorif Uddin. "BERT-Based Personalized Course Recommendation System from Online Learning Platform." In 2024 6th International Conference on Electrical Engineering and Information & Communication Technology (ICEEICT), pp. 980-985. IEEE, 2024

[2]. R. Waikar et al., "Student Career Guidance Using Generative AI," 2024 International Conference on Artificial Intelligence and Quantum Computation-Based Sensor Application (ICAIQSA), Nagpur, India, 2024

[3]. S. Shilaskar, S. Bhatlawande, P. Sawle, S. Gupta and R. Buche, "Conversational AI for Career Counseling," 2024 MIT Art, Design and Technology School of Computing International Conference (MITADTSoCiCon), Pune, India, 2024.

[4]. Krishnan, Akhil, James Joseph, N. N. Nihal, and C. V. Priya. "Skill Mount: Personalized Career Skills Development Using Machine Learning Algorithms." In 2024 11th International Conference on Advances in Computing and Communications (ICACC), pp. 1-6. IEEE, 2024.

[5]. Chandak, Ashish Virendra, Hardik Pandey, Gourav Rushiya, and Harsh Sharma. "Resume parser and job recommendation system using machine learning." In 2024 International Conference on Emerging Systems and Intelligent Computing (ESIC), pp. 157-162. IEEE, 2024.

[6]. Zhou Jingyi, Xu Yingying, and Wang Hengke."Research on the Application of Personalized Learning Paths and Recommendation Algorithms in Gardening." In 2024 2nd International Conference on Electrical, Automation and Computer Engineering (ICEACE), IEEE,2024.

[7]. Gupta, Deepanshi, and Preetvanti Singh. "Development of a Recommendation System for Resume Tracking and Job Suggestions." In 2024 3rd Edition of IEEE Delhi Section Flagship Conference (DELCON), pp. 1-6. IEEE, 2024.