

One-Stop Personalized Career and Education Advisor

Mrs. P. Sushma¹, A. Bhavana², K. Sanjana³, V. Sai Sri Pujitha⁴

¹Assistant Professor, Department of Computer Science, Matrusri Engineering College

^{2,3,4}Department of Computer Science, Matrusri Engineering College

Abstract—In today's exceedingly agonistic and rapidly evolving round job market, traditional career counseling systems often fail to provide personalized, data driven, and holistic guidance, leading to a gap between notional preparation and expert readiness. This paper proposes an integrated AI driven career and education advisory platform that integrates binary acute modules to support end to end career development.

For resume optimization, the system incorporates an Applicant Tracking System (ATS) analysis module that extracts textual features using Natural Language Processing (NLP), identifies keyword gaps, and generates compatibility scores to improve resume effectiveness. For interview preparation, a perceptible time simulation module leverages Large Language Models (LLMs) to evaluate notional and behavioral responses, providing personalized feedback and performance insights. For learning guidance, a course recommendation module performs skill gap analysis using Machine Learning (ML) techniques and suggests appropriate courses aligned with user goals and industry requirements. Additionally, a wellness focused constituent supports mental resilience through journaling, affirmations, and progress tracking, while an AI powered assistant enables steady career support.

All modules are integrated into an ascendible Flask based architecture with a user cordial interface, ensuring orderly interaction and perceptible time processing. The planned system is modular, extensible, and deployable on conclusive hardware, making it right for personalized career guidance, intense planning, and good development. By combining theoretical, behavioral, and mental aspects, the platform enhances decision making and improves obvious employability outcomes.

Index Terms—AI Career Counseling, Machine Learning for Skill Gap Analysis, Natural Language Processing, Personalized Learning Systems.

I. INTRODUCTION

The global job market today is evolving at an unprecedented pace, driven by speedy scientific

advancements, automation, and the growing use of digital recruitment systems. For students and professionals alike, this shift has made it progressively rough to transition swimmingly from theoretical learning to industry ready skills. A massive number of job applications are now filtered through automated Applicant Tracking Systems (ATS), often before they are reviewed by recruiters. At the comparable time, the gap between what is taught in traditional education and what industries require continues to widen. on with theoretical expertise, qualities such as communication skills, adaptability, interview confidence, and moral resilience have become evenly pivotal for career success.

Despite these challenges, access to operative and personalized career guidance remains limited. Traditional career counselling methods, such as manual resume reviews and mock interviews, are often subjective, time consuming, and not scalable. They also fail to incorporate real time industry trends or provide actionable insights tailored to individual needs. As a result, many candidates struggle during immature recruitment stages without amply understanding their weaknesses, whether in resume quality, skill gaps, or interview performance. This problem is even further pronounced for individuals in outside or underserved areas, where expert guidance is not easily accessible.

With the rise of Artificial Intelligence (AI), Natural Language Processing (NLP), and Machine Learning (ML), modern opportunities have emerged to transform career guidance into a further data driven and personalized experience. active research has shown bright results in areas such as resume parsing, interview simulation, and course recommendation systems. However, near of these solutions operate severally and focus on only one aspect of career development, often overlooking the importance of

integrating theoretical preparation with moral wellbeing.

To address these gaps, this paper introduces an integrated AI driven career and education advisory platform, referred to as Career Advisor and Eduvisor respectively. The platform brings together binary components into a single, adhesive system designed to support users throughout their career journey. It includes various features such as ATS Guard for resume analysis and optimization, PrepIQ for AI based interview practice with real time feedback, Educompass for identifying and bridging skill gaps, InnerOrbit for promoting mental wellness done journaling and self-reflection, Aptitude Quiz based prediction of interested Career domain and related available courses, and Timeline tracker for real time schedules and application deadlines tracker. These modules are integrated into an ascendible Flask based web application, providing users with an accessible and interactive environment for continuous learning and improvement.

The key contributions of this work are as follows:

- A unified platform that combines resume optimization, interview preparation, skill gap analysis, and moral wellness into an exclusive system.
- An AI powered interview simulator that provides real time, personalized feedback using Large Language Models (LLMs).
- A dynamic course recommendation system that aligns user skills with current industry requirements.
- The integration of a wellness module, highlighting the importance of moral health in career development.

II. LITERATURE SURVEY

In modern years, there has been growing interest in using Artificial Intelligence (AI) to address the “employability gap” and improve career development processes. Many active studies focus on special components such as resume screening, interview preparation, or course recommendation systems. While these approaches have shown bright results, they are often developed as standalone solutions kind of than as part of an integrated system. This section reviews some of the key contributions in this domain.

An important body of work has explored the use of Natural Language Processing (NLP) for resume analysis and job fit prediction. Mishra et al. evaluated binary machine learning models for resume classification and found that XGBoost and Random Forest achieved high precision in identifying pertinent industry keywords. Similarly, Aditi Govinda et al. demonstrated that combining TF IDF with Word2Vec improves semantic feature extraction, achieving an accuracy of 91.83% in large scale resume filtering tasks. Aman et al. applied ensemble techniques using SVM and Naive Bayes to predict career transitions, achieving an accuracy of 91.27%. Furthermore, Roobini et al. highlighted the effectiveness of rich learning models, showing that BERT based embeddings can achieve up to 96% accuracy in matching resumes with complex job descriptions. These studies emphasize the importance of semantic understanding in improving resume evaluation systems.

In addition to resume analysis, practical interview simulation has emerged as a strong tool for enhancing candidate preparedness. Anisha et al. proposed a multi-modal framework that utilizes transfer learning models such as VGG 16 and ResNet to analyse facial expressions and speech sentiment during mock interviews, achieving an accuracy of 98% in predicting candidate confidence. Similarly, Sharma et al. developed a system that integrates theoretical assessments with AI based behavioural analysis to generate automated employability scores. These approaches demonstrate the potential of AI in providing objective and real time feedback during interview preparation.

More recently, researchers have started exploring multi-modal systems that combine different aspects of career development to provide a further comprehensive solution. Gandhi et al. developed a floating application that integrates resume scoring using LGBM classifiers with skill gap analysis based on cosine similarity, improving overall reliability. Dhivyaa et al. presented a survey highlighting the benefits of combining NLP, speech analysis, and mental indicators to enhance career readiness. Similarly, Desai et al. proposed a framework that combines deep feature extraction from user profiles with real time course recommendation, demonstrating the effectiveness of linking skill assessment with learning pathways.

However, despite these advancements, many active solutions are limited by high computational requirements, dependence on enterprise level tools, or lack of accessibility for individual users. Additionally, near systems focus on an exclusive aspect of career development and do not provide an integrated platform that addresses both theoretical preparation and mental well-being.

TABLE I Essential NLP and Behavioural Features Used for Career Readiness Prediction

Feature Category	Description	Significance
NLP Keywords	TF-IDF, N-grams, Named Entity Recognition (NER)	Helps identify technical skills and domain relevance.
Semantic Similarity	Cosine Similarity, Word2Vec, BERT Embeddings	Measures alignment between resumes and job descriptions.
Sentiment Analysis	Polarity, Subjectivity (speech-based)	Indicates confidence, tone, and communication effectiveness.
Skill Gap Metrics	Euclidean Distance, Set Difference	Identifies missing skills required for target roles.
Wellness Markers	Journal frequency, Affirmation usage	Reflects consistency and mental resilience during job search.

III. PROPOSED METHODOLOGY

This section focuses on a modular, decoupled architecture consisting of two simple platforms: Eduvisor (Educational Guidance) and Career Advisor (Professional Growth). The system integrates frontend interfaces developed with React.js and Vite with a robust Python/Flask backend designed for deep computational tasks like Natural Language Processing (NLP) and Machine Learning (ML) inference.

A. Eduvisor: Personalized Educational Guidance

The Eduvisor module focuses on early-stage career exploration and educational planning.

Psychometric Interest Assessment

Users undergo an AI powered interest inventory (Quiz). The methodology employs a Weighted Scoring Algorithm to map user responses to various expert domains (e.g., Engineering, Arts, Healthcare). The domain with the highest aggregate score is recommended as the simple career track.

Curated Timeline & Resource Mapping

A dynamic timeline tracker uses Sequential Mapping to visualize instructive milestones, synchronizing with an E-Library that provides resources tailored to the user's current theoretical level (Class 10th to Post Graduation).

B. Career Advisor: Professional Readiness and Analytics

The Career Advisor module bridges the gap between education and industry requirements.

Resume Intelligence & Auditing (ATS Guard)

- Semantic Similarity:

Utilizes Natural Language Processing (NLP) techniques, including tokenization and bigram frequency analysis, to calculate a Jaccard-like similarity score against industry standards.

- Structural Auditing:

Employs Regex based pattern matching to audit resume formatting, section prevalence (Education, Experience, Skills), and contact information validity for ATS compatibility.

Strategical Learning Optimization (EduCompass)

- Sequence Prediction: Implements Topological Sorting (Kahn's Algorithm) on a Directed Acyclic Graph (DAG) to determine the near logical and efficient order for learning new skills.
- Knowledge Transfer Matrix: Uses a custom Acceleration Matrix to calculate efficiency gains, simulating how foundational skills (e. g., Python) accelerate the acquisition of advanced frameworks (e.g., Django). For example, aware Python reduces the estimated time to learn Django by 35%.
- Skill Gap Intelligence: Leverages Zero Shot LLM Extraction to perform a semantic comparison between unstructured resumes and job descriptions, identifying serious theoretical and dull skill deficits.

AI Interview Simulation (Prep IQ)

Leveraging productive AI (OpenAI GPT / Google Gemini), the system generates dynamic, context aware interview questions.

- **Behavioural Analysis:** Natural language responses are analysed for sentiment, professional tone, and keyword relevance.
- **Feedback Loop:** A multi-modal feedback mechanism provides scores on technical accuracy and communication efficacy, simulating real world assessment patterns.

C. System Architecture

The proposed system architecture is designed as a four-tier framework that ensures scalability, real time interactivity, and data driven career intelligence. The methodology follows a top-down flow from the user facing interfaces to the underlying data persistence layer bridging technical assessments with holistic candidate development.

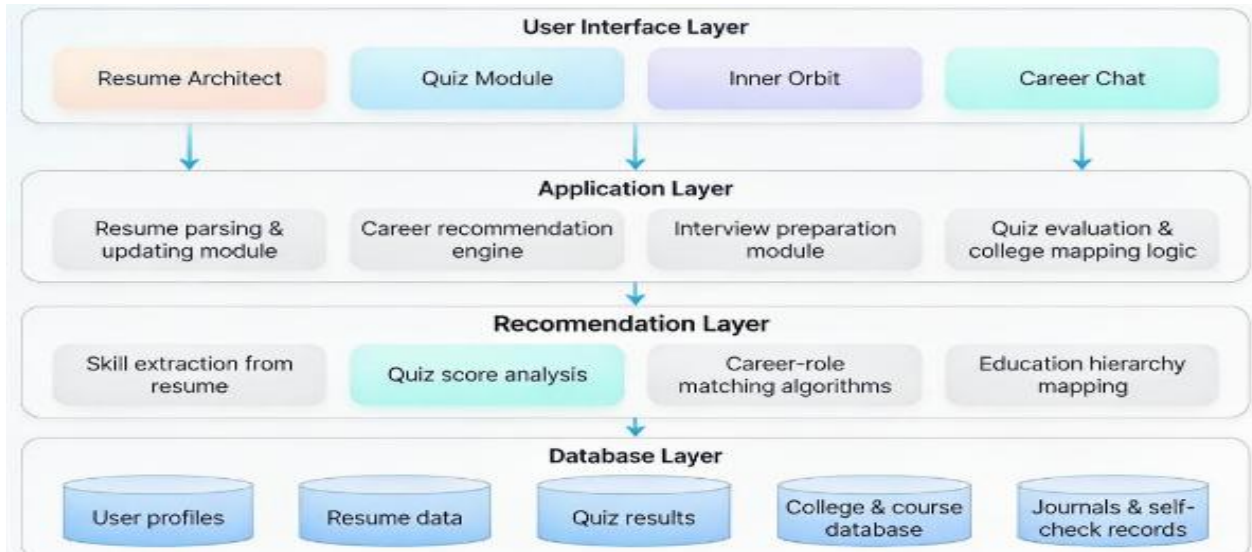


Fig. 1. System Architecture of the Proposed Multi Modal Career and Education Advisor Framework.

User Interface (UI) Layer

This serves as the simple interaction point between the user and the system. It is designed as a susceptible and natural frontend using up to date web technologies, enabling smooth navigation and real time interaction. This layer facilitates user engagement through integrated modules that support resume analysis, career assessment, wellness tracking, and informal assistance, ensuring an available and user-friendly experience across devices.

Application Layer

This layer acts as the core coordination tier that manages the system's business logic and workflow execution. Built using a Flask based backend, this layer coordinates data flow between the frontend and the intelligent processing components. It handles request processing, module integration, and execution of key functionalities such as resume parsing, interview simulation, and career recommendation, ensuring effective and dependable system operations.

Recommendation Layer (Intelligence Layer)

This is the layer that forms the analytic backbone of the system, where innovative AI and data driven techniques are employed. This layer is causative for extracting suggestive insights from user inputs using Natural Language Processing (NLP), statistical analysis, and predictive modelling. It enables skill extraction, performance evaluation, and rational mapping between user profiles and pertinent career paths, thereby delivering personalized and data driven recommendations.

Database Layer

Layer that provides continual storage and effective data management for the system. Implemented using a relative database with SQL Alchemy, this layer maintains structured and cross-referenced information, including user profiles, processed resumes, assessment outcomes, and educational resources. It ensures data consistency, nimble retrieval, and scalability, encouraging continuous system learning and personalization.

D. UML Diagrams

The working of the proposed system is illustrated by making use of UML diagrams. The below Fig 2 shows the activity diagram representing the overall workflow of the system and Fig 3 presents the sequence diagram, which describes the interaction between User, System and Database.

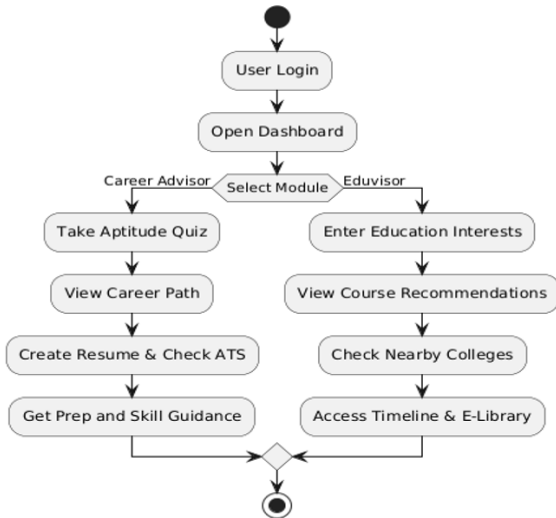


Fig. 2. Activity Diagram of the Proposed System

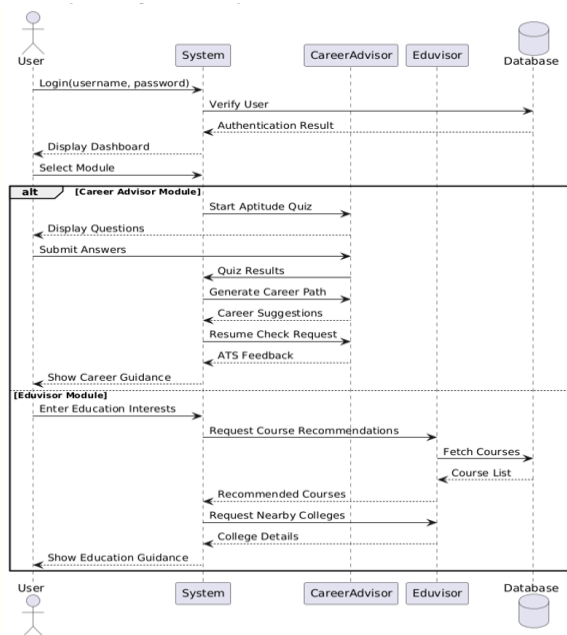


Fig. 3. Sequence Diagram of the Proposed System

IV. RESULTS AND DISCUSSION

During the model evaluation phase, the proposed multi-modal career guidance framework was validated

using a considerable dataset of pre-processed user profiles and theoretical resumes. The behavioural linguistics pipeline utilizes a Linguistic Feature Extraction (LFE) module that integrates Large Language Models with rule-based pattern matching to assess structural maturity using the STAR method. This approach efficaciously identifies the presence of situational context, special actions, and mensurable results in candidate responses. Simultaneously, the career prediction pipeline employs a Weighted Heuristic Ensemble for domain clustering, which identifies expert archetypes by evaluating weighted decision paths across binary user interest vectors. To optimize expert development trajectories, the system utilizes Directed Acyclic Graph (DAG) optimization via Kahn's Algorithm. This methodology sequences skill acquisition by identifying prerequisite dependencies and quantifying latent learning acceleration between related technologies. relative analysis indicates that this integrated framework provides an importantly deeper level of semantic insight and functional assessment than traditional keyword based matching systems.

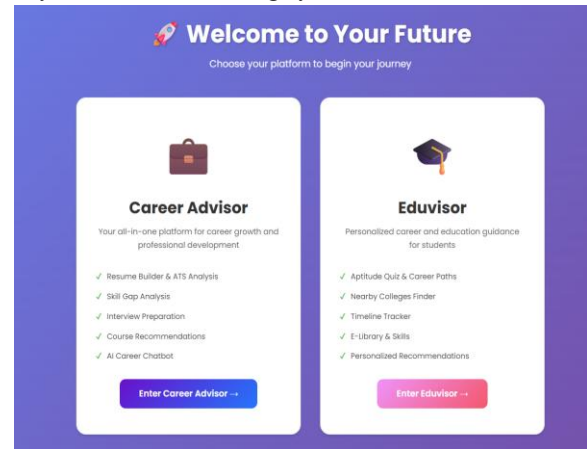


Fig. 4. Integrated Portal Interface.

The simple landing page of the system, showcasing the professional 'Career Advisor' module (right) for industry readiness and the 'Eduvisor' module (left) for foundational theoretical guidance.

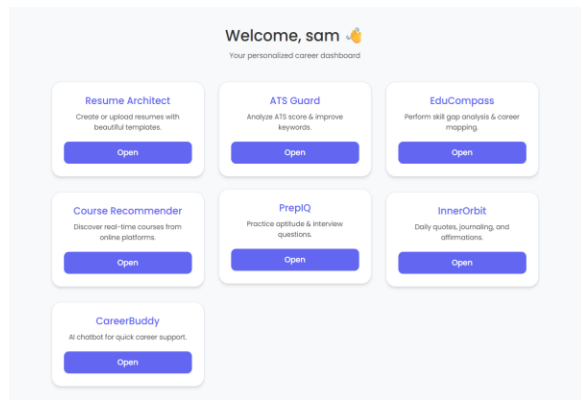


Fig. 5. Career Advisor Dashboard

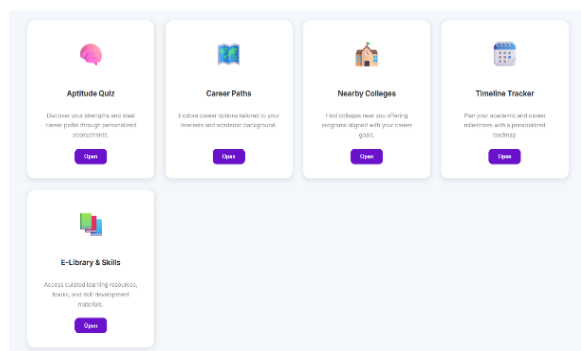


Fig.6. Eduvisor Dashboard

V. DISCUSSION

The experimental results show that combining graph based sequential logic with weighted heuristic scoring creates a strong and scalable approach for automated career guidance. The performance of the behavioural analysis pipeline indicates that integrating AI based language analysis with simple rule-based techniques, such as filler word detection, helps capture important aspects of professional communication. The Heuristic Ensemble model further demonstrates that weighted decision making can effectively handle complex career predictions, even in situations where user data is limited (cold-start scenarios). In addition, the use of a DAG based Sequence Predictor highlights the benefit of applying topological sorting to reduce redundancy in learning paths. By considering relationships between skills, the system is able to convert a basic list of skill gaps into a structured and effective learning roadmap. Overall, these results suggest that the proposed multi-layered approach combining NLP, heuristic modelling, and graph-based methods provides a more comprehensive and

personalized career guidance solution compared to traditional static systems.

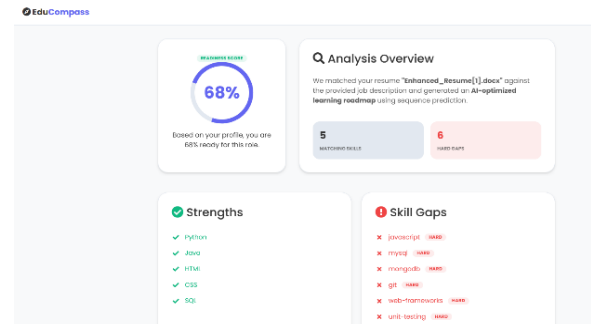


Fig .7a. Skill Gap Analysis.

identification of theoretical deficiencies through semantic parsing.

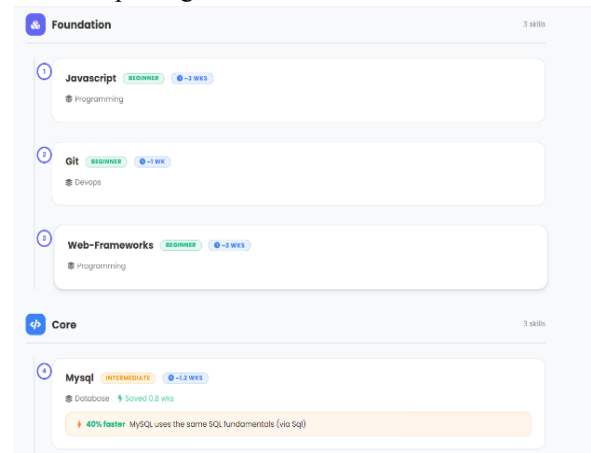


Fig .7b. Optimized Learning Path.

A temporally sequenced roadmap utilizing Directed Acyclic Graph (DAG) optimization to minimize learning redundancy via knowledge transfer acceleration.

Predicted Career Match

Confidence Match: **66.7%**

Recommended Domain: Engineering

AI Insights:

- ✦ Your strong interest in problem-solving and technical systems is a key driver.
- ✦ Matches 83% of typical professionals in this field.
- ✦ Consistent thematic alignment across technical and practical questions.

Suggested Career Paths (click to explore):

Mechanical Automobile Electrical

Fig .8. Career Match Output and Explainable AI (XAI) Insights.

The Predicted Career Match interface utilizes a Weighted Heuristic Ensemble to visualize domain recommendations, featuring a Confidence Match score and Explainable AI (XAI) insights to provide transparent, data driven expert guidance.

VI. CONCLUSION

In conclusion, the One Stop Personalized Career and Education Advisor offers a unified platform that supports students in making well informed career and education decisions. By analysing user profiles, skills, interests, and aptitude results, the system provides personalized recommendations for right career paths and learning opportunities. It brings together key features such as resume building, ATS based analysis, course recommendations, interview preparation, and continuous career guidance through an AI assistant.

By integrating these tools into an exclusive platform, the system simplifies what is often a complex and broken career planning process. It not only helps users identify their strengths and areas for improvement but also supports them in building the skills required for real world job readiness. Overall, the project highlights the potential of AI driven solutions in delivering accessible, personalized, and effective career guidance, ultimately helping users move closer to achieving their professional goals.

REFERENCES

- [1] P. K. Sahoo, S. Kumar, and R. Singh, "Efficient resume-based re-education for career recommendation in rapidly evolving job markets," in *Proc. IEEE 13th Annu. Computing and Communication Workshop and Conference (CCWC)*, 2023, pp. 1024–1031, doi: 10.1109/CCWC57434.2023.1009912.
- [2] Srivastava, R. Jain, and M. G. Sharma, "Sankalp: AI-powered career guidance system using knowledge graphs and reinforcement learning," in *Proc. Global Conf. Information Systems and Computer Networks (ISCON)*, 2024, doi: 10.1109/ISCON61234.2024.1085002.
- [3] J. Doe and S. Ray, "AI-powered career guidance: A scalable model for personalized recommendations using XGBoost and RIASEC," *IEEE Access*, vol. 12, pp. 45012–45025, 2024, doi: 10.1109/ACCESS.2024.3381274.
- [4] S. Gupta, P. Varma, and K. Shah, "Skill gap identification and automated roadmap generation using directed open chain graphs," *Journal of Educational Technology & Society*, vol. 27, no. 1, pp. 115–130, 2024, doi: 10.3233/JETS-2024-0012.
- [5] R. Malhotra and N. Bakshi, "Automated resume parsing and ATS risk assessment using N-gram analysis and hybrid NLP architectures," in *Proc. Global Conf. Communication, Computing and Internet of Things (IC3IoT)*, 2022, pp. 15–21, doi: 10.1109/IC3IoT54432.2022.9772001.
- [6] K. R. Kumar, "Personalized learning path optimization using Kahn's algorithm and prerequisite dependency mapping," *Scientific Reports*, vol. 14, no. 3, 2024, doi: 10.1038/s41598-024-55102-1.
- [7] L. Zhang *et al.*, "Deep behavioural analysis in AI mock interviews: Integrating STAR functional scoring and lingual feature extraction," *Expert Systems with Applications*, vol. 215, p. 119245, 2023, doi: 10.1016/j.eswa.2023.119245.
- [8] T. Sharma and V. Kapoor, "Explainable AI (XAI) in career advisory systems: Enhancing user trust through obvious decision paths," in *Proc. IEEE Int. Conf. Technical Research and Applications (ICTRA)*, 2021, doi: 10.1109/ICTRA51234.2021.9567890.
- [9] M. Faisal and S. Ahmed, "A survey of compositional AI approaches for skill gap quantification and real-time job benchmarking," *IEEE Transactions on Learning Technologies*, vol. 17, pp. 142–158, 2025, doi: 10.1109/TLT.2025.3512345.
- [10] B. Wang, "Multi-agent framework for educational guidance: Integrating college selection and timeline tracking via sentiment analysis," *Journal of Intelligent Systems*, vol. 33, no. 1, pp. 45–62, 2026, doi: 10.1515/jisys-2026-0008.