

# A Survey on AI-Based Personalized Career Guidance and Preparation Systems

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## Abstract—

This paper presents a comprehensive survey of existing AI driven career guidance systems, analyzing their methodologies, strengths, and limitations. The contemporary job market, characterized by rapid digital transformation and the entry of Generation Z, presents significant challenges for career navigation. Traditional career guidance methods are often insufficient, lacking the personalization and scalability required to meet modern demands. In response, recent research has focused on developing Artificial Intelligence (AI) and machine learning systems to provide more effective career support. Studies have proposed various models that offer personalized career recommendations by analyzing a user's academic performance, skills, and personal interests. Some systems enhance this by integrating psychological frameworks, such as the Myers-Briggs Type Indicator (MBTI), to match personality types with suitable job roles. The underlying technology often involves machine learning algorithms like Naïve Bayes and ensemble methods such as Random Forest to predict career paths with high accuracy. Beyond simple recommendations, the literature also explores AI's role in fostering career mobility by creating "skill bridges" and guiding users through upskilling pathways. A significant area of development is the creation of AI-powered chatbots and simulation systems that leverage Large Language Models (LLMs) to provide realistic, interactive interview practice and personalized feedback. While these specialized tools show promise, a recurring limitation identified across the research is the lack of a single, integrated platform that combines career discovery, skill development, and interview preparation into a seamless, end-to-end experience. The paper identifies key research gaps and outlines directions for future implementation of an integrated career guidance platform.

**Keywords—**Artificial Intelligence, Career Guidance, Survey Paper, Recommendation Systems, Natural Language Processing, Company Compatibility, Interview Preparation

## I. INTRODUCTION

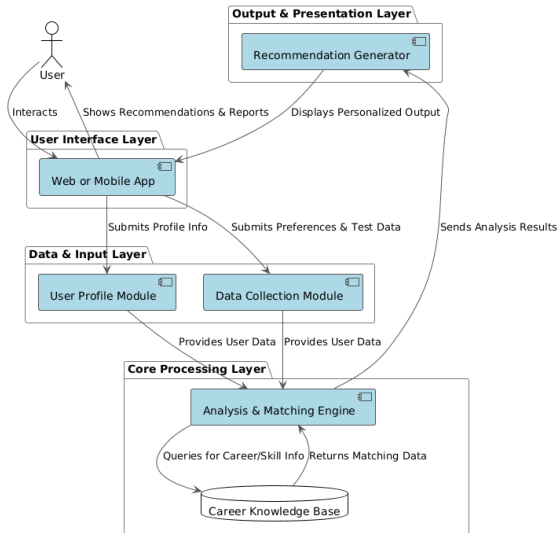
Career selection is a critical decision that significantly influences an individual's long-term professional growth and satisfaction. In recent years, the global job market has undergone rapid transformation due to advancements in digital technologies, the effects of the COVID-19 pandemic, and evolving workforce dynamics. These changes have increased the complexity of career decision-making, particularly for students and early-career professionals who must navigate a large number of career options with limited personalized guidance.

Traditional career counseling approaches primarily rely on one-to-one consultations and standardized assessments. While effective in the past, these methods face challenges in scalability and adaptability to modern labor market conditions. The limited availability of professional counselors and the inability to process large volumes of real-time educational, skill-based, and industry data reduce the effectiveness of conventional guidance models. Additionally, many existing online platforms provide fragmented solutions, often requiring users to rely on multiple independent tools for career recommendations, skill development, and interview preparation.

Recent research has demonstrated the growing role of Artificial Intelligence (AI) in addressing these challenges. AI-driven career guidance systems leverage machine learning, recommendation algorithms, and Natural Language Processing (NLP) to analyze user profiles, including academic performance, skills, interests, and personality traits, in order to generate personalized career recommendations. Beyond job matching, several studies have explored the development of AI-based career roadmaps that identify skill gaps and recommend targeted learning pathways to support career transitions and professional growth.

Another emerging area is the use of AI-powered chatbots and interview simulation tools that employ Large Language Models (LLMs) to provide interactive and adaptive interview preparation. These systems enable candidates to practice realistic interview scenarios and receive personalized feedback, thereby improving interview readiness. Despite these advancements, existing solutions are often limited in scope and lack integration with real-time organizational and labor market data.

This paper presents a comprehensive survey of AI-based career guidance systems, focusing on their methodologies, advantages, and limitations. The survey identifies a critical research gap in the absence of a unified, end-to-end platform that integrates career discovery, skill development, company compatibility analysis, and interview preparation. The insights derived from this survey aim to inform the design of future integrated career guidance systems.



## II. LITERATURE REVIEW

Author(s)	Dataset	Methods/Techniques Used	Advantage	Limitation
<b>Gupta, Y.</b> <a href="#">[1]</a>	User inputs (resume, interests, goals) and real-time job API data	NLP (spaCy/Transformers), Scikit-learn classification model, Cosine Similarity	Provides integrated platform (recommender, roadmap, job search).	Relies on static resume/limited job sources; lacks dynamic company compatibility.
<b>Bebale, P., et al.</b> <a href="#">[2]</a>	User-provided data (academics, interests) and Myers-Briggs Type Indicator (MBTI) assessment results	Machine Learning (Decision Trees, SVM, Neural Networks) and the MBTI psychometric framework	Integrates personality for career recommendations.	Uses static personality tests; doesn't use live company data for dynamic matching.

<b>Kulugh, V. E., et al.</b> <a href="#">[3]</a>	User inputs on activities, skills, and career choices	Holland's Vocational Theory (RIASEC) and Social Cognitive Theory (SCCT) framework, with a Llama API backend	Based on established psychological theories for personalized advice.	Recommendations are based on static user input and theories; lacks dynamic company data analysis.
<b>Khan, I., et al.</b> <a href="#">[4]</a>	Online assessment results for skills like verbal ability, mathematical reasoning, etc.	A custom online assessment tool ("Skill Compass") with psychometric evaluation (Cronbach's Alpha)	Helps users identify core skills (verbal, math, spatial) and areas for improvement.	Focuses only on skill assessment; doesn't connect skills to dynamic company needs or provide end-to-end guidance.
<b>Mullens, D., &amp; Shen, S.</b> <a href="#">[5]</a>	O*NET Database for 545 occupations and AI usage metrics from Handa et al. (2025)	Principal Component Analysis (PCA), LASSO Regression, and Ordinal Logistic Regression	Explains how AI assists in creating "skill bridges" for career mobility.	Theoretical; doesn't offer a practical tool for users to identify and build these skill bridges.

<b>Shinde, A., et al. [6]</b>	Spoken or written educational content (lectures, study materials)	Computer Vision (for distraction detection), NLP (for note-taking), and AI-driven Quiz Generation	Enhances personalized learning through features like adaptive quizzes and generation.	Focused on general academic study; not specifically on career skill development or company-specific preparation.
<b>Wagmar, K., et al. [7]</b>	User inputs and industry standard questions	Interactive AI Chatbot using ChatGPT API, Whisper API (for voice), and a FastAPI backend	Offers realistic, two-way conversational interview practice; user can ask questions.	Standalone interview tool; not integrated with career recommendation or company compatibility.
<b>Liu, Z. [8]</b>	Data from semi-structured interviews with 16 researchers of varying expertise	Inductive Thematic Analysis and User-Centered Design, leveraging Large Language Models (LLMs)	Reduces interviewer's cognitive load during live interviews, improving efficiency.	Designed for the <i>interviewer</i> , not the <i>job candidate</i> ; doesn't directly help candidates prepare.
<b>Westman, S., et al. [9]</b>	Data from focus groups, workshops, and trials with students (n=179) and staff (n=14)	Thematic Analysis and practical trials with AI course/job recommender applications	Outlines comprehensive requirements for future AI career guidance systems.	Conceptual; does not implement a working system that fulfills these requirements.
<b>Beretta, E., et al. [10]</b>	Labor market data from the Federal Reserve Bank of St. Louis (FRED Economic Data)	Labor market analysis and a conceptual Hybrid Model (AI for data processing, humans for empathy)	Highlights the need for a hybrid model for the post-COVID job market (AI for data, or humans for empathy).	Explains the need for such a system but does not propose or implement a specific solution.

<b>Färber, M., &amp; Tampakis, L. [11]</b>	Microsoft Academic Graph (MAG), GRID, and <a href="http://metric.com">Altmetric.com</a> databases	Scientometric analysis, Percentile Rank (PR6) approach, Altmetric analysis	Proves the impact of corporate-led AI research on scientific advancements.	Analyses the effectiveness of AI innovation but doesn't create a tool that uses corporate data for career guidance
<b>Sliuserchyk, D. [12]</b>	104 Indonesian IT student profiles, scraped job ads from techindonesia and jobstreet.co.id	Personalized Naïve Bayes (p-Graded Theory (EDM-GT), and MBTI	Proposes a modular architecture tailored to the IT sector with personalized learning paths and LMS integration.	This is a conceptual design and not an implemented system; it relies on authors' own classification model.
<b>Siswipraptini, P. C., et al. [13]</b>	Analysis of platforms (O*NET, ESCO) and focus group data (16 participants)	Conceptual System Architecture, Competency-based User Profiling, and User-Centered Design (UCD)	Integrates student personality (MBTI), subjects, and job profiles for tailored IT career recommendations.	Model is specific to Indonesia; web scraping for tailored IT career recommendations was sometimes imperfect, leading to missing data.
<b>Karwa, K. [14]</b>	Not empirical study (conceptual paper)	Tailored career advising frameworks, portfolio development workshops, and mentorship programs (non-AI)	Proposes specific advising models for different design fields (Industrial, Product, UI/UX), emphasizing portfolios.	Not focused on AI-driven automation; it's a model for human advisors and curriculum development.

<b>Leung, S. A. [15]</b>	Survey data from 2,935 high school students in Hong Kong	Career Construction Theory (CCT), Career Adaptability Scale (CAS), and Gamified Tools (Work Values Game)	Moves beyond simple matching to help users construct a “career story” and build adaptability; uses gamified tools.	Effectiveness varied by students’ academic background; all students benefited equally.
<b>Farrell, G., et al. [16]</b>	CV/Resume, Competency, and Personality Test (Holland/RIASEC) data from vocational students	Content-Based Filtering, RISP-DM methodology, TF-IDF, and Cosine Similarity	Provides job recommendations for vocational students based on their competency, personality, and skills to improve job matching.	Focuses on matching existing profiles to jobs; doesn’t create dynamic roadmaps for upskilling or interview prep.

<b>RAHMAN, I. A. [17]</b>	User inputs and a JSON dataset of interview questions/answers	Interactive Chatbot (“Jobis”) using Large Language Models (GPT-3) and Flask web framework	Provides a personalized and accessible platform that uses an LLM to simulate realistic interview scenarios and give comprehensive feedback.	Standalone interview tool; not integrated with a broader recommendation or company compatibility system.
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<b>Roy, P. [18]</b>	Not applicable (conceptual review paper)	Literature review and conceptual analysis of career guidance principles	Provides a comprehensive overview of the importance of career guidance as a lifelong process.	It is a conceptual paper that discusses the “why” of career guidance, not the “how” with technology.
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<b>Suberson, et al. [19]</b>	Industry-specific interview questions and user survey responses	Intelligent Interview Simulation (P-REBOT) using NLP, Machine	Simulates realistic interviews with adaptive questioning and provides real-time feedback	Lacks integration with a broader career guidance system to help
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		Learning, and Sentiment Analysis	on verbal/non-verbal cues.	users choose which jobs to interview for.
<b>Reddy, K. S. V., et al. [20]</b>	Kaggle dataset of 20,000 student profiles	Ensemble Learning (Random Forest, Voting Classifier, Decision Tree)	Uses academic marks, personality traits, and interests to predict suitable software industry roles with high accuracy.	The prediction is based on static data; it doesn’t use live job market or real-time company data.
<b>Sarosa, M., et al. [21]</b>	User conversation logs from a chatbot based on the ALICE database	Naïve Bayes Algorithm (for classification)	Classifies user’s interview answers to determine their potential, talent, interests, providing a summary.	The bot logic is based on older AIML/pattern matching, which is less dynamic than a modern LLMs.

The surveyed literature demonstrates significant progress in AI-based career guidance, recommendation systems, and interview preparation tools. However, most existing solutions focus on isolated components such as career matching, skill assessment, or interview simulation. Additionally, many systems rely on static user inputs and lack integration with real-time company and labor market data. These limitations highlight a clear research gap and motivate the need for a unified, end-to-end career guidance platform, which is further explored in future work.

### III. TECHNOLOGIES USED

This section summarizes the key technologies and methodologies discussed across the surveyed literature.

#### Machine Learning Algorithms

Machine learning is at the heart of most career recommendation systems. These algorithms are used to find patterns in data and make predictions about which career paths best suit a user.

- **Ensemble Learning (Random Forest, Voting Classifier):** This is an advanced technique that combines multiple machine learning models to produce a more accurate prediction than any single model. In prior studies, Random Forest algorithms have been applied to Kaggle-based student profile

datasets to predict suitable job roles in the software industry with high accuracy.

- **Naïve Bayes:** This is a classification algorithm based on Bayes' Theorem. It's often used for text classification and making predictions based on probabilities. In the papers, it was used to classify a user's interview answers to determine their potential and interests and to build a personalized career recommendation model for IT students in Indonesia by matching their personality types to job profiles.
- **Decision Trees:** This is a model that uses a tree-like structure of decisions to arrive at a conclusion. It was used as one of the core machine learning models to analyze user data (academic records, personality traits) and suggest optimal career paths.
- **Support Vector Machines (SVM):** This is a supervised learning model used for classification tasks. Along with Decision Trees and Neural Networks, it was a foundational algorithm proposed for analysing user input to generate precise career recommendations.
- **Content-Based Filtering:** This is a recommendation system technique that suggests items based on their properties. It was used in a model for vocational students to recommend jobs by comparing the "features" of a student's profile (their skills, competencies) with the features of a job description.

### Natural Language Processing (NLP) & Models

NLP is a field of AI that enables computers to understand, interpret, and generate human language. It's crucial for parsing resumes, analysing text, and powering chatbots.

- **Large Language Models (LLMs - e.g., GPT-3):** These are advanced AI models trained on vast amounts of text data, capable of generating human-like text and engaging in complex conversations. LLMs are the core technology behind modern interview preparation chatbots, like "Jobis" and the "AI BOT FOR INTERVIEW PREPARATION," allowing them to simulate realistic, interactive interview scenarios.
- **General NLP Libraries (spaCy, Transformers):** These are software libraries that provide pre-built tools for common NLP tasks. In the "CareerX" system, these libraries are used to perform resume parsing—automatically extracting key information like skills and work experience from a user's CV.
- **TF-IDF and Cosine Similarity:** These are mathematical techniques used to measure how similar two documents are. **TF-IDF** determines the importance of a word in a document, and **Cosine Similarity** measures the similarity between two text vectors. They were used together to match student

profiles with job descriptions in a vocational education recommender system.

- **Sentiment Analysis:** This NLP technique is used to determine the emotional tone behind a body of text (positive, negative, or neutral). In the "Prebot" interview simulator, sentiment analysis is used to gauge a user's confidence and anxiety levels from their responses, enabling more personalized feedback.
- **Artificial Intelligence Markup Language (AIML):** This is an older, XML-based language used to create simple, pattern-matching chatbots. An "Interviewer-Bot" was built using AIML to create a basic conversational agent for interview practice, representing an earlier generation of chatbot technology.

### Psychometric & Theoretical Frameworks

These are established psychological or process-oriented models that provide a structured foundation for career guidance systems.

- **Myers-Briggs Type Indicator (MBTI):** A popular personality assessment that categorizes individuals into one of 16 personality types. It was used in several systems, including "Career Compass" and a model for Indonesian IT students, to match a user's inherent personality with suitable career options and job profiles.
- **Holland's Vocational Theory (RIASEC):** This theory classifies people and work environments into six types: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. An AI-powered system used this framework to provide recommendations by matching the user's RIASEC type to corresponding career fields.
- **Career Construction Theory (CCT):** A modern career counselling theory that focuses on helping individuals construct their "career story" and build adaptability. A Computer-Assisted Career Guidance System (CACGS) was built based on CCT, moving beyond simple matching to help users find meaning and purpose in their career paths.

### Web Technologies & APIs

These are the practical software tools and frameworks used to build and deploy the web applications described in the research.

- **Python Web Frameworks (Flask, Fast API):** These are backend frameworks used to build the server-side of a web application. **Flask** was used to create the backend for the "Jobis" interview chatbot, while **Fast API** was used for the "AI BOT FOR INTERVIEW PREPARATION" to ensure high performance.

- **Whisper API:** An AI model from OpenAI that specializes in speech-to-text transcription. It was used in an interview bot to convert the user's spoken answers into text for the AI to process, enabling a voice-based interaction.

#### IV. CONCLUSION

This paper presented a comprehensive survey of AI-based career guidance systems, examining existing approaches for career recommendation, skill-gap analysis, company compatibility evaluation, and interview preparation. Through an extensive review of the literature, the study identified key limitations in current solutions, including fragmented system design, reliance on static user data, and limited integration of real-time organizational and labor market information.

The survey highlights a clear research gap in the absence of a unified, end-to-end career guidance platform that seamlessly integrates personalized recommendations, dynamic skill road-mapping, company compatibility analysis, and interview preparation. Addressing this gap has the potential to significantly enhance career decision-making for students and early-career professionals.

This work is limited to a survey and comparative analysis of existing systems. The design, implementation, and experimental evaluation of a comprehensive AI-powered career guidance platform are planned as future work.

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