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AI-Powered Career Enhancement Portal: A Comprehensive Survey on Intelligent Career Guidance Systems Using NLP and Generative AI

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Abstract: Competition and the use of technology are some of the major elements that have significantly impacted career planning. The conventional career guidance programs are seen to be unable to provide personalized solutions to individuals. This paper provides a detailed review of different Artificial Intelligence-based career enhancement systems using techniques like Natural Language Processing, Machine Learning, and Generative AI. This paper discusses various issues such as resume analysis, AI-powered interview simulations, career pathway formulation, and cover letter writing. This paper analyzes both the pros and cons of implementing such intelligent solutions. In addition, a combined AI-based career enhancement portal solution is introduced that combines all of these intelligent systems in one platform. This will have a major impact on career development.

Index Terms: Artificial Intelligence, Natural Language Processing, Machine Learning, Resume Analysis, Mock Interview, Career Enhancement, Generative AI, SBERT

I. INTRODUCTION

Moving from studies to profession is becoming more and more challenging owing to the drastic technological advancements and dynamic requirements of the industrial sector. It is not enough for the people looking for jobs to be technically skilled; they need to be communicative, problem solvers, and flexible.

Counseling, training, and job placement systems are not customized according to individual needs. Such systems are static. The general information provided by such systems does not cater to the dynamic requirements of the job market.

With the emergence of Artificial Intelligence (AI), significant improvements have been observed in automation, personalization, and scalability of career support systems. AI-based systems can analyze large volumes of data, identify patterns, and generate intelligent recommendations.

In particular, NLP and LLMs have allowed human language to be understood and generated by these tools, hence, their immense application within career-oriented uses.

Even though there have been such advancements within AI technology, most of the software created so far cater to specific uses such as resume building or job interview preparation [2], [5], [11]. The need exists for an all-in-one solution that can bring together various functions within a common platform. This study discusses the thorough analysis of available career systems based on AI technology.

II. LITERATURE SURVEY

A. AI-Based Mock Interview Systems

The general idea regarding the application of artificial intelligence for mock interview training involves the creation of realistic interview cases with the use of highly advanced Natural Language Processing (NLP) and Machine Learning (ML). For instance, Mishra et al. [2] suggested implementing the GPT-based mock interview design framework that evaluates answers based on accuracy, self-confidence, and communication ability.

The most recent innovations in the domain of machine learning and NLP allowed the introduction of voice-based communication into the mock interview framework. According to Naing et al. [9], the development and implementation of interview cases can be achieved through such technological means as ASR and TTS.

However, most of these systems lack integration with other career development modules and often operate as standalone solutions. These systems significantly improve interview readiness but lack integration with other modules [3], [4].

B. Resume Analysis Systems

Resume screening systems have been extensively used in recruitment processes in order to enhance the efficiency of resume screening.

Resume screening systems leverage NLP techniques like tokenization, POS tagging, and entity recognition.

Julian et al. [5] suggested the use of an NLP-based system that would classify resumes through machine learning. Prashanth et al. [6] suggested building an NLP-based system for resume screening by using the Word2Vec algorithm and the cosine similarity method.

There are several advanced resume screening techniques that include SentenceBERT that improves the understanding of the resume. But at the same time, these systems heavily rely on keywords and do not provide any career guidance.

One of the ways in which NLP can be used in resume screening includes using machine learning for scoring purposes [7][8].

C. Career Roadmap Generation

Career pathway planning system employs AI technology in giving recommendations for career paths of individuals. The pathways recommended by the system are in addition to the technological tools needed.

A Career Pathway Planning System based on AI Technology has been introduced by Naing et al. [9]. The proposed system can be employed for providing guidance on career steps. The proposed system is dynamic in nature because its functioning is determined by user inputs.

The maximum potential of the system is not exploited as it does not include tools for preparation of interviews and resumes. Modern day systems employ both AI and adaptive learning models [10], [12].

D. Automated Cover Letter Generation

The process of document creation has been greatly enhanced by generative AI. According to Kavitha et al., [13], there is a suggestion of developing a system for the generation of personalized cover letters through language models.

The development of this system helps create professional documents from analysis of job descriptions and candidates' profiles. However, this system has not been incorporated into other career modules.

E. Integrated Career Guidance Systems

Current research has taken an interest in bringing different career services under one roof. Such a service will consist of resume analysis, interview preparation, and job advice.

There are still some issues in the current integrated career service such as scalability, real-time feedback, and personalization. Current career services lack advanced capabilities of AI such as semantics and voice commands.

F. Feedback, Explainability, and Recommendation Layers

The better a career system becomes in terms of explainability, the more successful its recommendations become. Explainability plays a key role as users should be able to have confidence in recommendations provided by a particular career system and understand how to improve their profile and skills accordingly. Sankalp, together with other similar career systems, shows the strength of using the hybrid architecture to create explainable career system recommendations. Sankalp uses semantic matching, sentiment analysis, and rule-based logic to provide effective career system recommendations [12].

The system leverages SBERT-based semantic similarity, VADER sentiment analysis, knowledge graphs, and rule-based logic to provide an explainable recommendation of the system's performance. In addition, the system makes use of voice-based interactions in several languages and adaptive learning to improve recommendations through user feedback [12].

The most successful career systems are those that use all three methods. From the survey standpoint, the following three main types of AI-based feedback exist:

- Rule-based feedback: This type of feedback is based on deterministic suggestions based on the absence of certain skills, weak sections, or certain criteria.
- Semantic feedback: This type of feedback is based on embedding similarity models.
- LLM-based feedback: This type of feedback is based on natural language explanations and summaries.

This is especially useful in academic and real-world systems where scoring and interpretability are both important.

Career guidance solutions based on Artificial Intelligence have undergone substantial improvement through the incorporation of several other technologies including Natural Language Processing (NLP), Machine Learning (ML), and Generative AI.

Recent research focuses on the adoption of combined methods that leverage these techniques to enhance the efficiency of such solutions [9], [12].

The introduction of Transformer architecture models such as BERT and SBERT has led to enhanced semantic understanding for resume and job match systems. Such models make use of the context relationship of the words to perform the matching process effectively as opposed to conventional keyword-based techniques [5], [6].

One major trend that has emerged through the reading of the current literature is that of adaptability and feedback-based career guidance systems. Some advanced solutions including Sankalpare based on reinforcement learning and feedback from users [12].

III. COMPARATIVE ANALYSIS

The comparative analysis of the current career guidance systems using artificial intelligence is needed to evaluate their effectiveness, adaptability, and usability. The study shows that the current AI-based career guidance systems are created for dealing with particular problems such as resume analysis, preparing for interviews, and career guidance. Nevertheless, their effectiveness depends on the methods used within the system.

The methods used in AI-based mock interview systems are large language models (LLM) and NLP. The first benefit of using this system is to improve communication skills and boost confidence. The limitation of this system is the incapability of understanding contexts and analyzing the performance. Another disadvantage of this system is that it is not customized according to resume-based criteria.

The resume analysis system uses several NLP methods such as TF-IDF, Word2Vec, and SBERT. This system was highly efficient in recruitment. The limitation of this system is that it is only capable of matching keywords. Another system that utilizes SBERT technology was highly efficient in contextualizing. The limitation of this system is that it requires a lot of computational power.

The career guidance system utilizes machine learning and recommendation technologies. These technologies are helpful in recognizing the gaps in skills and providing a learning path. However, the system lacks flexibility and the capability to adapt to the latest industry trends and user responses.

The automated cover letter writing system utilizes Generative AI technology. This technology has the advantage of creating professional cover letters. However, the system lacks personalization in the context and tone of the cover letter.

The integrated system attempts to integrate all the components in a single system. However, the existing systems in the field face many challenges, such as scalability, the absence of real-time feedback, and the absence of explainability. These systems also fail to provide a seamless user experience because the modules in the system interact poorly.

The existing systems also fail to provide the necessary evaluation metrics to compare the system's effectiveness. For instance, the system's accuracy, user satisfaction, response time, and flexibility are not taken into account while creating the system.

The above challenges show the need to design an integrated system which is scalable and intelligent in nature. The system must be able to provide personalization, real-time feedback, and explainability [1], [5], [11].

Table I shows the comparison of various systems in terms of techniques, features, and limitations.

TABLE I. COMPARISON OF EXISTING SYSTEMS

System	Technique	Features	Limitations
Mock Interview	LLM	Dynamic Q/A	No integration
Resume Analyzer	NLP	Skill Matching	Limited context
Career Systems	ML	Recommendations	Static output
Cover Letter	GenAI	Automation	Standalone
Integrated Systems	Hybrid AI	Multi-module	Limited scalability

From the comparison, it is evident that most systems lack a unified architecture and fail to provide end-to-end career support.

Resume analysis tools enhance recruiting effectiveness but are constrained by keyword search and inflexibility to adjust to evolving job descriptions [7], [8].

Career advising services offer systematic advice but do not account for current job market dynamics, thus offering static career advice [11]. Generative AI-based cover letter generators automate cover letter creation but lack context without linking to user profiles [13].

IV. RESEARCH GAP

On the basis of literature survey and comparative analysis, it has been identified that there are several critical gaps in the existing AI-based career guidance systems.

Firstly, there is a lack of integrated systems that can perform resume analysis, interview preparation, career roadmap creation, and document creation. The existing systems work in an isolated manner, which is creating difficulties for users.

Secondly, another significant problem of career guidance systems is that of personalization. Current career guidance systems give general advice to users without being able to adapt their services according to each individual's profile, learning style, and career objectives. Lack of an adaptive learning process is causing difficulties for users.

Thirdly, the feedback process offered by the career guidance systems is not an effective one. Several systems offer feedback after a delay period.

Continuous feedback and iterative learning are essential for skill development but are rarely implemented.

The next major area where there is a gap in the application of AI in natural language processing is the lack of application of semantic understanding. Although there has been some improvement in the application of SBERT and embeddings, it is still in its early stages.

Explainability is another area where there is a major gap in the application of AI in natural language processing. Many AI systems are still in a black box state, meaning they give recommendations without being able to explain them. Systems like Sankalp [12] have tried to address this issue, but it is still in its early stages.

In addition to that, the development of voice-based or interactive systems is still in the early stages. The majority of the systems are based on text-based interfaces. As a result, the level of realism in the simulation of the interview process is compromised.

The issue of scalability is another significant problem in the development of AI-based systems. The majority of the systems lack the required efficiency in the handling of large data or real-time processing.

Last but not least, the lack of standardized evaluation systems is one of the problems in the development of AI-based systems. The majority of the systems are evaluated using isolated metrics. The above problems clearly show the need for an integrated, explainable, and adaptive AI-based system for career enhancement [1].

Besides the gaps mentioned above, there is no mechanism for learning in current systems. Most existing systems fail to update their recommendations depending on how the users interact with them, which limits their capacity to provide adaptive career recommendations [12].

A further major gap lies in real-time integration with job markets. This means that many current systems use static data sets, which produces less accurate recommendations [9].

Moreover, interdisciplinary approach is barely used. Integration of AI with psychology can greatly enhance the quality of career advice.

Finally, there is no standardized framework for evaluating different systems. The most common criteria used are response time and accuracy.

V. CHALLENGES IN EXISTING SYSTEMS

As mentioned in the literature review section, the following limitations were faced in the existing AI-based career guidance systems:

- **Lack of Integration:** The existing systems were fragmented and were more focused on specific components such as resume analysis [5], mock interviews [2] etc. .
- **Limited Personalization:** The existing systems were not able to provide personalization and were more generic in nature.
- **Keyword-Based Processing:** The existing systems were not able to understand the contextual and semantic meaning of the text.
- **Lack of Explainability:** The existing systems were not able to explain the feedback provided.
- **No Real-Time Feedback:** The existing systems were not able to provide real-time feedback.
- **Scalability problems:** The current systems lacked the capability to handle large data volumes. Many systems lack the capacity to handle huge data volumes or large numbers of simultaneous users.
- **Limited interaction:** The current systems lacked the capability to offer voice functionality. This means that interactions take place in text form with limited voice functionality.

VI. FUTURE SCOPE

Further improvement in the design of the suggested system can be made as:

- Integration of different job portals such as LinkedIn and Naukri in real-time for purposes of matching:

This will ensure that the jobs available in these portals can be accessed instantly and recommendations can be made according to the demand in the market.

- Use of emotion detection through facial expressions or voice recognition technology:

The addition of this technology will allow the analysis of candidate confidence in mock interviews.

- Construction of AI-based analytical dashboards for analyzing user performance:

AI-driven dashboards can provide useful insight into the performance of the user by highlighting his/her weaknesses and strengths.

- Analysis of job market trends in real-time through the use of big data and web scraping technology:

Big data and web scraping can be used for analysis of large volumes of data to forecast future trends in the job market.

- Offering a multilingual interface for attracting global users:

This will allow the system to cater to an international customer base.

- Reinforcement learning algorithm for recommendation purposes:

The implementation of this learning algorithm can enhance the efficiency of recommendation techniques adopted by the system.

- Hosting of the system on cloud platforms:

Hosting of the system on cloud platforms offers several benefits for optimizing system performance.

- Combination of all intelligent modules into one career preparation platform:

Having all the modules integrated into one platform means that the user experience will be seamless and more effective.

VII. CONCLUSION

The objective of this paper is to present a survey of career enhancement portals using Artificial Intelligence. This survey will particularly focus on its individual components such as Resume Analysis, Mock Interview, Career Roadmap Development, and Cover Letter Development. This study demonstrates how Artificial Intelligence, Natural Language Processing, and Generative AI technologies have been highly useful in enhancing the various aspects of Career Enhancement Processes.

Many Career Enhancement Systems contain unique and stand-alone features that have led to their inability to provide personalized solutions to the users of the system. Moreover, there have been issues like a lack of semantic understanding and explainability that have reduced the effectiveness of Career Enhancement Systems.

To address the abovementioned challenges, an AI-based career enhancement portal will be discussed that utilizes several modules in an integrated manner.

Overall, the integration of AI-based systems can make career preparation more effective.

The survey demonstrates the importance of the introduction of state-of-the-art technologies such as Artificial Intelligence, Natural Language Processing, and Generative AI, which make career preparation more efficient, accessible, and personalized.

Based on the assessment of current solutions, it can be concluded that despite the fact that there are several innovations in place, all of these systems function separately from each other. It leads to a decrease in personalization and inefficiency of use. Moreover, several problems, including a lack of semantic understanding, contextual awareness, and explainability of AI-based decisions, still remain relevant. Furthermore, the implementation of advanced NLP tools and Generative AI models can help increase the ability of the system to provide more personalized responses by better interpreting the user requests.

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