

AI Resume Optimizer: A Multi-Agent Approach for Intelligent Resume Enhancement and ATS Alignment

Vishakha Ghatole¹ and Prof. Ujwala Khartad²

Student, Department of Computer Science and Engineering (Data Science)¹

Supervisor, Department of Computer Science and Engineering (Data Science)²

Tulsiramji Gaikwad Patil College of Engineering & Technology, Nagpur, India.

Abstract: *This paper presents an AI-based Resume Optimization System designed to improve the structure, relevance, and quality of resumes in alignment with job descriptions. The system addresses challenges faced by candidates in preparing ATS-compatible resumes and tailoring content for specific roles. It utilizes Generative Artificial Intelligence to analyze resume content and job requirements, restructure information, and generate professionally formatted outputs. The architecture follows a multi-agent approach, where separate components handle content optimization, document formatting, and interview question generation. The system is implemented using Python and Streamlit, with integration of the Google Gemini API for intelligent processing and libraries such as pdfplumber, PyPDF2, and python-docx for document handling. The proposed approach enhances resume clarity, improves alignment with industry expectations, and supports interview preparation through context-aware question generation*

Keywords: Resume Optimization, Generative AI, Applicant Tracking System, Multi-Agent System, Natural Language Processing, Document Processing, Streamlit, Gemini API

I. INTRODUCTION

The system design follows a modular and structured architecture to support efficient resume optimization and interview preparation. The process begins with the input stage, where users upload their resume and a corresponding job description in formats such as PDF, DOCX, or TXT. A file processing module extracts textual content from these documents and converts it into a standardized format for analysis. The extracted data is then passed to the content optimization module, which uses Generative Artificial Intelligence to restructure and refine resume information based on job-specific requirements. Following content refinement, a formatting module transforms the structured text into a professionally organized resume layout suitable for Applicant Tracking Systems. In parallel, an interview question generation module analyzes both the resume and job description to produce context-aware questions that assist users in preparation for recruitment processes. The system also provides an interactive interface that allows users to review and edit generated content before finalizing the document. This modular design ensures improved clarity, flexibility, and efficient handling of resume optimization tasks.

SYSTEM DESIGN

The system design adopts a modular architecture to efficiently support resume optimization and interview preparation. The workflow begins with user input, where a resume and corresponding job description are uploaded in formats such as PDF, DOCX, or TXT. A file processing module extracts and standardizes textual content from these documents for further analysis. The processed data is then passed to an AI-based content optimization module that utilizes Generative Artificial Intelligence to restructure and refine resume information in alignment with job-specific requirements. The refined content is subsequently handled by a formatting module, which generates a professionally structured and Applicant Tracking System-compatible resume.



In parallel, an interview question generation module analyzes both inputs to produce context-aware questions for user preparation. The system also includes an interactive interface that allows users to review, edit, and download the final output. This modular design ensures clarity, flexibility, and efficient processing throughout the system.

METHODOLOGY

Python was used for developing the AI Resume Optimization System, including document processing, content refinement, and multi-agent coordination. The system accepts resumes and job descriptions in formats such as PDF, DOCX, and TXT, and extracts textual content using libraries such as pdfplumber, PyPDF2, and python-docx. The extracted data is processed using the Google Gemini API, where structured prompts are used to generate optimized resume content aligned with job requirements.

Streamlit was used to build an interactive web-based interface that allows users to upload documents, review generated outputs, and make necessary modifications. The system applies a multi-agent approach to handle tasks such as content optimization, formatting, and interview question generation. The final output is presented in a structured format, enabling users to download a professionally formatted resume along with generated interview questions for preparation.

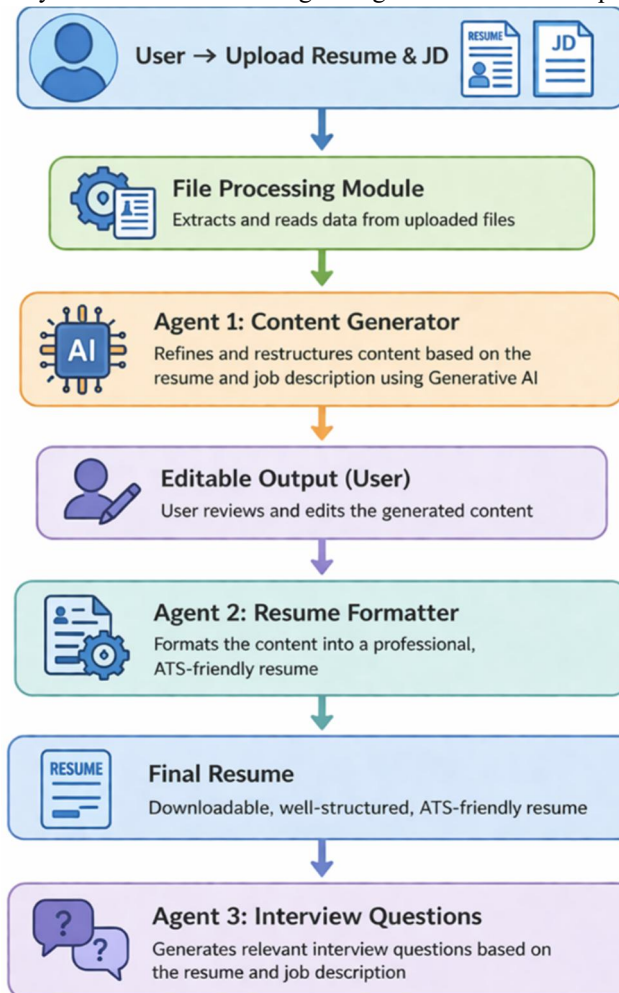


Fig. 1. Overall System Architecture of AI Resume Optimization System



RESULT AND DISCUSSION

The AI Resume Optimization System successfully improved the structure, clarity, and relevance of resumes by aligning content with job-specific requirements. The use of Generative Artificial Intelligence enabled effective restructuring of candidate information, highlighting key skills and experiences in a more organized manner. The system also generated professionally formatted resumes that are compatible with Applicant Tracking Systems, improving the likelihood of successful screening. The interactive interface allowed users to review and modify generated content, ensuring flexibility and personalization. Additionally, the interview question generation module provided context-aware questions based on both the resume and job description, supporting better preparation for recruitment processes. Overall, the system demonstrated improved usability, efficiency, and effectiveness compared to traditional template-based resume tools.

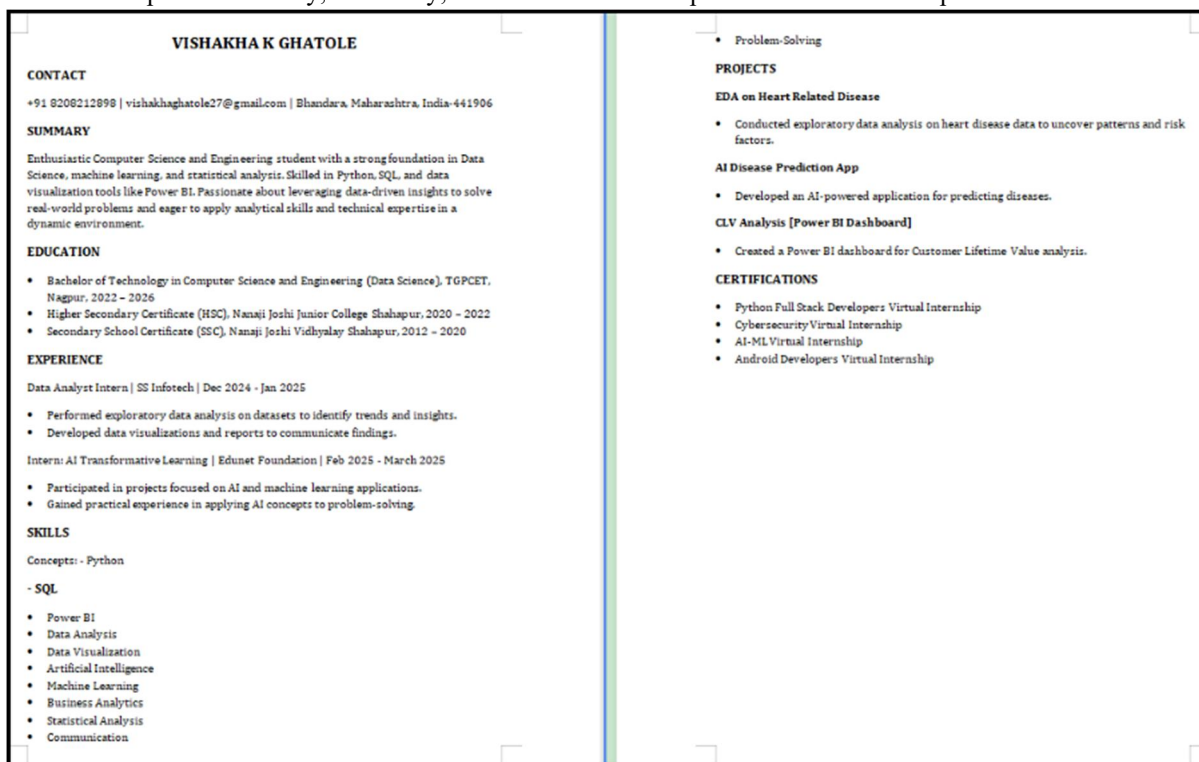


Fig. 2. Generated Resume Output after Optimization

II. CONCLUSION

This paper presents the design and implementation of an AI-based Resume Optimization System that enhances resume quality, structure, and relevance with respect to job descriptions. By integrating Generative Artificial Intelligence with a multi-agent architecture, the system effectively supports content refinement, professional formatting, and interview preparation within a unified platform. The proposed approach improves alignment with Applicant Tracking System requirements while maintaining user control through an interactive editing interface. The results demonstrate that intelligent automation can significantly reduce manual effort in resume preparation and improve overall candidate readiness for recruitment processes. Future work may include integration of resume scoring mechanisms, job recommendation systems, multilingual support, and deployment on cloud-based platforms for wider accessibility.

ACKNOWLEDGEMENT

The author would like to express sincere gratitude to the Department of Computer Science and Engineering (Data Science), Tulsiramji Gaikwad Patil College of Engineering & Technology, Nagpur, for providing the necessary resources and support to carry out this work. Special thanks are extended to Prof. Ujwala Khartad for valuable guidance,



encouragement, and continuous support throughout the development of this research. The author also acknowledges all faculty members and peers who contributed directly or indirectly to the successful completion of this work.

REFERENCES

- [1]. Google DeepMind. (2025). Gemini API Documentation: Advanced Generative AI for Conversational Systems. Google Developers.
- [2]. OpenAI. (2024). GPT-4 Technical Report. arXiv preprint arXiv:2303.08774.
- [3]. Li, H., Wang, Z., and Zhao, Q. (2024). Generative AI for Document Optimization and Text Refinement. IEEE Access.
- [4]. Zhang, Y., Chen, X., and Kumar, S. (2023). Multi-Agent Systems in Intelligent Applications: A Survey. IEEE Access.
- [5]. Kumar, P., and Sharma, R. (2025). AI-Powered Resume Optimization and ATS-Based Filtering Techniques. International Journal of Intelligent Systems.

