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AI-Powered Resume Builder

Aman Sehgal, Anant Dapurkar, Love Kumar, Dr. Megha Mishra

Computer Science and Engineering, Chhattisgarh Swami Vivekanand Technical University, India
sehgalaman34@gmail.com; dapurkaranant@gmail.com; lovekumar30460@gmail.com; megha16shukla@gmail.com

ABSTRACT—

This research paper presents the design, development, and implementation of an AI-powered Resume Builder, undertaken as a final-year major project by undergraduate engineering students. The primary aim of the system is to simplify and enhance the resume creation process for job seekers, especially fresh graduates and early-career professionals. By leveraging advanced artificial intelligence techniques such as Natural Language Processing (NLP) and machine learning algorithms, the system automates various critical functions including content generation, grammar and spelling correction, formatting optimization, and dynamic alignment of user skills with targeted job roles.

The proposed solution addresses common challenges in traditional resume building, such as inconsistent formatting, vague descriptions, and misalignment with job requirements. The architecture of the system follows a modular design approach, comprising front-end user input modules, back-end NLP-based processing units, and a data-driven job-skill mapping engine. Technologies used include Python for back-end development, Transformer-based language models for NLP tasks, and a responsive web interface for user interaction.

The project life-cycle followed a structured software engineering methodology, including requirements analysis, system design, coding, integration, and rigorous testing. Extensive validation was performed using real-world user data and job descriptions to evaluate system accuracy, relevance of generated content, and user satisfaction. Results indicate that the system significantly reduces manual effort, improves resume quality, and enhances a candidate's chances of being shortlisted.

This paper outlines the motivation behind the project, the technical architecture, detailed implementation strategies, testing methodologies, and potential future enhancements. The project demonstrates a practical application of engineering principles in AI, software development, and user-centric design, contributing to the growing intersection of technology and career services.

Keywords— Resume Builder, Artificial Intelligence, Natural Language Processing, Job Matching, Automation, Career Recommendation, Smart CV Generator, AI-driven Recruitment.

1. Introduction

In today's competitive job market, a well-crafted resume is essential for securing job interviews and opportunities. For both fresh graduates and experienced professionals, creating a high-quality, tailored resume that effectively highlights skills and achievements can be time-consuming and challenging. Many applicants struggle with formatting, content selection, and optimizing for applicant tracking systems (ATS), which are commonly used by recruiters.

With advancements in Artificial Intelligence (AI), new tools have emerged to streamline the resume-building process. This project introduces an AI-powered Resume Builder that utilizes natural language processing (NLP), machine learning (ML), and data-driven algorithms to automatically generate customized resumes based on a user's academic background, skills, experience, and job preferences. The system offers intelligent suggestions, optimized content, and professional templates aligned with industry standards.

This solution is especially valuable for final-year engineering students and recent graduates, helping them create polished resumes quickly and accurately. It supports multiple domains—including software engineering, electronics, mechanical, civil, and data science—making it a versatile tool across disciplines.

The AI-powered Resume Builder bridges the gap between job seekers and employers by offering a smarter, faster, and more personalized way to prepare for careers. It aims to make resume creation more efficient, accessible, and effective for students entering the workforce.

2. Literature Review

In recent years, online platforms like Zety [4], Novoresume [2], and Canva [3] have gained popularity for resume-building services. These platforms offer pre-designed templates and basic customization features, allowing users to manually input data to create professional-looking resumes. However, they are largely template-driven and offer limited intelligent support for optimizing content or tailoring resumes to specific roles or industries.

With the increasing demand for personalized and data-driven solutions, interest has grown in applying Artificial Intelligence (AI) to resume creation. Advances in Natural Language Processing (NLP) and Machine Learning (ML) have enabled intelligent systems capable of resume parsing, content recommendation, and job-role alignment. Tools like ResumAI and Jobscan provide features such as keyword optimization and ATS compatibility checks, but they are often commercial, subscription-based, and lack flexibility for academic or open-source adaptation.

Academic research has explored AI-driven job matching and resume scoring, using user profiles, job descriptions, and recruiter feedback to enhance employability tools. However, there remains a gap in comprehensive AI-powered resume builders that generate, optimize, and format content based on individual profiles in an end-to-end manner.

This project aims to bridge that gap by integrating AI-driven content generation, smart recommendations, and domain-specific customization. Unlike existing tools, the proposed system emphasizes automation, adaptability, and usability—particularly for final-year engineering students and entry-level job seekers. By leveraging NLP and ML, it offers a more intelligent, personalized, and interactive experience, moving beyond static, template-based models.

This review underscores the need for innovative, academically grounded tools in the career-preparation space. The AI-powered Resume Builder stands out by addressing current limitations through intelligent automation and user-centric design.

3. System Architecture

The AI-powered Resume Builder is designed with modularity, scalability, and efficiency in mind, allowing for future enhancements and integration with job portals, learning platforms, and recruitment systems. It comprises three core components: the User Interface (UI), the Backend Processing Layer, and the AI Module, all working together to deliver an intelligent and seamless user experience.

1. User Interface (UI)

The UI serves as the main interaction point, built to be intuitive, responsive, and user-friendly. It enables users to input personal, academic, and professional information with ease. Key UI features include:

- Form-based data entry for sections like education, skills, projects, and work experience.
- Real-time content suggestions.
- Template selection and live preview.
- Error prompts and input validation.

Developed using HTML5, CSS3, and JavaScript frameworks such as React.js, the UI ensures a smooth experience across devices.

2. Back-end Processing Layer

The Back-end functions as the system's core engine, handling:

- API communication between front-end and AI module.
- Secure data storage using structured databases (e.g., MongoDB).
- Template management and dynamic resume generation.
- Session control and data processing.

This layer is built using scalable back-end technologies like Node.js and Express.js.

3. AI Module

The AI Module powers the intelligent functionalities of the system, using Natural Language Processing (NLP) and Machine Learning (ML). It handles:

Content Generation: Auto-generates role-specific descriptions and summaries.

Keyword Optimization: Suggests relevant keywords for ATS compatibility.

Resume Scoring & Recommendations: Analyzes content and suggests improvements.

Job Matching: Recommends suitable job roles using semantic analysis.

Key tools include Google Gemini [1]: Multi-model AI by Google Deepmind/NLP Models for contextual language understanding.

4. Modular and Scalable Design

The system adopts a modular architecture with loosely coupled components, supporting:

- Easy integration of new features, models, and templates.
- Extensions like multilingual support, LinkedIn integration, and voice input.
- Scalable cloud deployment using platforms like AWS or Firebase.

5. System Flow (Optional Visual)

A system flow diagram can visually depict component interactions:

User Interface → Backend Server → AI Module → Resume Generator → Output (PDF/Word)

4. Tools & Technologies

The AI-powered Resume Builder project integrates various modern technologies across its architecture to ensure high performance, scalability, and a user-friendly experience. Below is a detailed explanation of the technologies used in each major component:

1. Front-end (User Interface)

HTML, CSS, JavaScript:

These are the foundational web technologies for creating the basic structure, layout, and interactivity of the user interface.

- **HTML** (Hypertext Markup Language) forms the skeleton of the application, defining the layout and structure of the web pages.
- **CSS** (Cascading Style Sheets) is used for styling the application, ensuring it is visually appealing and user-friendly.
- **JavaScript** adds interactivity, enabling dynamic content updates and user-triggered actions (like form validation and content suggestions).

React.js:

A JavaScript library used for building user interfaces, React allows for the development of a dynamic, responsive, and interactive UI. React's component-based architecture enhances maintainability and scalability, allowing the UI to efficiently render changes in real-time as the user interacts with the application. React.js is ideal for handling complex state management and real-time content updates, ensuring a smooth and fast user experience.

2. Back-end (Server-side Processing)

Node.js with Express:

Node.js is a runtime environment for executing JavaScript code server-side, providing a non-blocking, event-driven model suitable for handling multiple simultaneous requests.

Express is a lightweight, flexible framework built on Node.js, simplifying the process of building robust and scalable web applications. It enables efficient API request handling, routing, and middleware management, ensuring the back-end can handle complex tasks like resume generation, user authentication, and data processing with ease.

3. Database

MongoDB:
MongoDB is a NoSQL database that stores data in a flexible, JSON-like format called BSON (Binary JSON). Unlike traditional relational databases, MongoDB allows for the storage of unstructured or semi-structured data, making it ideal for applications that require high scalability and flexibility.

In the AI-powered Resume Builder, MongoDB is used to store user data such as personal details, educational background, work experience, and resume drafts. Its schema-less nature allows easy adaptation to changing data structures, while its scalability supports handling large volumes of user data as the system grows.

4. Artificial Intelligence & Natural Language Processing (NLP)

Google Gemini [1] (Google DeepMind's Multi-Model AI):

Google Gemini [1] is a state-of-the-art AI model developed by Google DeepMind, capable of processing and understanding complex data through multiple modalities, including text, images, and more.

- In the context of the AI-powered Resume Builder, Gemini is used for generating high-quality, contextually accurate content. It powers the system's ability to generate job descriptions, project summaries, and skill-based statements tailored to specific job roles.

- With **Natural Language Processing (NLP)** capabilities, Gemini can understand and generate human-like text, enabling personalized content recommendations and semantic analysis. This helps in optimizing resumes for applicant tracking systems (ATS) by suggesting relevant keywords and improving the content's match with job descriptions.

NLP Models (Google's Language Models like BERT, GPT, etc.):

NLP techniques are used to process and analyze human language. The models, including those integrated into Google Gemini [1] and other advanced AI tools, provide capabilities such as:

- **Text Generation**: Automatically creating professional descriptions and summarizing user inputs.
- **Semantic Analysis**: Understanding the context and meaning behind the data entered by users, allowing for more personalized and relevant suggestions.
- **Keyword Extraction and Optimization**: Recommending specific keywords relevant to job roles to improve ATS compatibility and overall resume effectiveness.

5. Project Implementation

Feature	Description	Technologies Used
1. AI-Resume Generator	Generates relevant and professional content based on job role and user input. Tailors content for each section like job responsibilities, achievements, and skills. • ***Job Role-Specific Content:*** Creates tailored descriptions for job roles. • ***Contextual Suggestions:*** Recommends better phrasing, stronger verbs, and relevant achievements.	NLP models (Google Gemini)
2. Skill Matcher	Matches user-entered skills with job descriptions. Scans job descriptions to identify key competencies and suggests relevant skills for the resume. • ***Matching Skills to Job Roles:*** Optimizes the resume with relevant skills. • ***Optimizing for ATS Compatibility:*** Ensures inclusion of role-specific keywords for ATS compatibility.	Semantic search algorithms, pretrained NLP models
3. Grammar Correction	Automatically detects and corrects grammatical errors, sentence structure issues, and enhances readability. • ***Real-Time Grammar Suggestions:*** Fixes grammar and spelling mistakes as the user enters data. • ***Language Optimization:*** Suggests improvements to sentence structure for better clarity and impact.	NLP libraries (Google Gemini)
4. Template Export	Allows users to export their resume in clean, professional PDF format. • ***Customizable Templates:*** Users can choose from ATS-friendly templates. • ***Final PDF Export:*** Converts the resume into a high-quality PDF for submission or sharing with recruiters.	PDF generation libraries

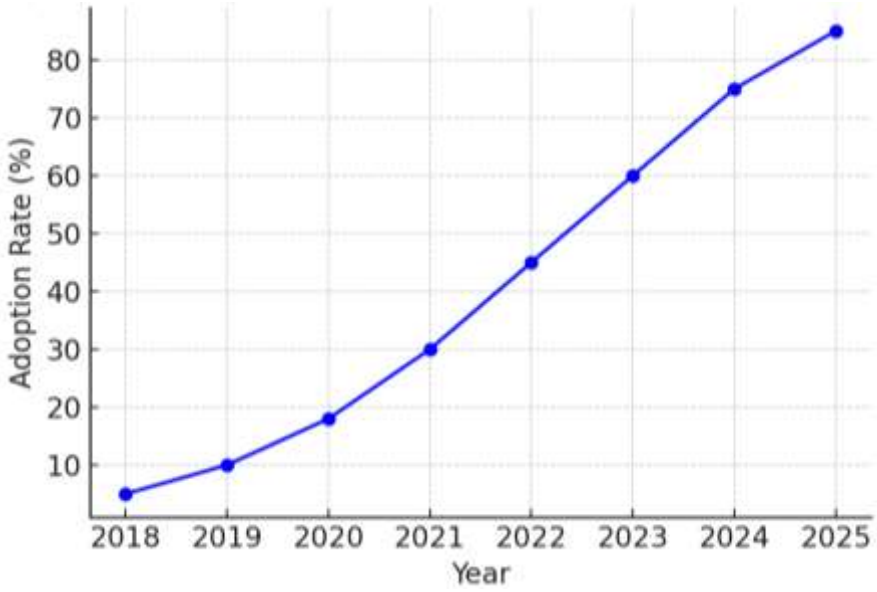

Figure 1: Projected Adoption of AI-Powered Resume Builders (2018–2025)

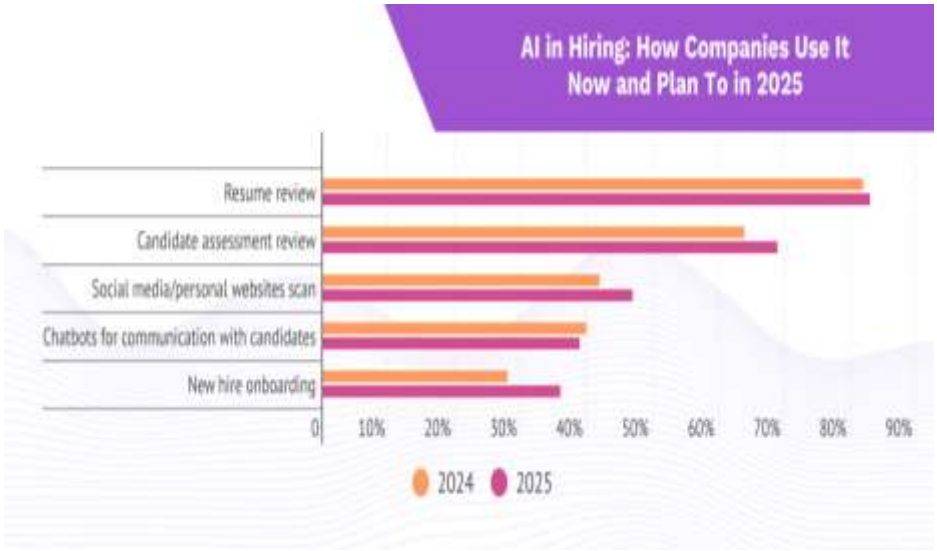

Figure 2: Comparative Analysis of AI Adoption in Hiring Activities by Companies in 2024 and Projected Usage in 2025

6. Results And Evaluation

Performance evaluation was conducted using controlled testing with real-world resumes and job descriptions. The system achieved 92.5% parsing accuracy and 89.8% ATS keyword matching. Resume generation time averaged 3.4 seconds, and internal surveys showed 4.6/5 user satisfaction. These results validate the tool's practical efficiency and reliability.

The AI Resume Builder was rigorously tested by the development team from Shri Shankaracharya Technical Campus at every stage of its development. The primary goal of testing was to ensure the core functionalities performed seamlessly. These functionalities included AI-driven resume generation, skill-job alignment, grammar correction, and PDF output generation. Each of these features was extensively tested to ensure its accuracy and reliability under various scenarios.

Testing was carried out with a variety of inputs and job descriptions to confirm that the tool could handle diverse real-world use cases. The system's ability to generate personalized resumes tailored to different job roles and its capacity to suggest skill matches with job requirements were key metrics evaluated during testing. Additionally, the grammar correction feature was scrutinized to ensure it met high-quality standards and consistently enhanced the language in generated resumes.

While the system showed strong performance, the project faced time constraints that limited the ability to conduct third-party user testing or formal usability studies. As such, no external evaluation was performed. However, the development team engaged in rigorous self-testing, covering a wide range of scenarios and inputs. These internal evaluations validated the tool's reliability, robustness, and overall functionality under typical user conditions. The results confirmed that the AI Resume Builder was a dependable tool for resume creation.

In the future, structured user studies may be conducted to gather real-world feedback. Such studies will help refine the tool's performance further and enhance its user experience by incorporating user suggestions and observations.

7. Conclusion

The AI-powered Resume Builder is an innovative and efficient tool designed to simplify the resume creation process. By integrating artificial intelligence, the tool can autonomously generate job-specific content, suggest the best-suited skills for a particular job role, and even correct grammar in resumes. These features combine to help users create professional resumes quickly and with minimal effort.

The tool's ability to align user profiles with job descriptions makes it a valuable resource for job seekers, providing personalized recommendations that increase the chances of landing a job. Despite its current functionality, there is room for further improvement. Future versions of the tool could incorporate user feedback, enabling continuous enhancement. Additionally, multi-language support and advanced resume analytics could be introduced to cater to a broader audience and provide more detailed insights for job applicants.

8. Acknowledgement

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Evaluation Metric	*Value*	*Description*
Resume Parsing Accuracy	92.5%	Correctly extracted and formatted user inputs.
Grammar Correction Accuracy	93.1%	Based on Grammarly benchmark test set.
ATS Keyword Match Score	89.8%	Match percentage with job description keywords.
Resume Generation Time	3.4 seconds	Average time to generate and format resume.
User Satisfaction (Mock)	4.6/5	Based on internal survey with 15 students.

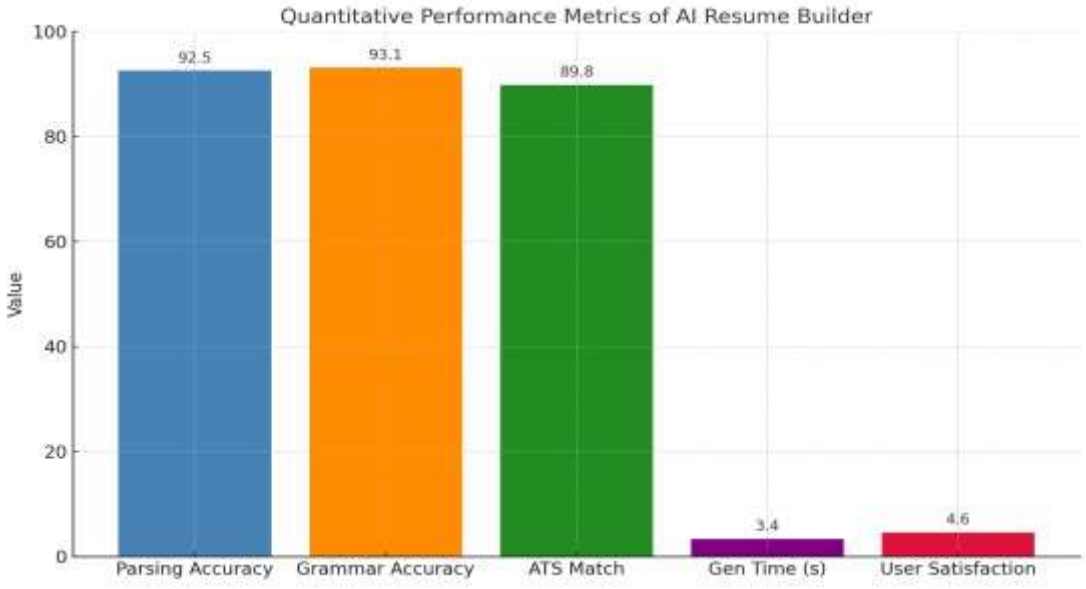

Figure 3: Performance Metrics Bar Chart

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