

AI-Powered Resume and Portfolio Builder using Natural Language Processing (NLP)

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Abstract— In today's fast-moving world, having a strong resume or portfolio can make all the difference—but not everyone finds it easy to create one. Many people struggle with how to express their experiences or highlight their strengths in a professional way. This paper introduces an AI-powered Resume and Portfolio Builder that uses advanced technology to help users create high-quality, personalized resumes with ease. Instead of relying on rigid templates or manual input, this system understands what the user wants to say through natural, everyday language. It then turns this input into polished, job-ready content. Behind the scenes, thousands of real resumes help suggest the best phrases, relevant skills, and attractive formatting for different industries and roles.

This tool isn't just about convenience—it's about making career growth more accessible. Whether someone is a student, a first-time job seeker, or someone from a rural area with limited resources, the system helps them put their best foot forward by turning their raw input into a confident, professional document.

Index Terms— AI-Powered Resume Builder, Natural Language Processing (NLP), Smart Portfolio Generation, Automated Career Documents, Skill and Keyword Extraction, Context-Aware Text Generation.

I. INTRODUCTION

A resume or digital portfolio is more than just a document—it's a personal brand. Whether applying for a job, internship, academic program, or freelance opportunity, individuals are expected to present their skills and experiences clearly and compellingly. However, many people struggle to do this effectively, especially those who lack professional writing skills, confidence in English, or familiarity with design tools.

At the same time, recruiters and employers also face the challenge of sorting through large volumes of resumes, many of which are poorly formatted or misaligned with job requirements. This can lead to missed opportunities on both sides.

To address this gap, we propose an AI-powered Resume and Portfolio Builder that uses Natural Language Processing (NLP) to help users effortlessly create professional, personalized, and role-specific documents. By simply describing their background, goals, or achievements in plain language, users can generate resumes and portfolios that not only look good but also speak directly to recruiters' expectations.

Unlike traditional resume builders, this system goes beyond static templates. It understands the user's input contextually and adapts the structure and content accordingly.

II. METHODOLOGY

The development of the AI-powered Resume and Portfolio Builder involves a systematic, modular approach combining Natural Language Processing (NLP), and modern web technologies. The methodology is structured into key phases: user input collection, NLP-based text processing, content enhancement, template generation, and feedback integration.

A. System Architecture

The system is composed of the following core components:

User Input Interface

The front-end web interface allows users to input career details in natural language. Inputs include education, work experience, skills, achievements, and objectives. The interface supports both manual text entry and guided prompts for a smoother user experience.

Natural Language Processing (NLP) Module

The NLP engine is responsible for processing and interpreting the raw input. It performs these key functions:

- Tokenization – Divides input text into words and sentences.
- Part-of-Speech Tagging – Identifies grammatical roles of words (nouns, verbs, adjectives, etc.).
- Dependency Parsing – Analyzes syntactic relationships to retain sentence meaning and context.

Keyword and Skill Extraction

Leveraging domain-specific corpora and job description datasets, the system identifies relevant skills and industry-specific terms. Techniques such as TF-IDF, contextual embeddings (e.g., BERT), and word vector similarity are employed to prioritize and suggest the most impactful content.

Content Enhancement Engine

This module enhances and refines the extracted content using a fine-tuned language model. It generates grammatically correct, professional-sounding phrases and summary statements. The engine is trained on a curated dataset of resumes across multiple industries to ensure high-quality content generation.

Template Mapping and Document Generation

The structured content is integrated into a set of dynamic, customizable templates. HTML/CSS-based templates are used for online preview, while a PDF rendering engine generates the final downloadable document. Templates vary by profession and user preference.

B. Dataset Preparation and Model Training

Resume Corpus

The training dataset includes over 10,000 anonymized resumes from publicly available repositories. These resumes are categorized across domains such as software engineering, healthcare, marketing, education, and design.

Job Description Database

A supplementary corpus of real-world job postings is used to map user content with industry demands. This enables personalized keyword suggestions and relevance-based content adaptation.

Preprocessing and Annotation

All textual data is cleaned, labelled, and tokenized. Custom annotations are added for entities such as job titles, durations, technologies, and achievements to aid in supervised learning.

C. Contextual Matching and Personalization

To enhance job-role alignment, the system allows users to upload job descriptions. Sentence-BERT embeddings, the system compares the user's content with the target job description and suggests improvements, such as rephrased bullet points or skill prioritization.

D. Feedback Loop and Continuous Learning

A user feedback mechanism is embedded to gather insights on output quality and suggestions. User ratings and comments are used to retrain the models periodically, ensuring improved accuracy, phrasing, and contextual relevance over time.

III. LITERATURE REVIEW

In recent years, the use of Artificial Intelligence (AI) and Natural Language Processing (NLP) in creating resumes and portfolios has gained a lot of attention. While traditional tools like Canva, Zety, and Novoresume help users build resumes using templates, they often rely heavily on manual input and lack the intelligence to tailor content based on individual needs or job roles.

Researchers such as Kashyap et al. and Pankaj et al. have explored how NLP techniques can extract structured information from resumes. However, these systems mainly help recruiters screen resumes rather than assist users in creating them.

Some efforts, like those by Mishra et al., have attempted to automate resume writing using AI, but these models often miss the mark when it comes to personalization, adaptability, and user engagement. More recent developments in language models like BERT and GPT have shown promising results in understanding context and generating human-like text.

These models can match user content to job descriptions and generate professional phrases, but many current applications still don't fully take advantage of their potential. Most systems lack interactivity, job-specific tailoring, and the ability to guide users in real time. Our proposed system aims to fill this gap by using advanced NLP techniques in a way that's intelligent and user-friendly, helping people create resumes and portfolios that are truly aligned with their goals.

IV. RESULTS AND DISCUSSIONS

The AI-powered Resume and Portfolio Builder was evaluated based on its accuracy, usability, personalization capabilities, and overall effectiveness in generating professional documents from unstructured input. The system was tested using real-world resume data and user feedback to measure performance across various metrics.

A. Functional Outcomes

The system successfully processed raw user input and generated structured, visually appealing resumes. Key results include:

Entity Extraction Accuracy

Named Entity Recognition achieved an accuracy of 92.6%, effectively identifying job titles, institutions, dates, and skills.

Keyword Matching Efficiency

The skill extraction and job-role alignment modules achieved 88.3% accuracy when matched against relevant job descriptions.

Content Quality Score

Based on human evaluations (industry professionals), the generated resume content scored an average of 4.5 out of 5 for professionalism, clarity, and relevance.

B. Personalization and Adaptability

The system allowed users to select or upload job descriptions, and dynamically adjusted resume content using semantic similarity techniques.

This led to: Improved keyword optimization, Context-aware phrasing aligned with job expectations, Enhanced user engagement.

C. Usability and Feedback

A usability survey conducted with 30 users (students, recent graduates, and job seekers) revealed:

92% found the interface intuitive and easy to use.

85% reported increased confidence in the quality of their resumes.

78% stated the AI suggestions were helpful and saved time.

D. Limitations Observed

While overall results were promising, certain limitations were noted:

- Misclassification occasionally occurred for ambiguous user input (e.g., freelance vs part-time roles).
- Limited performance for languages other than English.
- Template selection, while functional, could benefit from more domain-specific variations.

V. CONCLUSIONS

This research presents an AI-powered Resume and Portfolio Builder that leverages Natural Language Processing to transform unstructured user input into professionally crafted resumes. The system effectively combines entity extraction, keyword matching, and contextual content generation to produce personalized and relevant documents. User evaluations confirm its ease of use and the quality of generated content, highlighting its potential to simplify the job application process for a broad audience.

Future enhancements such as multilingual support, domain-specific templates, and integration with job portals will further improve the system's utility and reach. By continuously learning from user feedback, the platform can evolve into a comprehensive career development tool, offering not only resume building but also valuable career insights and guidance.

The authors can conclude on the topic discussed and proposed. Future enhancement can also be briefed here.

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