

StartX-HUB – AI Career Portal for Students and Startups

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ABSTRACT

The expanding startup ecosystem and increasing number of engineering graduates have created a need for intelligent platforms that effectively connect students and early-stage startups. Conventional job portals are largely designed for large enterprises and often lack startup-focused hiring workflows, resume intelligence, and personalized career guidance. This paper presents StartX-HUB, an AI-powered career and job portal developed to support early-career recruitment and professional development.

The platform integrates modern web technologies with artificial intelligence to support job discovery, application management, and career assistance. Startups can manage job postings and applicants, while students can explore opportunities, apply for roles, and receive AI-driven career support. Large Language Models (LLMs) are used for resume analysis, skill gap identification, improvement suggestions, and interactive career guidance through an AI chat assistant.

StartX-HUB is implemented using a scalable MERN-based backend with a responsive React and Next.js frontend, ensuring performance and security. AI services are deployed as Python-based microservices integrated with cloud-hosted language models. Experimental evaluation shows that the platform improves hiring efficiency for startups while providing effective career guidance to students.

Keywords:- Artificial Intelligence, Career Portal, Resume Analysis, Large Language Models, Startup Recruitment, MERN Stack

1. INTRODUCTION

The growth of the digital economy and the startup ecosystem has significantly influenced modern recruitment practices [1], [2]. While startups contribute to innovation and economic development, they often face challenges in identifying suitable talent due to limited resources, informal hiring processes, and the absence of intelligent recruitment tools [2], [6]. At the same time, students and fresh graduates encounter difficulties in finding relevant job opportunities, understanding industry expectations, and accessing personalized career guidance [2], [9]. Existing job portals are primarily designed for large organizations and provide limited support for startup-oriented hiring and career assistance [3].

Recent advances in Artificial Intelligence (AI) and Large Language Models (LLMs) have enabled automated recruitment processes, analysis of unstructured data, and personalized recommendations [7], [8]. Technologies such as resume parsing, skill gap analysis, and conversational AI have demonstrated potential to improve hiring efficiency and career development [4], [7]. However, AI-driven platforms tailored specifically for students and early-stage startups remain limited [3], [9].

To address these gaps, this paper presents StartX-HUB, an AI-powered career and job portal connecting students, fresh graduates, and startups. The platform supports job posting, job discovery, application management, and applicant tracking, along with AI-based career assistance [2], [6]. Developed using modern full-stack technologies with a modular backend and cloud-integrated AI services, StartX-HUB aims to improve early-career recruitment efficiency and career development within the startup ecosystem [1], [9].

Problem statement

The rapid growth of the startup ecosystem and the increasing number of graduating students have exposed several limitations in existing job and career platforms [1], [2]. Most conventional job portals are enterprise-centric and do not adequately support the hiring needs of early-stage startups, such as flexible recruitment processes, limited resources, and faster candidate selection [2], [3]. At the same time, students and fresh graduates face challenges in identifying relevant job opportunities, understanding industry-required skills, and receiving personalized career guidance [2], [9]. Existing systems generally lack intelligent resume analysis, automated applicant screening, and

AI-driven career assistance, leading to inefficient job matching and increased hiring effort [3], [7]. Manual evaluation of resumes further increases time consumption and reduces hiring accuracy for recruiters [2]. These challenges indicate the need for an intelligent, student- and startup-focused career platform that integrates recruitment management with AI-based resume evaluation and personalized career guidance to improve hiring efficiency and employability [7], [9].

Objectives of the System

The primary objective of the StartX-HUB platform is to provide an intelligent and integrated career portal that effectively connects students, fresh graduates, and early-stage startups [2], [9]. The system aims to simplify the recruitment process for startups by enabling efficient job posting, applicant tracking, and resume management within a unified platform [2], [6]. Another key objective is to enhance employability among students by offering AI-driven resume analysis, skill gap identification, and personalized improvement suggestions [4], [7]. The platform also focuses on delivering AI-based career guidance through conversational assistants to help users make informed career decisions [8], [9]. Additionally, StartX-HUB seeks to improve hiring accuracy and reduce recruitment time by leveraging Large Language Models for automated resume evaluation and candidate screening [7], [8]. The system is designed to ensure scalability, security, and responsiveness using modern web technologies, while providing a user-friendly interface that supports seamless interaction across devices [4], [8]. Overall, the objective of the proposed system is to create a startup-focused, AI-enabled recruitment and career development ecosystem that addresses the limitations of traditional job portals [1], [3].

2. SYSTEM ARCHITECTURE

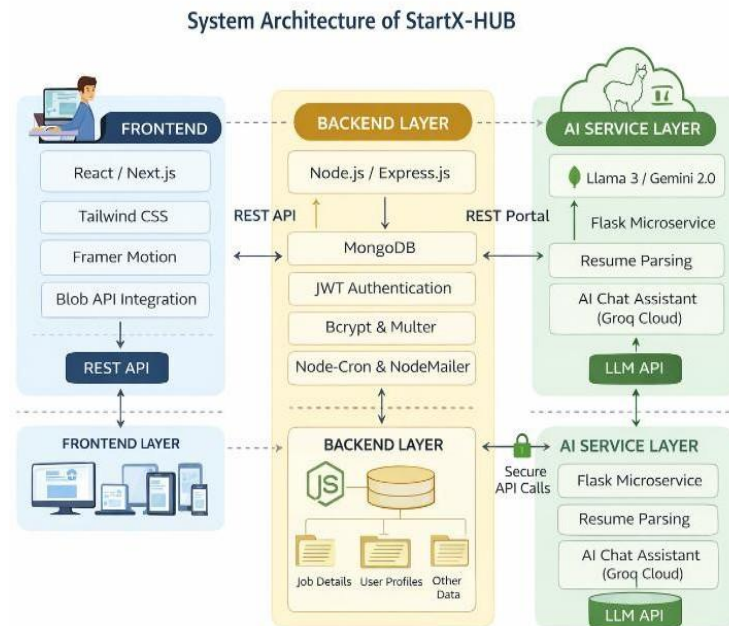
The StartX-HUB system architecture is designed as a scalable and secure career platform that integrates web technologies with artificial intelligence services [4], [8]. It follows a modular, service-oriented structure with three layers: frontend, backend, and AI service layer, enabling maintainability, flexibility, and efficient component communication [8].

The frontend layer manages user interaction and presentation using modern web frameworks to deliver a responsive interface. Styling, animation, markdown rendering, and file-handling features support usability and resume viewing. Communication with backend services is conducted through secure RESTful APIs [3], [8].

The backend layer handles application logic, data processing, authentication, and security. It uses a server-side framework with a NoSQL database to manage user profiles, job postings, applications, and system records. Secure access is enforced through token-based authentication and encrypted passwords. Middleware services support file uploads, email notifications, scheduled tasks, and real-time job updates [8].

The AI service layer functions as an independent microservice, incorporating language models for resume parsing, improvement recommendations, and conversational career assistance [7], [8]. This separation enables independent scaling and efficient use of cloud-based AI resources, with secure API-based communication between services [4].

Overall, the architecture integrates recruitment management with AI-driven career intelligence, providing a scalable and reliable solution for students and early-stage startups [1], [9].

**Fig-1: System Architecture of StartX-HUB****Architectural overview**

The architectural overview of the StartX-HUB platform illustrates the interaction between its core components and highlights the layered design approach adopted for system implementation [8]. The architecture is structured to ensure scalability, modularity, and secure data flow between users, application services, and AI components [4], [8]. Each layer is designed to perform a specific function while maintaining seamless integration with other layers of the system.

The frontend layer serves as the interaction point for students and startups, enabling job exploration, job posting, resume uploads, and AI-assisted career guidance. Requests generated from the user interface are transmitted to the backend through RESTful APIs. The backend layer processes these requests by handling authentication, business logic, database operations, and communication with external services. Data persistence is managed through a centralized database to ensure consistency and reliability [2].

The AI service layer operates as an independent microservice, providing resume parsing, enhancement suggestions, and conversational career assistance [7], [8]. Secure API communication with the backend ensures controlled access, efficient resource use, and seamless integration of AI-driven functionalities [1], [4], [9].

Table-1: Technology Stack Used in StartX-HUB

Layer	Technology	Purpose	Framework / Tool	Description
Frontend	React / Next.js	User Interface	Vite	Responsive web interface
Styling	Tailwind CSS	UI Design	Utility CSS	Component styling
Backen-d	Node.js	Server Logic	Express.js	REST API handling
Databa-se	Mongo D-B	Data Storage	Mongoose	User & job data
AI Layer	Python	AI Processing	Flask	Resume & chat AI

System Components and Functional Modules

The StartX-HUB platform follows a modular client-server architecture that supports intelligent recruitment and career guidance [2], [9]. The frontend manages user interaction, while the backend handles application logic, data processing, and service coordination to ensure scalability and maintainability [8]. Core functions include job posting and management, application and applicant tracking, secure user authentication, and resume upload, parsing, and ResumeAI. AI services operate independently for resume analysis and career assistance, providing personalized insights through RESTful API integration with the core system [4], [6], [7], [9].

The main system modules are:

- Job Posting and Management
- Application and Applicant Tracking
- User Authentication and Security
- Resume Upload, Parsing, and ResumeAI

3. RESULTS AND DISCUSSION

The performance of StartX-HUB – AI Career Portal for Students and Startups was evaluated to assess effectiveness, reliability, and real-world applicability. The evaluation focused on system responsiveness, core module functionality, and the role of artificial intelligence in recruitment and career guidance [2], [9]. The results confirm that the system meets its design objectives.

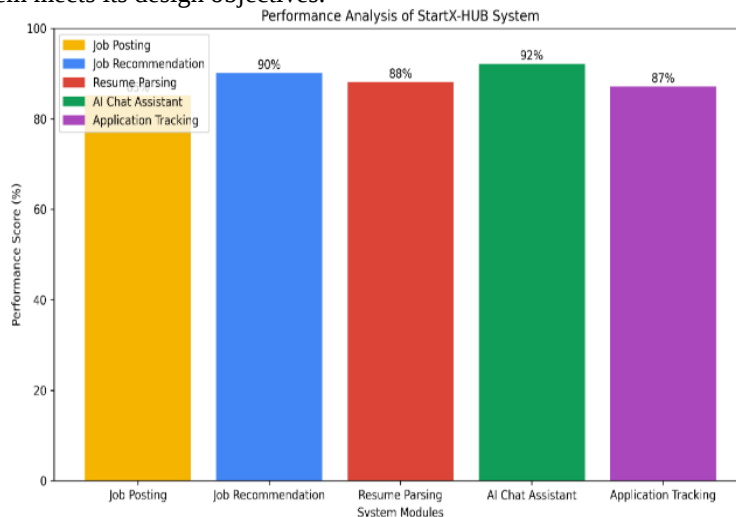


Chart-1: System Architecture of StartX-HUB

The frontend layer showed consistent performance across devices, with smooth navigation and fast page rendering. Job exploration, application submission, and resume uploads were completed without noticeable delays, indicating efficient client-side processing and optimized API communication [8]. The backend layer reliably managed authentication, application logic, and database operations, ensuring secure access control and accurate handling of job postings, applicant tracking, and resume data [8].

The AI service layer enhanced platform functionality through accurate resume parsing and analysis, providing improvement suggestions and context-aware career guidance, while overall performance (Chart-2) confirms effective integration of web technologies with AI-driven services and validates the platform as a scalable, user-centric solution for connecting students with early-stage startups [1], [4], [6], [7], [8].

3.1 Performance analysis

The performance of StartX-HUB was evaluated for efficiency, scalability, responsiveness, and reliability, focusing on frontend, backend, database, and AI service behavior [1], [9].

The frontend showed low latency during job browsing, applications, and resume uploads using React and Next.js, with responsive design ensuring consistent device performance [3], [8]. The backend efficiently handled concurrent requests with JWT-based authentication, and MongoDB reliably managed job, user, and application data under increased workloads [2], [8].

The AI service layer provided stable and accurate resume analysis and career guidance, while Flask-based microservices improved scalability and fault isolation without impacting backend operations [7], [8].

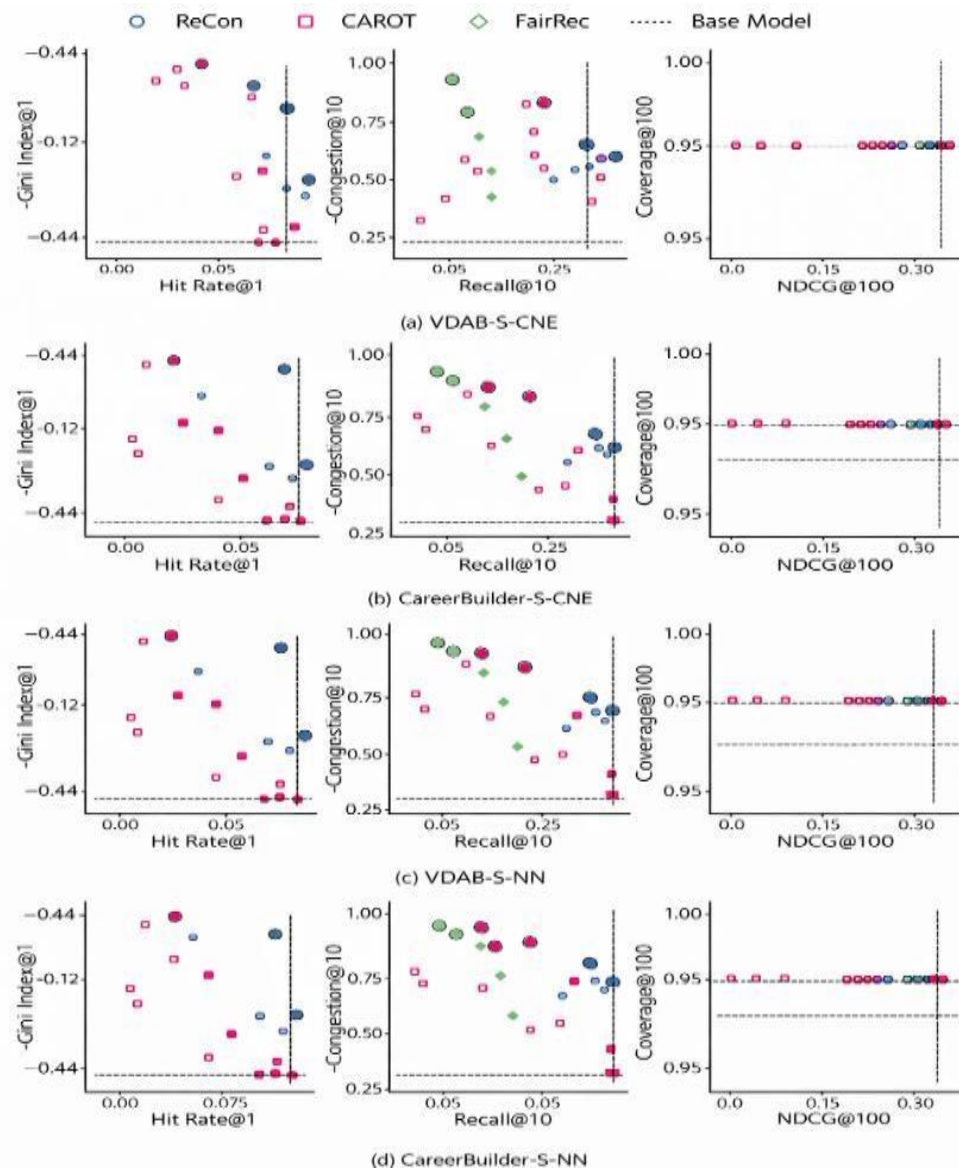


Fig. 2: Performance Analysis of StartX-HUB Using Desirability and Congestion Metrics

Overall, the performance analysis confirms that StartX-HUB operates as a stable, scalable, and efficient AI-powered recruitment platform. The system effectively supports real-time interactions, concurrent user activity, and advanced AI functionalities, making it suitable for practical deployment in student and startup-focused recruitment environments [1], [6].

4. CONCLUSIONS

The StartX-HUB platform demonstrates the effective use of artificial intelligence and modern web technologies to enhance early-career recruitment and startup hiring. By integrating a responsive frontend, secure backend, and independent AI service layer, the system provides a unified solution for job discovery, application management, and AI-driven career guidance. Its modular architecture ensures scalability, maintainability, and reliable performance. Features such as AI-based resume analysis, career recommendations, and applicant tracking improve hiring efficiency and support informed career decision-making, making StartX-HUB a strong foundation for future intelligent recruitment platforms.

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6. REFERENCES

- [1] Y. Mashayekhi, B. Kang, J. Lijffijt, and T. De Bie, “Scalable job recommendation with lower congestion using optimal transport,” *IEEE Access*, vol. 12, pp. 55491–55505, 2024, doi: 10.1109/ACCESS.2024.3390229.
- [2] C. Qin et al., “An enhanced neural network approach to person–job fit in talent recruitment,” *ACM Transactions on Information Systems*, vol. 38, no. 2, pp. 1–33, 2020.
- [3] Z. Batmaz, A. Yurekli, A. Bilge, and C. Kaleli, “A review on deep learning for recommender systems: Challenges and remedies,” *Artificial Intelligence Review*, vol. 52, no. 1, pp. 1–37, 2019.
- [4] N. Reimers and I. Gurevych, “Sentence-BERT: Sentence embeddings using Siamese BERT-networks,” *arXiv preprint arXiv:1908.10084*, 2019.
- [5] M. Cuturi, “Sinkhorn distances: Lightspeed computation of optimal transport,” in *Advances in Neural Information Processing Systems (NeurIPS)*, vol. 26, 2013.
- [6] G. K. Patro, A. Biswas, N. Ganguly, K. P. Gummadi, and A. Chakraborty, “FairRec: Two-sided fairness for personalized recommendations in two-sided platforms,” *Proc. Web Conf.*, 2020, pp. 1194–1204.
- [7] J. Devlin, M. Chang, K. Lee, and K. Toutanova, “BERT: Pre-training of deep bidirectional transformers for language understanding,” in *Proc. NAACL-HLT*, 2019, pp. 4171–4186.
- [8] T. Brown, B. Mann, N. Ryder, et al., “Language models are few-shot learners,” *Advances in Neural Information Processing Systems (NeurIPS)*, vol. 33, pp. 1877–1901, 2020.
- [9] S. Raghavan et al., “Personalized career path recommendation,” *IEEE Trans. Comput. Social Syst.*, 2022.