

An AI-Assisted Voice employment platform for Improving Job Accessibility in Low-Digital-Literacy workers

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Abstract

Semi-skilled and unskilled workers in urban India are facing difficulties in finding employment because of low digital literacy and lack of text-based job portals. The problem finds its solution in the proposed KaamKhojAI project Voice Assistive AI-based Job Portal System, aiming to make employment through voice-based systems more accessible for low-literacy individuals. An offline survey was conducted on 550 workers in Nagpur city. The conclusion revealed that the availability of current job applications are low, but acceptance for voice-based systems is high. The proposed system not only focuses on ease of use but also emphasizes inclusivity, proving the efficiency of these systems in overcoming the gap of employment through digitalization.

Keywords: Voice-Based Job Portal, Employment Accessibility, Blue-Collar Workforce, AI Assistant, Job Recommendation, Trust Score

1. Introduction

Unemployment among semi-skilled and casual workers remains one of the major socio-economic challenges in urban India. A larger section of workers consists of daily wage earners, helpers, cleaners, and mechanics who are out of the reach of organized digital job markets due to low digital awareness and limited technological exposure. Consequently, many proficient workers are unable to find gainful employment, while small business enterprises have to struggle in finding suitable manpower locally.

Enhancements in artificial intelligence have provided new avenues to take on these challenges through accessible and intelligent job matchmaking platforms. KaamKhojAI is envisioned as an AI-powered, voice-enabled employment platform that would seek to bring together job seekers and employers in urban areas. The proposed platform will adopt a multilingual AI assistant for ease of interaction for its end users and a rule-based mechanism of job recommendations, matching workers according to skills, availability, and location. With this platform, recruitment will be faster and more accessible, thereby assisting in the inclusive and efficient development of the urban workforce.

2.Literature Review

Prior research has explored digital employment platforms aimed at supporting blue-collar and informal workers through mobile and web-based job portals. While such systems improve job discovery and employer–worker connectivity, most rely on basic rule-based or keyword-driven matching, resulting in limited personalization and automation in job allocation.

Recent studies demonstrate that AI and machine learning techniques, including semantic matching, natural language processing, and collaborative filtering, significantly enhance job recommendation accuracy by analyzing job descriptions, resumes, and user behaviour [2], [3]. However, these approaches often demand higher computational resources and assume a level of digital literacy that restricts their adoption among semi-skilled workers in developing regions.

Conversational AI and voice-based interaction have emerged as effective solutions for improving accessibility in multilingual contexts such as India. Chatbots, voice assistants, and text-to-speech systems reduce interaction complexity and promote inclusive digital access, though challenges related to contextual understanding and scalability remain [4], [5]. Additionally, socio-economic studies highlight persistent issues of job insecurity, wage imbalance, and lack of structured employment support for blue-collar workers, emphasizing the need for transparent and inclusive employment systems [9].

3.Proposed System / Methodology

KaamKhojAI is a web-based, voice-driven job portal that aims to make jobs more accessible for semi-skilled and unskilled employees. The portal is localized for the city of Nagpur, overcoming the issues of illiteracy, language, and functionality that are faced by unskilled employees. KaamKhojAI has two primary users.

3.1 System Overview

KaamKhojAI is designed to facilitate the process of job search and hiring through voice interaction and the use of rule-based job recommendation systems. Job seekers are able to create accounts and look for jobs through voice inputs without the need to read and write in an advanced manner. Employers are introduced to the system through a formal workflow process to post the requirements of the job. The proposed system aims to improve the process of job matching between the seekers and the providers.

3.2 AI Components

3.2.1 Suggesting employment

For recommending jobs to the employees, KaamKhojAI follows a deterministic approach with rules. The candidates are asked to fill some basic information such as age, work preference, experience, availability, and salaries expected, while the employers fill in the work type, skills needed, availability of work hours, and requirements to be eligible. The system assesses similarity based on skills, age requirements, availability, and geographical area. Non-critical constraints can be removed to prevent no result sets. This system also follows a similarity-ranking principle.

3.2.2 AI Assistant and Interaction Layer

The system also incorporates a voice interface to help users all through the process. The voice input is captured through browser-based speech recognition. Free-form voice is processed using deterministic multilingual extraction and normalization approaches. Profile development is aided, and job suggestions are offered through graphic display as well as voice.

3.3 Accessibility and Multilingual Support

The goal of KaamKhojAI in terms of its design is to be accessible. The interface is designed for simplicity and voice-engaged use. The system can be interacted with in English, Hindi, and Marathi. The users can switch between the three languages dynamically. The interaction is optimized for increased simplicity and voice-engaged use. The system can be interacted with in different regions using the speech recognition and text-to-speech module that is regionally adapted for optimal usage.

3.4 Data Collection

3.4.1 Labour Force Dynamics in Maharashtra (2023-24)

Analysis of the Periodic Labor Force Survey (PLFS) data for the period 2023-2024 has revealed significant discrepancies in participation in the labor market on the basis of demographic and geographic factors. The LFPR, involving all persons aged 15 years and older who are either employed or looking for work, is highest for rural males, which are recorded at 77.8%.

Nevertheless, a large gender gap still exists in urban areas, with recorded females LFPR of 29.3%. This indicates that approximately 70.7% of females in urban areas are “Out of the Labour Force,” which constitutes an immense talent pool waiting to be tapped in initiatives like KaamKhoj. [16]

3.4.1.1 Employment vs. Unemployment Trends

While rural areas show relatively high Worker Population Ratios (WPR), urban unemployment remains a concern, particularly among females, with an unemployment rate of 5.8% compared to 0.7% in rural regions [16]. These trends suggest skill mismatch and accessibility challenges in urban labour markets.

Region & Gender	LFPR (%)	WPR (%)	Unemployment Rate (%)	Out of Labour Force (%)
Rural Male	77.8	76.1	2.2	22.2
Rural Female	47.8	47.5	0.7	52.2
Urban Male	76.4	72.7	4.8	23.6
Urban Female	29.3	27.6	5.8	70.7

Table 1: Employment Indicators by Demographic (2023-24)

3.4.1.2 Sectoral Distribution of the Workforce

Sectoral employment patterns highlight structural differences between rural and urban economies. In rural areas, the primary sector (agriculture) remains the dominant employer, accounting for 67.5% of employment. However, rural employment in the secondary sector (industry) has increased to 14.4% from 11.0% in 2018–19, indicating a gradual structural shift. Urban employment is largely concentrated in the tertiary (service) sector, which accounts for 65.6% of the total urban workforce, followed by the industrial sector at 30.6%. These trends emphasize the importance of employment platforms like KaamKhojAI in supporting service-oriented urban jobs while also addressing the growing transition of workers from rural and agricultural sectors to urban and industrial employment.

3.4.2 Workers Market Survey for KaamKhojAI

An offline survey was conducted among 550 semi-skilled and unskilled workers in the Nagpur urban region, including daily wage workers, helpers, cleaners, drivers, electricians, and construction workers. The survey consisted of 10–12 questions covering awareness of job applications, usability barriers, language constraints, and acceptance of voice-based systems.

The face-to-face survey approach ensured participation from individuals with limited literacy or smartphone familiarity. Findings revealed low awareness and usage of conventional text-based job portals, alongside strong interest in voice-enabled, regional-language employment solutions. These insights directly influenced the voice-first and multilingual design of the KaamKhojAI system.



Figure 3.1

4. System Architecture & Working

4.1 System Overview

KaamKhojAI, a voice-based multilingual job portal that facilitates employment opportunities for informal and semi-skilled workers located within urban India, has been launched as a web application dedicated specifically to users in the Nagpur region. The Job Seekers and Employers are the two main user groups utilizing this service. Unlike traditional text-intensive job boards, which can be difficult to navigate for users due to language barriers and lack thereof, users of KaamKhojAI can create their user profile and search for job openings via voice interaction using Hindi, Marathi and English. As a result, KaamKhojAI provides the following benefits: providing an easy method for users to find employment, enhanced transparency and trust with employers by utilizing a deterministic processing system that ensures unbiased results when matching JS and E, multilingual voice interaction to make job searching easier for those who

may not be fluent in an unfamiliar language, and providing a modular architecture which includes web-based front end, voice processing and AI interaction layer, backend service interface and a NoSQL database (refer to Figure 1).

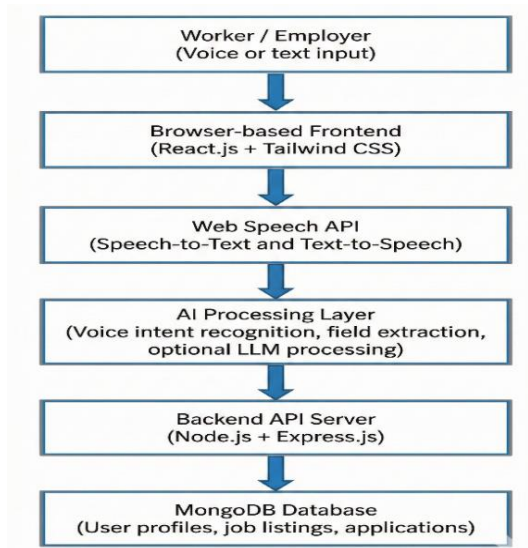


Figure 4.1: Overall System Architecture of KaamKhojAI

4.2 Frontend Interaction Layer

KaamKhojAI's Frontend is built in React (Vite) with Tailwind CSS to provide a fast-loading and responsive front end that is fully accessible on lower-end devices. The design of the Frontend is minimalistic, easy to navigate, and consists of large buttons, step-by-step guidance to assist first-time users, and prompt feedback for user actions. The main features include support for input from multiple languages, voice activation, and user authentication/profiling; browsing for jobs; text-to-speech capabilities (language translation). Internationalization of the front end was completed using i18next, and all communication between the front end and back-end services occurs via RESTful APIs.

4.3 Voice Processing and AI Interaction Layer

Voice Processing and AI Interaction Layer consists of processing user voice input into structured backend data using the browser-based Web Speech API. The voice response layer of KaamKhojAI provides a Speech-to-Text capability for capturing user input and a Text-to-Speech capability for relaying system responses, associating each utterance with a previously defined profile field. User data extraction is conducted using deterministic multilingual extraction (as opposed to using an AI "black box") methods; backend services will use Multi-Language Regular Expressions, Numerical Parsing, Keywords Detection, and Validation Rules for accurate results. Optional Conversational AI Assistants are used only for the purpose of user guidance and clarification; the primary extraction functions of the backend are completed using rule-based methods.

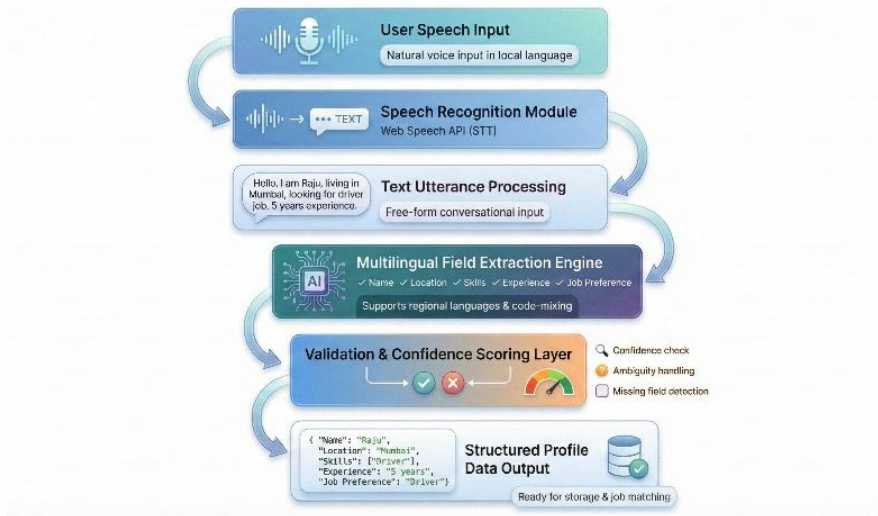


Figure 4.2: Voice-Based Profile Creation Workflow

4.4 Backend Processing Layer

The backend is implemented using Node.js and Express.js following a RESTful architecture. Authentication, maintenance of profiles, posting of jobs, and execution of the recommendation logic are some of the key functionalities handled by the backend. For authentication and authorization, it uses JWT to enable stateless, secure API access. The extracted profile data is then validated, and structured information is stored at the backend, which executes job matching rules and controls access to protected resources. This will help in scalability and future cloud deployment.

4.5 Profile Creation and Validation

Worker profiles are created through a sequential, voice-assisted interaction process. Speech inputs are mapped to structured fields including skills, experience, availability, location, and salary expectations. User authenticity is assured through verification by means of OTP, whereas a verified police clearance certificate is used for assigning trust tags to eligible profiles. Validation checks ensure that all the mandatory fields are present, along with acceptable numeric ranges, before storing data in MongoDB. Further, user ratings, history of job completion, and verification signals are combined into a composite trust score to highlight reliable workers. Such verified and structured profiling enables correct and transparent job matching with trust.

4.6 Labor Management and Employer Workflow

Employers interact with the KaamKhojAI through a simplified browser-based dashboard. For posting jobs, one has to fill in a structured form that captures most of the important attributes: job title, category, location, salary range, age requirement, experience, and availability. This standardized workflow reduces the overhead on employers while ensuring compatibility with the recommendation engine.

4.7 Job Recommendation Engine

KaamKhojAI uses a deterministic, rule-based recommendation engine tuned for employment informality. Matching of jobs includes a multi-factor approach: similarity in job title, eligibility in age, alignment in availability, and relevance in location. To avoid empty results in recommendations, the system uses progressive constraint relaxation by exact matching, loosening the constraints such as availability and age, and falling back to category-level matching.

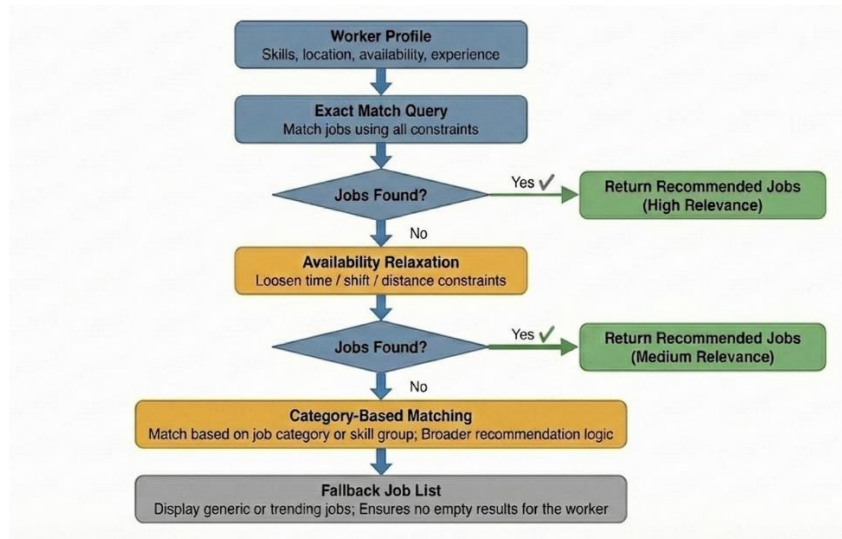


Figure 4.3: Job Recommendation Logic Flow

4.8 Data Persistence Layer

The application uses MongoDB as its main data storage solution for its ability to support semi-structured workforce data. The main collections in this database include authentication, workforce, and job postings. The database is indexed based on commonly searched variables such as type of job, availability, and location.

4.9 End-to-End System Workflow

It incorporates the following process in the overall system workflow: web browser access to the platform, choice of the languages, voice assistant that gives the user guidance on the process of capturing speech input, voice-to-text data extraction, verification, storage, job matching according to the verification of the user profile, followed by the rendering of the data both visually as well as in speech form.

4.10 Discussion

KaamKhojAI’s proposed architecture will be more focused on accessibility, transparency, and localization, rather than black-box AI models. By providing deterministic computing capabilities along with the option of conversational support, KaamKhojAI will be able to provide reliability and

interpretability. The system will be extensible for future developments such as location-based matching, messaging, and server-based speech processing.

5.Result

The offline survey conducted among 550 semi-skilled and unskilled workers in Nagpur revealed a lack of awareness and usage of the conventional text-based job portals because of language and literacy constraints. The study revealed a dominant preference among the respondents for voice-supported systems in regional languages. The results of the study indicate that voice-based interaction enhances user engagement, profile-building, and trust in the platform. The rule-based job suggesting method ensured accurate and transparent mapping of jobs, thereby authenticating the viability of KaamKhojAI.

6.Conclusion

KaamKhojAI aims to address the addressed gap in the urban employment sector by offering the accessible voice-first job search solution for the semi-skilled and unskilled workforce. The system aims to diminish the reliance on literacy-intensive interfaces and informal employment methods by leveraging the voice interface with clear, rules-driven job recommendations and the trust and verification system (comprising badges and overall trust scores). The results of the surveys clearly reveal the requirement and feasibility of voice-based employment platforms for blue-collar workers. The presented system design focuses on scalability, explainability, localization, and trust for the workforce, suitable for larger urban deployments. KaamKhojAI clearly explains that there has been immense potential for accessible, AI-based systems to change the face of workforce development and accessibility for developing regions.

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