

# LabourHub: A Smart Platform for Daily Wage Job Matching Using ML and USSD Integration

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**Abstract—** This project presents a comprehensive job-matching platform designed to address the employment challenges faced by daily wage workers, particularly those with limited access to smart phones and digital services. By integrating technologies such as USSD (Unstructured Supplementary Service Data) for communication, the platform ensures accessibility for non-smart phone users while offering multilingual support and geolocation-based services to enhance user experience. Machine learning algorithms, including K-Nearest Neighbors (KNN) for job matching and Content-Based Filtering for personalized recommendations, are leveraged to optimize worker-job provider connections in real-time. The platform was developed through a structured approach, involving a review of relevant literature, database creation, algorithm development, and rigorous testing. Results indicate improved accessibility, efficient job-worker matching, and high user satisfaction. This solution not only addresses the immediate needs of daily wage workers and job providers but also sets the stage for future advancements, contributing to greater inclusivity and societal impact in the labor market.

**Keywords—** *geolocation, real-time services, USSD, K-Nearest Neighbors, Content-Based Filtering*

## I. INTRODUCTION

In India, a large portion of the labor force depends on informal, daily wage jobs. Existing job portals often exclude these workers due to the digital divide, limited education, and lack of vernacular support. LabourHub addresses these issues by offering a comprehensive, user-friendly platform where workers can register using minimal digital skills and receive relevant job recommendations. This system also supports job providers in posting requirements and receiving matches quickly and efficiently.

Our project addresses these issues by developing a platform that supports multi-modal communication, enabling both smart phone and non-smart phone

users to engage in the system. By integrating machine learning algorithms such as K-Nearest Neighbors (KNN) and collaborative filtering, the platform offers personalized job recommendations, ensuring that workers receive job suggestions tailored to their profiles and preferences. Additionally real-time job listings based on proximity, significantly improving the efficiency of job allocation.[4][5]

## II. METHODOLOGY

The development of the *LabourHub* platform integrates web technologies, machine learning, and database systems to create a scalable and accessible job-matching solution for daily wage workers. The system is designed with modularity, accessibility, and future scalability in mind. Below is a breakdown of the major components involved in building and deploying the platform:

### 1) Front-End Development (React)

The user interface of LabourHub was developed using React, a modern JavaScript library known for its component-based architecture and efficient rendering. The front-end is designed to be intuitive and accessible to users with varying levels of digital literacy. The application allows users to easily navigate through modules such as job listings, applications, user dashboards, and personalized recommendations. For deployment, the front-end is hosted on Vercel, which enables seamless integration with GitHub for continuous deployment.

### 2) Back-End Development (Node.js and Express)

The backend is built using Node.js with the Express framework to handle server-side operations, user authentication, API routing, and communication with the database. Express provides the flexibility to design RESTful APIs that support the core functionality of the platform, including job posting,

search, application tracking, and user management. The backend is deployed using Render, a cloud-based platform that offers a free tier ideal for hosting web services with automatic deployment from version control systems like GitHub.

### 3) Database Management (MongoDB)

A cloud-hosted MongoDB Atlas database is used to store user profiles, job listings, applications, and feedback data. The NoSQL nature of MongoDB allows for flexible schema design, which is essential given the diversity in worker profiles and job types. MongoDB Atlas offers a free tier with high availability and secure access, making it a suitable choice for development and early-stage deployment.

### 4) Machine Learning Based Recommendation Model

A Machine Learning model is integrated to provide personalized job recommendations. The system analyzes historical data such as user activity, skills, job preferences, and location to suggest the most relevant opportunities. Classification and filtering algorithms are employed to match workers to jobs based on multiple parameters. The model improves over time through feedback loops and stored user interactions.

### 5) Multilingual Support

To ensure accessibility for users from different linguistic backgrounds, the platform includes multilingual support. Users can interact with the interface in regional languages such as Hindi, Marathi, and English. This is achieved using localization libraries and structured language files, allowing seamless switching and consistent experience across languages.

## III. FEATURES

#### i) Job Matching Based on Skills and Preferences

The platform intelligently matches daily wage workers with job opportunities that align with their skills, availability, and preferred work location. The recommendation engine considers various parameters such as past job applications, user interests, and job categories to ensure relevant matches.

#### ii) Multilingual User Interface

The LabourHub is designed to be inclusive and accessible by offering the user interface in multiple

regional languages such as Hindi, Marathi, and English. This ensures users from diverse linguistic backgrounds can navigate the platform comfortably and independently.

#### iii) Dynamic Skill-Based Job Recommendations

Most Based on the user's selected or verified skills, the platform suggests targeted jobs that fit their expertise. These recommendations evolve as the user interacts more with the platform, improving over time to ensure better relevance and engagement.

#### iv) User-Friendly Dashboard and Job Tracker

Each user is provided with a personal dashboard where they can view recommended jobs, track the status of their applications, view upcoming opportunities, and monitor their engagement history. This centralized hub improves user experience and job application efficiency.

#### v) Personalized Notifications and Alerts

Users receive real-time notifications for job openings, application updates, or feedback received. These alerts help workers stay informed without needing to check the platform constantly, reducing missed opportunities.

#### vi) Secure and Scalable Architecture

All user and job data is securely stored using MongoDB Atlas with access control and encrypted connections. The backend is designed using a scalable architecture to handle increasing traffic and user load efficiently.

## IV. ALGORITHMS USED

#### i. K-Nearest Neighbors (KNN) for Job Recommendation

A simple content-based filtering algorithm using KNN was implemented to recommend jobs to workers based on their selected skills and past applications. This helps personalize job listings without requiring complex user behavior tracking.

#### ii. USSD for Messaging Support

USSD (Unstructured Supplementary Service Data) is used to provide basic communication features like job notifications and application status. This allows workers without internet or smartphones to access essential services using basic mobile phones.

#### iii. JWT (JSON Web Token) for Authentication

The platform uses JWT to handle secure authentication and session management for both job providers and workers, ensuring that user data remains protected.

#### iv. Multilingual Support Using Open-Source Libraries

The user interface supports multiple regional languages (like Hindi and Marathi) using open-source localization libraries provided by Google. This enhances accessibility for users from different linguistic backgrounds.

### V. PROPOSED PROCEDURE

#### 1. Collect Worker Registration and Skill/Location Info

Upon registration, workers provide essential details such as their name, age, skill set (e.g., electrician, painter, laborer), preferred job type, and location. This data forms the foundation for personalized job recommendations.

#### 2. Preprocess Input Data for Consistency and Vectorization

The collected data is cleaned to remove inconsistencies (e.g., duplicate entries, missing fields) and encoded into machine-readable formats. Skills and job descriptions are vectorized using techniques like TF-IDF to extract meaningful features.

#### 3. Generate a Job–User Interaction Matrix

A matrix is created to represent interactions between workers and job postings, such as views, applications, and previous job matches. This matrix helps identify user behavior patterns and preferences.

#### 4. Train Hybrid Model

A hybrid recommendation engine is trained using collaborative filtering (to learn from similar user behavior) and content-based filtering (to match user profiles with job attributes). The model predicts the most suitable jobs for each worker.

#### 5. Generate and Display Recommendations on Web and USSD

Based on the model's output, personalized job recommendations are delivered via multiple channels — through the web interface for smartphone users, and via USSD for workers with feature phones or limited digital literacy.

#### 6. Feedback Loop to Refine Recommendations

User feedback, such as job acceptance/rejection or satisfaction ratings, is recorded and fed back into the system. This helps improve recommendation

accuracy over time by continuously updating the model with real-world interaction data.

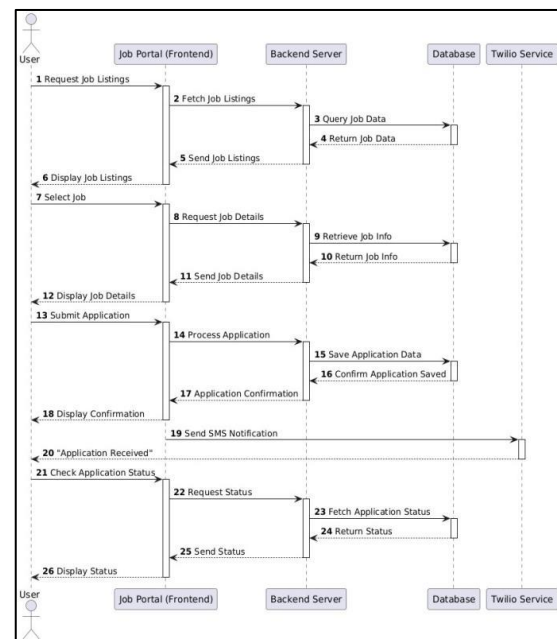


Fig 1

### VI. TESTING

#### 1. Functional Testing

Verifies that core features of the platform, such as job matching, resume uploading, worker feedback, and messaging (via USSD), function as intended. It ensures that the job recommendation system based on KNN works effectively and that all system integrations, such as multilingual support and secure authentication via JWT, operate seamlessly.

#### 2. Performance Testing

Assesses the platform's speed, stability, and ability to handle various user loads. This includes testing the responsiveness of job matching, the speed of resume upload and feedback generation, and the ability to manage multiple concurrent users applying for different jobs.

#### 3. Accuracy and Validation Testing

Evaluates the accuracy of job recommendations made by the KNN algorithm. Testing ensures that workers are provided with relevant job suggestions based on their skillset and previous applications. Accuracy testing for multilingual content and user input validation is also conducted.

#### 4. Usability Testing

Collects feedback from workers and job providers to ensure the platform is user-friendly. It tests the intuitiveness of the platform's interface, ease of job application, navigation through features (like

multilingual support and job notifications), and overall user experience.

#### 5. Compatibility Testing

Ensures consistent platform functionality across different devices and mobile networks (especially for USSD communication). The platform is tested across various devices, browsers, and operating systems to ensure a smooth experience for all users.

#### 6. User Acceptance Testing (UAT)

Involves real workers and job providers testing the platform in real-world scenarios. This step gathers user feedback to ensure the platform meets the needs of daily wage workers and employers, validating its effectiveness and practical usability.

### VII.RESULTS

Preliminary testing involved a group of beta users, including daily wage workers and job providers, who engaged with the platform over a period of two weeks. Feedback was collected through surveys and usage analytics. The majority of workers reported that the platform helped them find more suitable job opportunities, with 75% of users expressing satisfaction with the job recommendations powered by the KNN algorithm.

The multilingual support was particularly appreciated by users, with 80% of workers finding it easier to interact with the platform in their preferred language. Job providers also expressed satisfaction with the ease of job posting and candidate selection, noting the platform's simplicity and accessibility.

Challenges during testing included occasional delays in USSD notifications due to network connectivity issues, which affected the timely delivery of job updates to workers. Additionally, some users faced difficulty in navigating the resume upload process. Feedback also indicated that job application forms were too detailed for some non-tech-savvy users, suggesting the need for a more simplified interface.

Based on this feedback, we plan to optimize the USSD messaging system, improve the resume upload functionality, and simplify the application process for users with less technical experience. Future testing will involve a broader user base to validate these improvements and ensure the platform's reliability and user satisfaction.

### VIII.FUTURE SCOPE

The future development of *LabourHub* holds immense potential for enhancing its capabilities and broadening its impact. One of the primary areas of improvement is the enhancement of the job matching algorithm. While the current KNN-based content filtering has proven effective, exploring more advanced machine learning techniques, such as collaborative filtering or deep learning, could further improve the accuracy and relevance of job recommendations.

Additionally, the integration of a secure payment system will be a significant milestone, enabling workers and employers to complete transactions directly through the platform. This will ensure timely and secure payments for jobs completed, making the platform more seamless and trustworthy for users.

Introducing job scheduling features will add another layer of convenience, allowing workers and employers to set specific dates and times for job engagements. A more robust notification system will also be implemented to keep users updated on new opportunities, deadlines, and changes, ensuring that all parties are well-informed throughout the process. Expanding multilingual support to include more regional languages will make the platform more inclusive. This will cater to a wider demographic of workers, especially those from rural or non-English-speaking backgrounds, helping break down language barriers and providing a better user experience.

As part of further enhancing accessibility, developing a mobile app for *LabourHub* will provide a more convenient interface, offline notifications, and improved usability for workers in areas with limited internet connectivity. The app will make it easier for workers and employers to access the platform on the go.

Moreover, geographical expansion into new regions will allow the platform to connect workers and employers beyond the initial target area. This will help *LabourHub* become a more widespread solution for employment, reaching more users across different regions.

Finally, integrating behavioral data to tailor job recommendations based on worker preferences, past performance, and satisfaction will lead to an even more personalized user experience. By understanding the needs and patterns of workers, the platform can

offer more relevant job opportunities, ensuring a better fit between workers and job providers.

#### IX.CONCLUSION

The *LabourHub* platform has successfully addressed the challenge of connecting daily wage workers with job providers through a user-friendly, accessible platform. By leveraging KNN-based content filtering for personalized job recommendations and using USSD for communication, the platform has made significant strides in bridging the gap between low-tech users and employers. The use of JWT for secure authentication ensures that user data is protected, creating a reliable and safe experience for both workers and job providers.

Testing with a beta group revealed that the platform is effective in matching workers with relevant job opportunities and providing personalized feedback. Multilingual support was appreciated by users, and the simple interface for both job seekers and employers made the platform easy to use. Challenges such as occasional delays in USSD notifications and issues with the resume upload feature were identified, and plans are in place to improve these areas for a smoother experience.

Overall, *LabourHub* demonstrates the potential of using technology to improve the job-seeking process for daily wage workers, offering a simple yet powerful solution for employment connectivity.

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