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Ability Bridge: Helping Hands for Specially Abled People

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Abstract: ***The internet has become a vital resource for job seekers in today's technologically advanced world, particularly for those with impairments. They mainly rely on internet resources to find jobs that fit their particular requirements and skill set. Though some disabled candidates receive prompt responses and job offers, others find it difficult to traverse the intricate world of job portals, the efficacy of this process frequently varies. The website will focus on inclusivity, featuring a fully accessible interface that accommodates a wide range of disabilities, including visual, auditory, and mobility impairments. Ability Bridge aims to bridge the gap between disabled job seekers and employers, offering an inclusive platform that caters specifically to their unique needs. The platform will provide tailored job listings, accessibility features, and Sign Language translation tool to ensure that disabled individuals can find and apply for suitable employment opportunities with ease. By leveraging technology and inclusive design principles, this portal seeks to promote equal opportunities and empower disabled individuals in the workforce.***
Keywords: Inclusivity, auditory, mobility impairment, Job listing, ISL translation tool

I. INTRODUCTION

In today's fast-paced digital world, the job market has transformed significantly, with online job portals becoming essential tools for both job seekers and employers. These platforms facilitate the connection between potential employees and employers, streamlining the recruitment process. However, despite their widespread use, many existing job portals suffer from limitations such as poor user experience, inadequate personalization, and security vulnerabilities. This platform aims to develop next-generation job portal that addresses these challenges. By leveraging machine learning algorithms for job recommendations and incorporating user-friendly features, the portal seeks to enhance the job search experience for users. Additionally, the implementation of robust security measures will ensure that users can navigate the platform safely and securely. The significance of this platform extends beyond just improving the job search process. It represents a step toward creating a more equitable job market where opportunities are accessible to a broader audience.

By focusing on inclusivity and usability, the proposed job portal aims to meet the diverse needs of job seekers and employers alike. Beyond functional improvements, this initiative aspires to create a more inclusive and equitable job market. It envisions a platform that caters to the diverse needs of job seekers and employers, fostering accessibility and inclusivity. By bridging the gap between technology and opportunity, this next-generation job portal seeks to empower individuals, expand access to career possibilities, and contribute to a more equitable and connected workforce.

II. OBJECTIVES

1) Facilitate Employment: Offer a dedicated job portal specifically designed for disabled job seekers.
2) Accessible Navigation: Ensure the platform is user-friendly and easy to navigate with accessibility features.
3) Centralized Resource Database: Provide a single platform that consolidates government, private, and NGO schemes for easy access to assistance.
4) Real-Time Sign Language Translation: Offer a tool that translates sign language into text/audio and vice versa, breaking communication barriers.
5) Feedback System: Allow users to provide feedback about their experience with the platform, helping to continuously improve the service.

III. LITERATURE REVIEW

1) "Employment opportunities for persons with different types of disability" (2022) by Tomas Boman, Anders Kjellberg, Berth Danermark, and Eva Boman examines the challenges and opportunities faced by individuals with various disabilities in the labor market.

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It highlights barriers such as stigmatization, lack of accommodations, and systemic inequalities, which contribute to lower employment rates among disabled individuals. The study emphasizes the importance of inclusive policies, workplace accommodations, and tailored programs to enable meaningful employment. It advocates for collaboration betweengovernments,employers,andorganizationstofoster inclusivity, unlock the potential of disabled individuals, and promote equity in the workforce.[1]

2) "An overview insight into employment of disability at workplaces around the world – a review of the literature" (2023) by Mishlin Nweiser and Krisztina Dajnoki explores global trends, challenges, and best practices in employing individuals with disabilities. It reviews literature to highlight barriers like discrimination, inadequate workplace accommodations, and lack of awareness among employers. The study also identifies strategies for improving inclusion, such as policy frameworks, employer education, and technology-driven solutions. It emphasizes the need for international collaboration and proactive efforts to create equitable and inclusive workplaces for individuals with disabilities worldwide.[2]

3) "EmpowerAbility: A portal for employment & scholarships fordifferently-abled"byHimanshuRaj,SubhamKumar,and Dr. J. Kalaivani (2024) presents a digital platform designed toenhanceopportunitiesforindividualswithdisabilities.The portal integrates features for job search and scholarship access,providingtailoredsupportfordifferently-abledusers. It emphasizes accessibility through user-friendly design, advancedfilteringoptions,andcompatibilitywithassistive technologies. The study highlights the platform's role in bridging the gap between employment, education, and resources, ultimately fostering inclusivity and empowering individuals to achieve economic independence and personal growth.[3]

4) "Sustainable Employment for People with Disabilities: A Scoping Review on Workplace Practices and Positive Employment Outcomes" by Siri Yde Aksnes and Julie Ulstein (2024) explores workplace strategies that promote sustainable employment for individuals with disabilities. It reviewspracticeslikereasonableaccommodations,inclusive policies,andsupportive management to ensure long-term employment success. The study emphasizes the importance ofcreatinganenablingworkenvironmentandhigh lightsthe positive outcomes, such as job retention, satisfaction, and productivity, that result from inclusive workplace practices.

5) "CanDo: A Web-Based Job Portal for Jobseekers andFreelancers with Disabilities," by M. J. C. Samonte, A. Z. Dela Cruz, D. A. Uy and E. S. Gabriel an accessible employment website designed for job seekers and freelancers with disabilities. The platform enhances job-seeking experiences by integrating inclusive web design and accessibility features, addressing employment barriers for PWDs. Evaluated using the IBM Accessibility Checker (WCAG 2.0) and System Usability Scale (SUS), user testing showed high satisfaction among both job seekers and employers. Job seekers found the platform effective for job applications and freelance services, while employers appreciated the ability to review candidate profiles before selection. Developed with input from employers and IT professionals, CanDo aims to expand accessibility and inclusivity in the job market. [5]

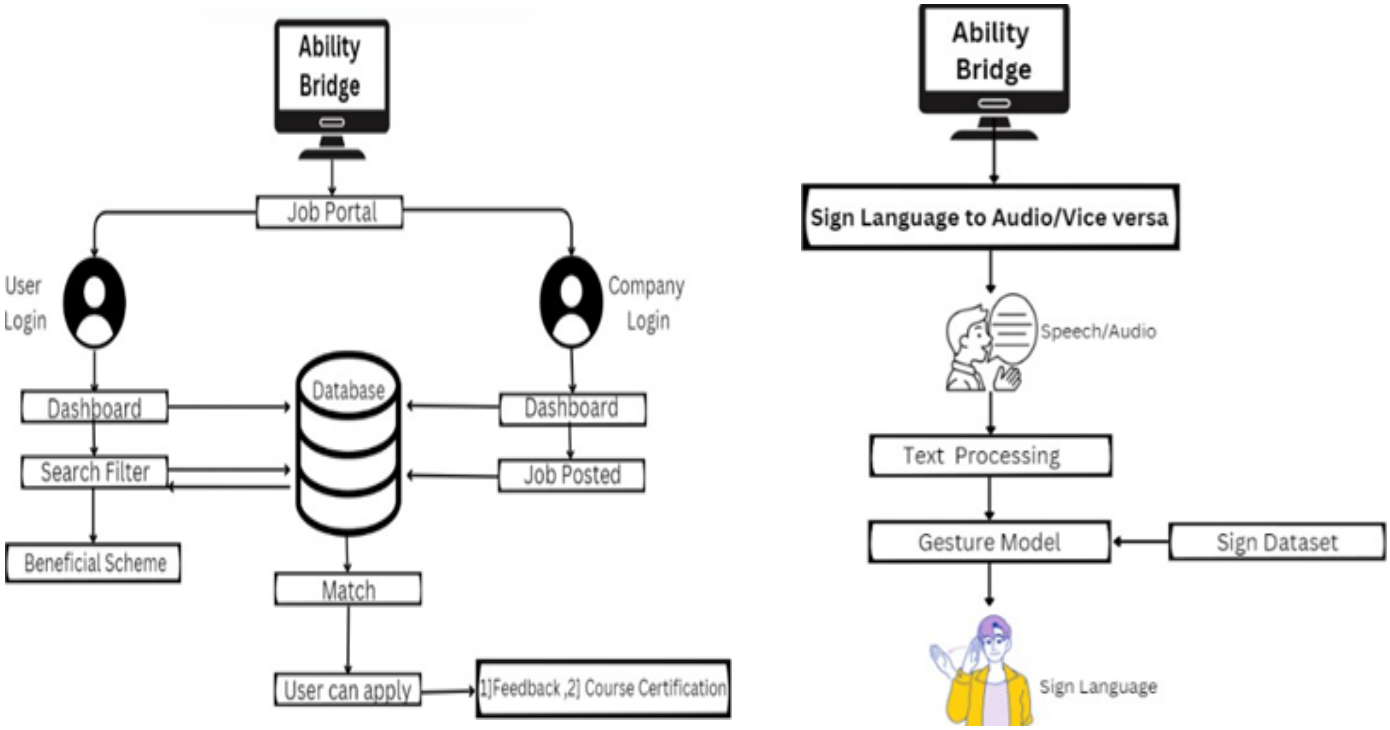
6) "EchoCareer: Enhancing Job Recommendations for the Hearing-Impaired Community With Semantic Technology." by Ertugrul, Duygu Celik, and Selin Bitirim is a career ontology knowledge base designed to provide tailored job recommendations for hearing-impaired individuals using Semantic Web technology. It ensures inclusivity, with plans to expand support for various disabilities. Quality is assessed using the OntoMetric tool to maintain accuracy and compliance with standards. As a unique ontology in its field, EchoCareer holds potential for integration into HR software, promoting unbiased recruitment and inclusive hiring practices.[6]

7) "Inclusive Hiring through Technology: A Recruitment Platform for Individuals with Intellectual Disabilities." by Madan, Shalini, Tarun Kumar, and Ajit Bhagat is a digital job search platform designed to support individuals with intellectual disabilities (ID) in India, promoting inclusivity and employment opportunities. Using User-Centered Design (UCD), the project involved collaboration with ID individuals, employers, and vocational centers. Features like speech-to-text and image recognition enhance accessibility. Feedback from participants guided iterative improvements, demonstrating that 'Workability' empowers ID individuals by improving job access and social integration. The study concludes that leveraging technology can reshape employment opportunities, ensuring a more inclusive society where individuals with ID are fully integrated based on their abilities and preferences. [7]

8) "Continuous speech recognition using hidden Markov models." by Picone, Joseph. This review discusses the use of Hidden Markov Models (HMMs) in continuous speech recognition, highlighting their evolution from dynamic programming. It presents a ied framework integrating linguistic decoding and acoustic matching within an optimal network search. Advances in recognition architectures, particularly the Viterbi beam search algorithm, are explored. The paper also examines probability estimation in HMMs, the supervised training paradigm, and provides examples of successful HMM-based speech recognition systems. [8]

IV. PROPOSED SYSTEM

The proposed system is an integrated, multi-functional platform designed to optimize the quality of life for individuals with disabilities by providing three key components: an intuitive job portal, an extensive repository of support schemes, and an advanced sign language translation module. Each module has been meticulously developedusinginclusivedesignprinciplesandcutting-edge technologies to address the unique challenges faced by the disabled community. The platform ensures robust accessibility, seamless user experience, and scalable integration, leveraging modern frameworks and machine learning algorithms to enhance usability, inclusivity, and overall convenience.



(Module 1 and Module 2) (Module 3)

Fig.1System Architecture ofAbility Bridge(Module 1, Module 2 and Module 3)

1) Job Portal: The Job Portal serves as the core component of the AbilityBridge platform, engineered with advanced accessibility features to cater to individuals with diverse disabilities. The portal leverages responsive design principles, allowing users to effortlessly search, filter, and apply for job opportunities based on their qualifications and preferences. By incorporating machine learning algorithms, specifically recommendation systems and collaborative filtering techniques, the platform provides personalized job recommendations, optimizing the match between job seekers' skills, experience, and desired roles. These intelligent features enhance economic independence by promoting inclusivity and providing pathways to meaningful employment.

2) Centralized Repository of Assistance Schemes: The Assistance Schemes module functions as a centralized repository, aggregating a diverse range of support programs from government entities, private organizations, and non- governmental organizations (NGOs). This repository is powered by an optimized database structure, equipped with advanced search algorithms, faceted search, and filtering options, enabling users to efficiently locate relevant schemes tailored to their specific needs. Utilizing data indexing and query optimization techniques, the system ensures quick access to various resources, including financial aid, vocational training programs, and accessibility services. Through an intuitive user interface, the platform offers seamless navigation and application processes, streamlining the user experience and reducing the complexity of interacting with fragmented resources.

3) Sign Language Translation Tool: The Sign Language Translation Tool is a pivotal feature of the AbilityBridge platform, designed to bridge the communication gap for individuals who rely on sign language. Utilizing real-time gesture recognition and computer vision algorithms, the tool convertssignlanguageintotextoraudiowithhighaccuracy.

By integrating deep learning models, such as convolutional neural networks (CNNs) for image processing and natural languageprocessing(NLP)techniquesforcontext-awaretext generation, the system ensures seamless and precise translation.
This facilitates bidirectional communication between sign language users and non-users, allowing for fluid interaction in both professional and personal environments. With robust processing capabilities and low-latency response times, the tool offers an intuitive and accessible experience, empowering users to communicate effectively and confidently across diverse contexts.

V. WORKING

1) Cosine Similarity for Job Matching:

Convert User Profile and Job Descriptions into Feature Vectors

- The system extracts keywords from the user's resume, skills, qualifications, and preferences.
- Similarly, keywords from the job description are extracted (skills required, job responsibilities, preferred experience).
- A TF-IDF (Term Frequency-Inverse Document Frequency) or Bag-of-Words (BoW) model is used to represent the extracted text as numerical vectors.

Compute Cosine Similarity

Where:

- A = User Profile Vector
- B = Job Description Vector
- A□B = Dot product of vectors
- □□A□□ and □□B□□ = Magnitude (norm) of each vector
- If Cosine Similarity = 1, the job perfectly matches the user profile.
- If Cosine Similarity = 0, there is no similarity between the profile and the job.

Rank Jobs Based on Similarity Scores

- The system calculates similarity scores for all available jobs.
- Jobs are ranked from highest to lowest similarity, ensuring that job seekers see the most relevant opportunities first.
- Additional filters (location, job type, salary) refine the results.

2) Convolutional Neural Networks (CNN) for Sign Language Recognition:

- Input Processing: The system captures a sign language gesture as an image or video frame, preprocesses it (resizing, normalization) for consistency.
- Feature Extraction: CNN applies convolution and pooling layers to detect key features like hand shape and finger positioning.
- Classification: Extracted features are passed through fully connected layers, where Softmax activation classifies the gesture into a letter, word, or phrase.
- Output Generation: The recognized sign is displayed as text, and if enabled, converted to speech using Text-to-Speech (TTS) for audio output.

3) Hidden Markov Model (HMM) for Sequential Gesture Recognition:

- Gesture Modeling: Each hand gesture is represented as a hidden state in the HMM, with visual features like hand position and movement extracted.
- Transition Probabilities: A probability matrix models how gestures transition between signs to form meaningful sequences.
- Feature Extraction: Computer vision tracks temporal hand movements, selecting keyframes for analysis.4. Sequence Recognition: The Viterbi Algorithm identifies the most probable gesture sequence, predicting the correct word or sentence.
- Text & Speech Output: The recognized gestures are converted into text, refined with NLP, and optionally synthesized into speech using TTS.

a) Working Flow of System Architecture(Module 1 ,Module2 and Module 3)

- *User Login (Job Seekers):* Job seekers log into the portal and access their dashboard. They can use a search filter to find suitable job opportunities. Additionally, users can explore beneficial schemes that might aid them in their career development.

- *CompanyLogin(Employers):* Companies log into the portal and access their dashboard. Theycanpostjobopenings,whicharestoredinthedatabase.
- *Database(CentralSystem):* Stores user profiles, job postings, and other relevant data.Ithelpsinmatchingjobseekerswithsuitablejobopenings.
- *MatchingProcess:* Thesystemmatchesjobseekerswithrelevantjobpostings. Users can then apply for the jobs.
- *Post-Application Process:* Once a user applies, there are two possible outcomes: Feedback from the company regarding the application. Course Certification, possibly to enhance skills if needed
- *SignLanguagetoAudio/ViceVersaModule:* Thismoduleisresponsiblefortranslatingsignlanguageinto speech/audio and vice versa.
- *Speech/AudioInput:* Spokenlanguageisprovidedasaninput(viaamicrophone or text).Thisisconvertedintotextforfurtherprocessing.
- *TextProcessing:* Thespokeninputisconvertedintostructuredtext.This processed text is then used to generate sign language gestures.
- *GestureModel&SignDataset:* TheGestureModelinterpretstextandmapsittocorresponding sign language gestures. TheSignDatasetservesasareferenceforgeneratingaccurate sign language gestures.
- *SignLanguageOutput:* The final output is presented in the form of sign language gestures.Thiscanbedisplayedviaananimatedavatarorvisual representations.

b) Key Component of System Architecture

- *UserRegistration/Login*

The registration and login system allows users to create accounts and securely access the platform. New users can register with essential details like username, password, and identity verification

- *Profile Management*

Profile management allows users to create and update their profiles, whether they are job seekers or employers. Job seekers can input details like qualifications, experience, and preferences, while employers can share company information and job posting history.

- *Job Posting (Employer)*

Employers can post job openings by providing details such as job title, description, qualifications, and location. This feature supports detailed input for job requirements, including salary range, benefits, and accessibility accommodations. Employers can review and manage their job postings, ensuring they reach the right candidates. The system's recommendation algorithms also help match job postings with relevant job seekers, promoting inclusivity and a wider pool of candidates.

- *JobSearch(JobSeeker)*

Job seekers can search and filter job listings using various criteria like job title, location, salary, industry, and job type. Advanced search filters, powered by machine learning algorithms,providepersonalizedjobrecommendationsbased ontheuser'sprofile,preferences,andprevioussearches.Job seekerscantrackapplicationstatuses,andapplydirectlyfrom the platform, ensuring they have access to the most relevant opportunities.

- *ApplicationSubmission*

The application submission feature allows job seekers to apply for jobs directly on the platform by submitting their resumes, cover letters, and additional documents. Users can pre-fill their profiles for faster applications and apply for multiple jobs with a single click. This streamlined process reduces friction, allowing for easy, accessible application submission.

- *NotificationSystem*

The notification system keeps users informed about job applications, new job postings, and important updates. Job seekersreceive real-timenotificationsabout the statusof their applications(e.g.,shortlisted,declined),whileemployersare notifiedwhennew applicationsarereceived.Usersreceive in-app alerts about new job postings that match their preferences.

VI. RESULT

The Job Portal serves as the core component of the AbilityBridge platform, engineered with advanced accessibility features to cater to individuals with diverse disabilities. The portal leverages responsive design principles, allowing users to effortlessly search, filter, and apply for job opportunities based on their qualifications and preferences. By incorporating machine learning algorithms, specifically recommendation systems and collaborative filtering techniques, the platform provides personalized job recommendations, optimizing the match between job seekers' skills, experience, and desired roles.

These intelligent features enhance economic independence by promoting inclusivity and providing pathways to meaningful employment.

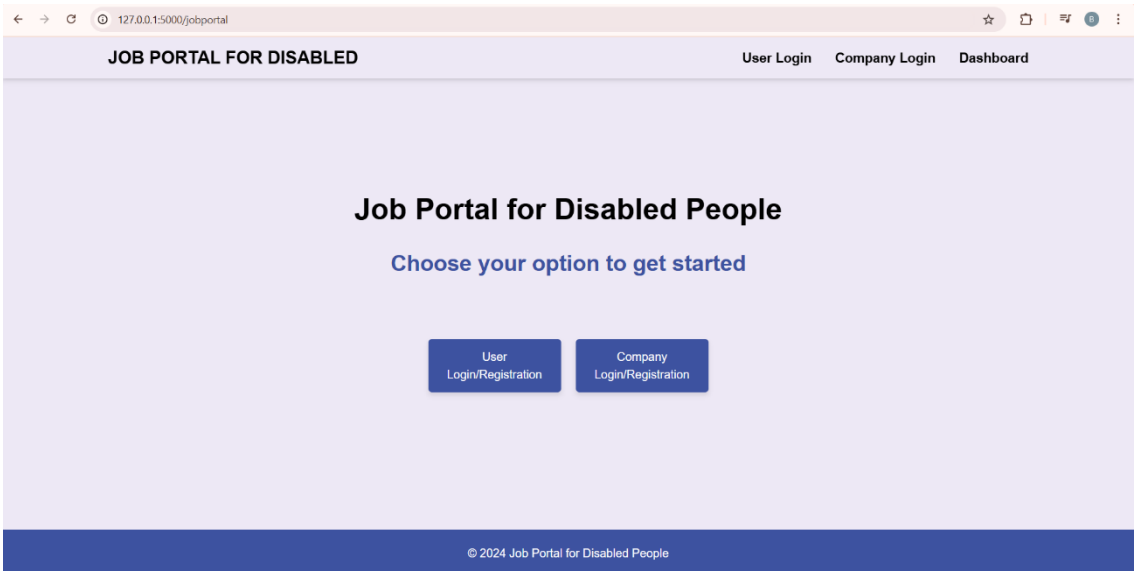


Fig.1 Homepage of a Job Portal

Figure 1 displays the homepage of a Job Portal designed specifically for disabled people. It serves as an entry point for both job seekers and companies, providing two main options: User Login/Registration and Company Login/Registration. The page includes a simple navigation bar at the top with links to User Login, Company Login, and Dashboard. At the bottom, a footer displays the copyright notice for the year 2024, indicating that the platform is dedicated to supporting employment opportunities for individuals with disabilities.

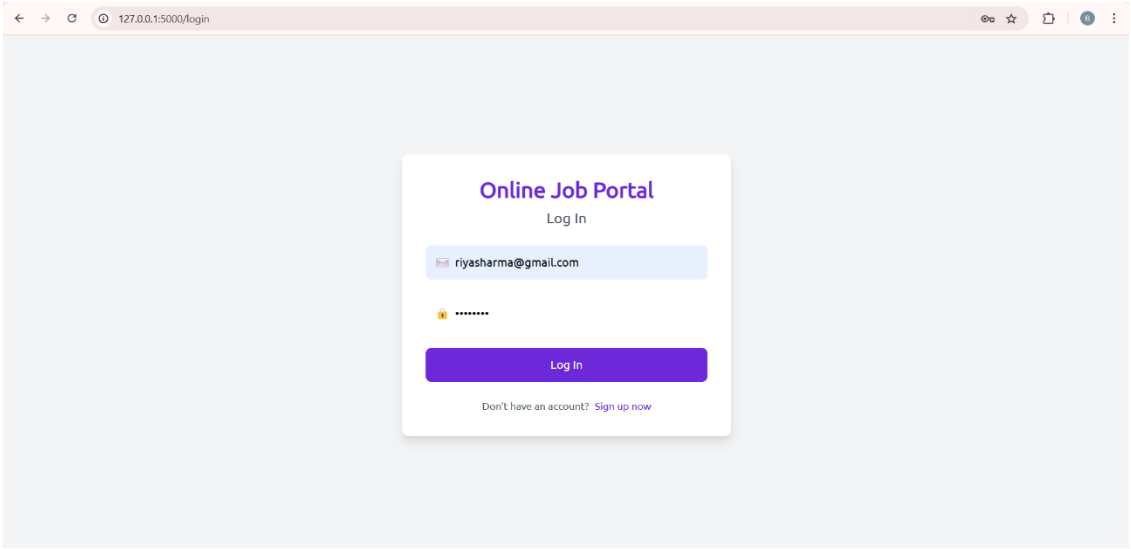


Fig.2 Login screen for online job portal

Figure 2 displays the login screen for the Online Job Portal. It allows registered users to log in by entering their email address and password. The interface is clean and user-friendly, featuring input fields with relevant icons for email and password. Below the login button, there is also a link for new users to sign up if they don't already have an account, encouraging easy access and registration.

The homepage of the Job Portal after a successful login. It greets the user with a personalized welcome message, "Welcome Riya!" and encourages them to search and apply for jobs online. The top navigation bar provides quick access to key sections such as Home, My Profile, Jobs, Interviews, and an "Options" dropdown for additional features.

The background features a professional image of a handshake, symbolizing employment opportunities and successful job placements.

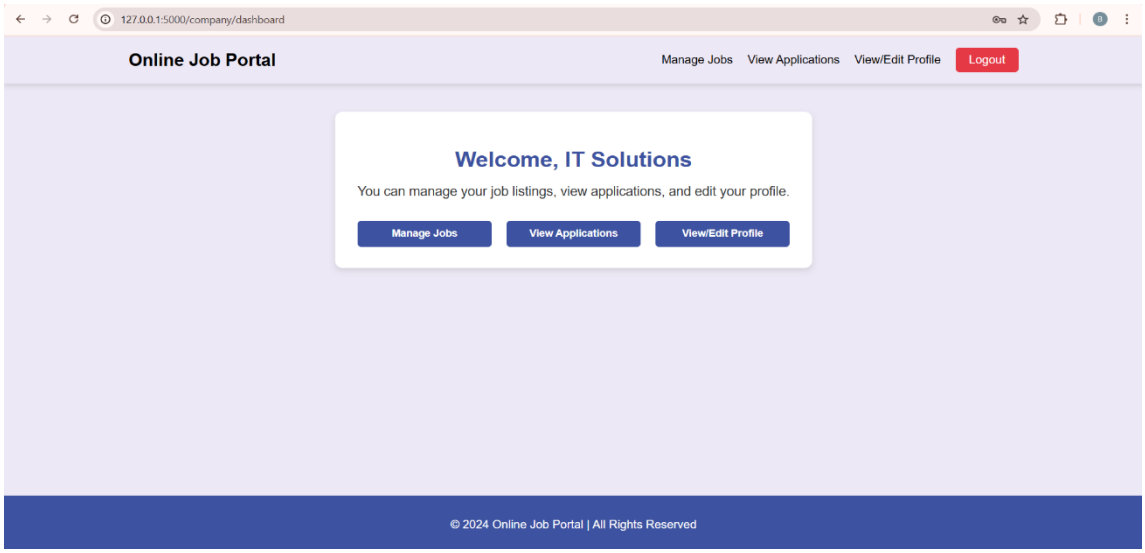


Fig.3 Company Dashboard

Figure 3 displays the company dashboard of the Online Job Portal, designed for recruiters or employers. It greets the company user “IT Solutions” and offers three main functionalities: managing job listings, viewing submitted applications, and editing the company profile. The interface includes clearly labeled buttons for each function and a top navigation bar with the same options, along with a red logout button for secure exit. The design is clean and professional, enabling companies to efficiently oversee recruitment activities.

In company dashboard there is part of the company interface on the Online Job Portal, allowing employers to add new job listings. It includes fields for the job title, type (e.g., part time), salary, and a brief description. In this example, a ”Software Developer Intern” role is being added with a focus on Java and Data Structures Algorithms (DSA). The form is completed by clicking the ”Add Job” button.

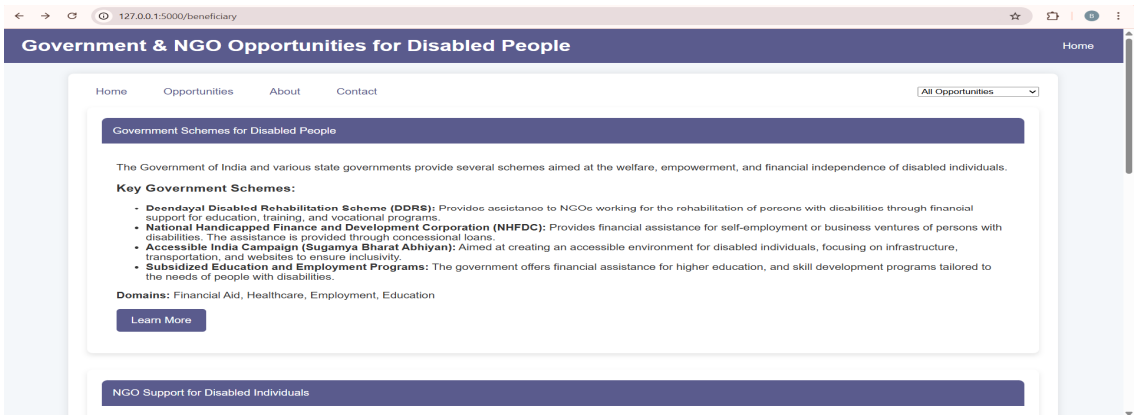


Fig.4Government & NGO schemes

Figure 4 provides information about various government schemes in India that support disabled individuals. It highlights key initiatives such as financial aid, vocational training, accessible infrastructure, and education programs. The listed schemes aim to promote the welfare, empowerment, and financial independence of people with disabilities, covering areas like healthcare, employment, and education.

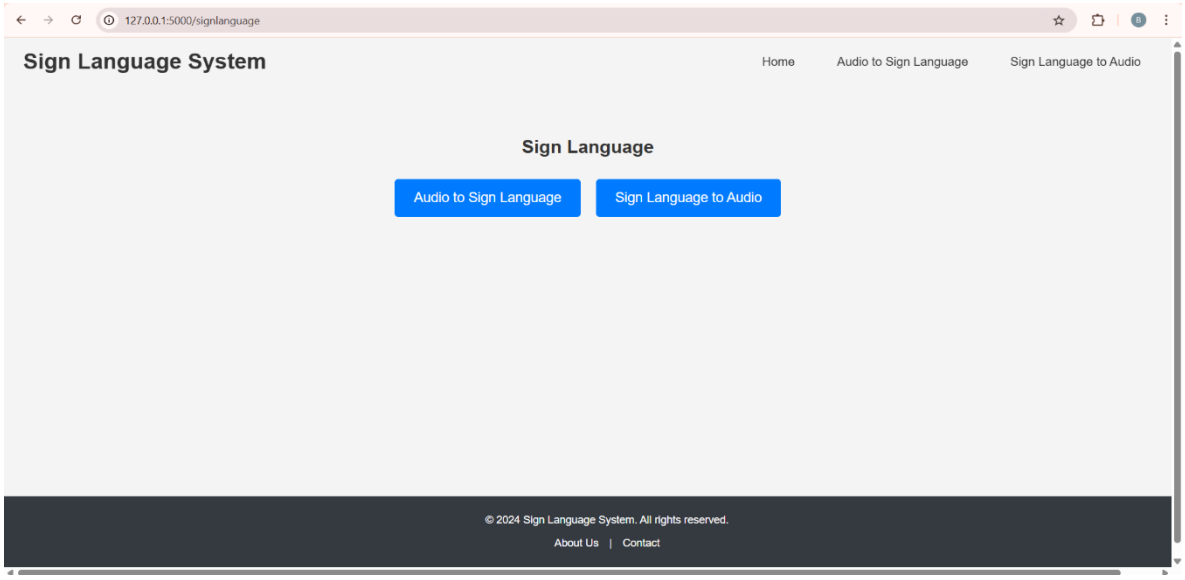


Fig.5Sign Language System

Figure 5 shows part of a "Sign Language System" that provides two main features:converting audio into sign language and translating sign language into audio. It aims to facilitate communication between hearing and speech-impaired individuals through easy-to-use, interactive buttons for each conversion option.

It features a simple interface with a button to start speech recognition, helping convert spoken language into a format accessible to hearing-impaired users. The tool aims to support better communication for individuals with hearing difficulties.

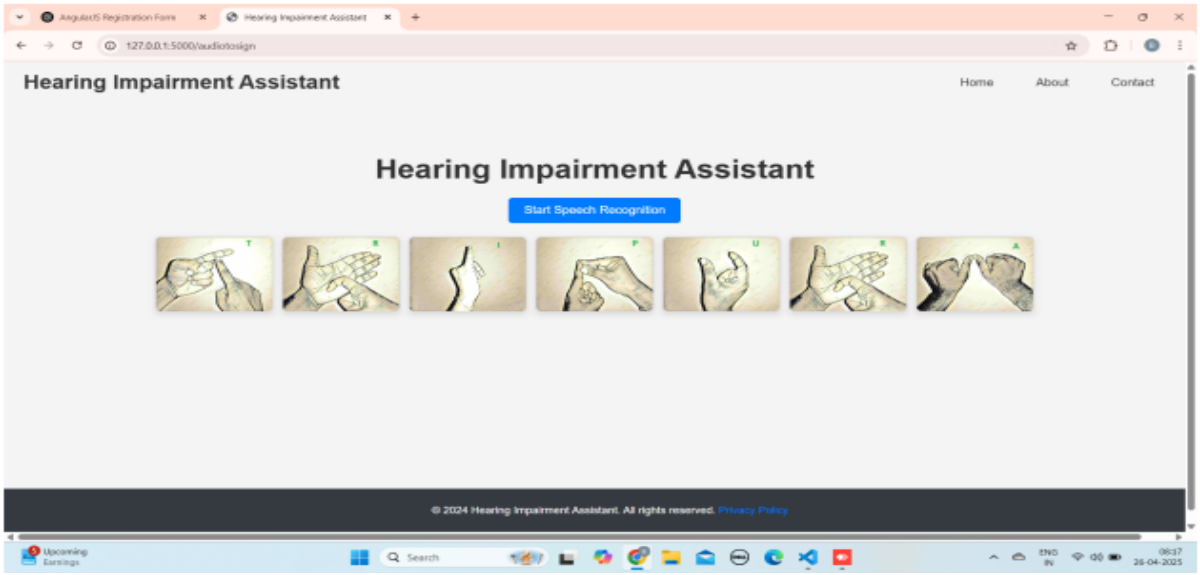


Fig.6Hearing Impairment Assistant

Figure 6shows a web application titled "Hearing Impairment Assistant". It features a clean interface with a header and a navigation menu (Home, About, Contact). The main section displays a bold title and a blue button labeled "Start Speech Recognition". Below the button, there are images of hands demonstrating Sign Language letters spelling the word "TRIPURA".

VII. FUTURE SCOPE

1) Mobile Application Development

Building cross-platform mobile apps (Android and iOS) will allow users to access job opportunities, schemes, and sign language tools on the go, improving accessibility and engagement.

2) Multilingual Support

Adding support for multiple Indian and foreign languages will broaden the user base, making the platform more inclusive to users from diverse linguistic backgrounds.

3) AI-Powered Career Guidance System

Integration of AI-driven chatbots and recommendation engines can help users choose appropriate career paths, suggest skill development resources, and give resume-building advice based on their profile and aspirations.

4) Real-Time Video Interview Support with ISL Interpretation

Introducing real-time video interviews with built-in ISL (Indian Sign Language) interpretation can further ease the hiring process for deaf candidates and employers.

5) Integration with Government and NGO APIs

Direct integration with government and NGO databases via APIs can enable automatic updates of new schemes, deadlines, and eligibility criteria, ensuring real-time information access.

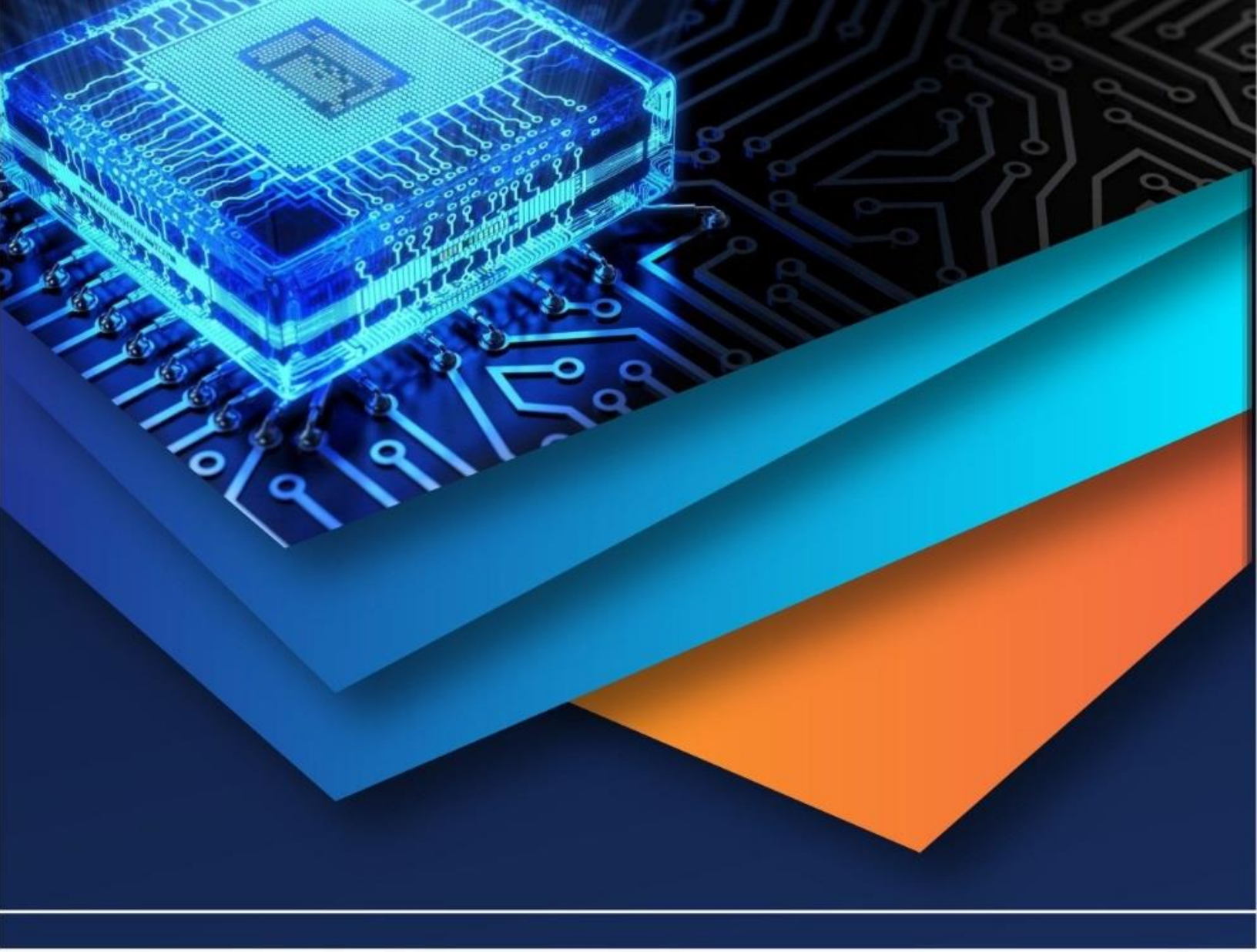
VIII. CONCLUSION

The Ability Bridge platform is a transformative platform that seeks to revolutionize the job search experience for individuals with disabilities by focusing on inclusivity and accessibility. By providing tailored job listings, a user-friendly interface designed to accommodate various impairments, and tools such as ISL translation, the platform eliminates common barriers faced by disabled job seekers. Through innovative use of technology and a commitment to equal opportunities, Ability Bridge empowers individuals with disabilities to connect with employers, paving the way for a more diverse and inclusive workforce.

Future developments could include integrating advanced analytics for predicting job market trends and enabling real-time video interviews within the platform.

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