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AI Enabled System for Simplified Access to Government Schemes for All Citizens

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ABSTRACT: An AI-based Inclusive Web Assistant to Equal Access to Government Schemes is an integrated single platform, which tries to enable citizens to search, find and apply government schemes in Central and State governments in India without difficulty. The project includes a React front and Fast-API back-end and structured data-set of 4000+ schemes retrieved using official government portals.The client can use key-words, filters, categories, or a smart Eligibility Wizard to do such searches. Provision of multilingual services, AI recommendation, document requirements guide also leads to reduction of the barrier as the platform aims to make sure that the process of finding welfare schemes is not complicated, and that the ones that need the benefits the most do not consider the most important ones due to poor navigation skills or lack of knowledge.

KEYWORDS: Government Welfare Schemes, Eligibility Matching, personalized recommendation engine, rule based decision support, AI chatbot, multi criteria decision making, weighted scoring algorithm, e-government platform, intelligent web system, user centric design.

I. INTRODUCTION

India is today running a number of over 900 central government schemes and over 4, 000 state-level welfare schemes, and these schemes are across various important areas of life including education, health, agriculture, employment, housing, and social security. These plans are meant to facilitate inclusive development, equality, and the quality of life of the citizens. Nevertheless, even though many welfare programs are available, only a significant segment of the target population is unable to make the most of the welfare programs. The disintegration of scheme related information in various government portals and state specific platforms is one of the greatest challenges that the citizens encounter. The portals use varying data formats, navigation designs, and eligibility designs, and it is hard to search, compare, and comprehend schemes using a particular portal. Additionally most schemes have complicated and multi-dimensional and dynamic eligibility requirements that depend on income level, occupation, gender, caste classification, age and location of residence among others. This complexity scares away users especially users in rural or digitally disadvantaged areas to utilize government benefits. The other severe shortcoming is that there is no individualized guidance and

intelligent decision support in current platforms. The majority of the portals offer static data without helping the users to find schemes that suit their personal profiles. This, consequently, tends to make the citizens dependent on middlemen or informal channels that can create misinformation or marginalization. Also, inadequate multilingual support and user-redundant user interfaces are other limiting factors that reduce access to the digital platform by a diverse population.To overcome these obstacles, there is the dire need of having a single digital platform that is smart, intelligent and user-centric where all central and state government schemes can be merged into one system. A platform of this nature would need to manage structured data, provide advanced filters, personalization based on their eligibility and AI-assisted features to help users research and make choices regarding the schemes. The proposed research is the evaluation of the effectiveness of government schemes with the assistance of machine learning. The authors also construct measures of scheme performance and beneficiaries information to ensure the impact and effectiveness. Though the work demonstrates opportunities of the ML to be applied into the evaluation of the policies, it is primarily concerned with the post-implementation analysis rather than improvement of accessibility of the citizens or identification of the personalized scheme [1].The authors propose the application of the data mining in connection with the system of user profiling and individualized government schemes proposals. Although it enhances the identification of schemes, the system lacks an

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interactive approach in terms of direction and chat support by the AI [2].This paper is describing a web-based system that automates the process of matching users with government schemes by their rules. The method is easier to check eligibility, though lacking in recommendation ranking and smart user support [3]The proposal proposes a chatbot system that is dynamic to enhance user interaction and availability of information regarding government schemes. Using the chatbot, users can inquire of scheme oriented information using natural language. Though it has enhanced accessibility, the system does not have personalization based on eligibility, document guidance and integration with pre-defined scheme filtering mechanisms[4]. The authors suggest a multi-platform chatbot that could be used to deliver information about the government schemes in both web and mobile platforms. The system increases accessibility and touch via chat interfaces. It, however, has restricted functionality to information retrieval and does not allow eligibility-based recommendations, application support, or decision support[5].

II. RELATED WORKS

The latest studies have considered how to use artificial intelligence to enhance access and awareness of government welfare programs. A number of projects have suggested the use of AI-based conversational agents to allow users to communicate with governmental websites using the natural language, which makes it easier to access scheme-related information. They lead to increased user interaction and decreased reliance on manual navigation, though they tend to lack personalization on the basis of eligibility and structured recommendation systems[6].These systems have been used with government scheme information systems to enable automated question-answer functionality; sequence-to-sequence (Seq2seq) based chatbot models have been applied. Although it is possible to incorporate such models to create responses based on context, some of them are not as effective due to reliance on structured inputs and a lack of decision-support capabilities, including verification of eligibility and guidance on application [7].Other papers have been written on how to incorporate artificial intelligence with e-governance services, especially in smart cities, to enhance service delivery, information security, and administrative efficiency. Though these systems exhibit high levels of technological integration, they are usually limited to urban systems and may not offer the specific analysis of scheme discovery and personalization to different groups of users[8].Some literature suggest software-based self-determined welfare systems where users can be provided to select applicable schemes based on specific defined inputs independently. These methods minimise human intervention, but depend on fixed rule bases and are not based on intelligent ranking, adaptive recommendations, or conversation assistance [9] .Also, machine learning systems have been used to classify beneficiary data, including farmer land records, to identify scheme eligibility. Though these models are accurate at the determination of eligibility, they are domain-specific and they do not provide a single user-facing interface that can combine search, recommendation, and guidance functions [10].Generally, the current study deals with a single aspect of either chat-based interaction, eligibility classification, or administrative automation. Nevertheless, a research gap exists in creation of a complete and integrated platform, which is centralized scheme management, eligibility based recommendation, artificial intelligence based conversation assistant and user friendly web interfaces, which the proposed system is to be developed to solve this issue [10]. The scheme combines the security of authentication with effective scheduling to minimize delay, energy usage, and unauthorized access. The experimental findings show better throughput and network lifetime than the existing approaches [11].The paper presents ECC-based secure authentication protocol to be implemented on cloud servers and smart IoT devices. The suggested method will guarantee mutual authentication, integrity and withstand against frequent security assaults with minimal computational overhead. To identify malicious wireless access points, the study introduces an implicit spatio-temporal hybrid recommendation model that is confirmed to be appropriate when resources are limited in the IoT environment[12]. The model is better at identifying threats in wireless networks by examining spatial and temporal patterns of behavior. The results of the experiments demonstrate better detection rates and resistance to changing attacker conditions[13].The proposed research presents a secure and new authentication system, which can be used to secure data centers in fog computing networks. The model focuses on the lightweight security operations but provides significant protection against unauthorized access and data breaches. Enhanced security with reduced latency and reduced computational cost are simulation findings that validate misdirected paths avoidance technique based on random waypoint mobility model in wireless sensor networks [14]. The strategy enhances the routing effectiveness by eliminating unreliable paths as well as limiting the loss of packets. Performance evaluation is more energy efficient, less routing overhead and network reliability is enhanced[15].

III. PROPOSED APPROACH

The proposed system presents a common, smart Web Assistance Platform that is aimed at streamlining the process of accessing the central and state government schemes. The strategy is aimed at unifying structured data management, eligibility-based personalization and AI-based user interaction into the one scalable architecture. First, multiple sources are retrieved and packaged in structured system (JSON/CSV) and processed by a central Scheme Management Module. This back-end module presents secure APIs which facilitates dynamically searched scheme information, category

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filtering, state filtering, benefit type filtering and beneficiary group filtering, which guarantee real-time and consistent access to scheme information.

A Frontend UI/UX Module, created in a modern web technology, is designed with an intuitive and responsive user interface, allowing customers to view schemes in categories, search using key word, by state, benefit type and beneficiary group. In order to support complicated eligibility rules, an Eligibility Wizard gathers data on both the user in terms of demographics and socio-economics using a multi-step questionnaire interface and uses logic-based rules to determine which schemes apply.

To further improve the decision-making process, a Recommendation Engine will prioritize the eligible schemes based on a scoring algorithm which requires the user to be of a particular attribute which includes income, occupation, location, and prediction of eligibility. Furthermore, a large language model-driven AI Chatbot Module can be used to provide conversational assistance, answering user queries, explaining the scheme detail in simple language, and guiding the user through documentation and application processes, which is why the proposed solution can be considered to serve as a bridge between the government welfare programs and citizens.

A .Scheme Data Management & API

TThe Scheme Management Module is the central back part of the platform, which handles, processes and provides government scheme information and data via secure and scalable APIs. Structured sources like JSON and CSV files get ingested into scheme information and are stored in a normalized database format thus providing consistency, integrity and efficient retrieval. All schemes are specified with the help of such key attributes as category, state applicability, type of benefits, and eligibility tags that allow organizing them and querying them conveniently.

This module has a multi-attribute indexing and filtering mechanism which can be used to find the schemas speedily and precisely according to user-specified criteria. Index lookups are made on frequently-used attributes and this reduces response time greatly and enables real time filtering even when the dataset used is large. The module plays the role of a centralized source of data to the frontend application, the Eligibility Wizard, and AI-driven functionalities, which makes it scaled, reliable, and flawlessly integrated throughout the platform.

B . Client-Side Presentation and Interaction Module

Client-side Presentation and Interaction Module is the key point of access by which users can interact with the system and which has the role of providing a smooth, responsive and intuitive user experience. React is used to implement the module, which should allow a modern component-based architecture and the uniform style of the user interface across the platform, thanks to TailwindCSS. Important interface features are a high-profile hero search for fast finding schemes, a scheme grid organization by category to facilitate navigation as well as special purpose featured and trending scheme sections to make high-impact welfare programs more visible.

The frontend is written in a modular style with each React component responsible for particular functionality, namely scheme listing, scheme detail views, category-wise browsing, state-wise exploration, and advanced search results.

Client side state management will provide a transparent flow of data between the components and API integration will provide real time access to scheme data on the backend and render it on the client.

It is particularly focused on accessibility, being mobile-responsive, and easy to navigate, making it inclusive and easy to use regardless of what devices and digital literacy one uses.

C. Eligibility Wizard Module

The Eligibility Wizard Module is a decision support system that is structured and based on rules to reduce the multi-dimensional and complex eligibility criteria that relate to government welfare programs. The module presents the user with a six-decade interactive questionnaire that Records vital demographic and socio-economic elements in a systematically manner, including age, gender, the income level, occupation, social category and residential state.

The input validation is done in real-time with every step in order to check the accuracy, completeness, and logical consistency of data, reducing the number of errors, and enhancing the accuracy of eligibility assessment. After the user profile is created, the obtained inputs are processed with the help of a rule-based eligibility matching algorithm according to which each scheme is associated with a fixed collection of logical eligibility rules.

These criteria are determined deterministically against the user profile and a scheme is only considered eligible when all the mandatory ones are met.

The schemes that are ineligible are filtered automatically and the final list is a refined list of relevant schemes which is personalized. Offering clear, predictable, and interpretable eligibility assessment, the Eligibility Wizard greatly decreases the user workload, increases confidence and faith in the system, and forms a crucial basis to subsequent recommendation and AI guiding modules.

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D. Personalized Scheme Recommendation Engine

The Personalized Scheme Recommendation Engine provides individualized government scheme recommendations based on the information about user profile collected by Eligibility Wizard. The module evaluates the eligibility results and the significant attributes of user to determine, prioritize and rank the pertinent schemes to the user.

To do that, a scoring and ranking mechanism is used whereby a variety of variables such as eligibility alignment, benefit relevancy and user profile similarity are given preset weights in order to obtain a relevancy score in each scheme.

The schemes are sorted according to the computed scores and presented in the descending order of the relevance, so that most appropriate and impactful schemes come first. This will reduce the amount of information to be entered in the search and will lead to efficiency in the decision-making process, as well as offering a narrow and personalized experience of scheme discovery to users.

.For each eligible scheme Si, a relevance score is computed as:

$$\text{Score}(S_i) = \sum_{k=1}^{n} w_k . f_k(S_i, U)$$

where$f_k(S_i,U)$represents the normalized relevance factor (e.g., benefit match, occupation relevance, income suitability) and w_k denotes the corresponding weight assigned to that factor, such that:

$$\sum_{k=1}^{n} w_k = 1$$

E .AI-Powered Conversational Assistance Module

TThe AI-Driven Conversational Assistance Module provides interactive and intelligent assistance to the user via a conversational interface, and allows the human computer interaction to take place smoothly across the scheme discovery and application process.

The chatbot will be helpful as it helps users with their queries based on the scheme eligibility requirements, documentation needed, application processes, benefit details, and application deadlines.

The module gives precise, brief and simplified responses to specific needs of each user by utilizing structured data on schemes and information on the user profile. The chatbot uses natural language understanding to extract the user intent and retain the conversational context, enabling significant multi-turn interaction.

Multilingual support is inbuilt to maintain diversification of users with different language background hence increasing inclusiveness and accessibility in different regions.

Besides informational support, the chatbot leads users through complicated procedures by disaggregating the eligibility criteria and the application process into step-by-step easy instructions.

Through real-time clarification and constant support, the AI Chatbot guarantees that the user will be less confused with the platform, it can enhance the usability of the platform, and serve as a virtual assistant that will support the work of the eligibility and recommendation modules and, consequently, increase citizen engagement and the use of the scheme..

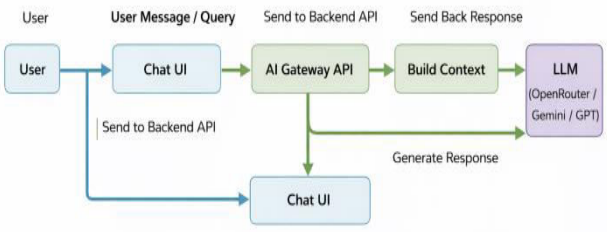

Figure 1 AI Workflow Module

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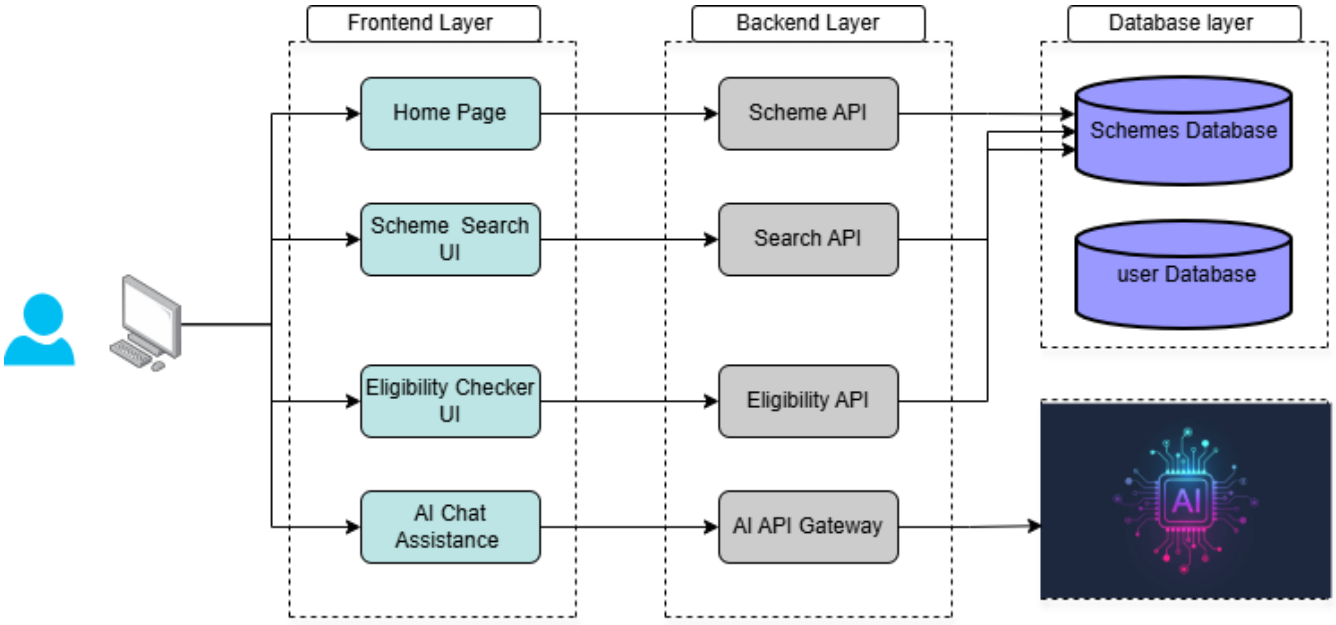

Figure 2 Architecture Diagram

The diagram depicts a transparent three level architecture of an AI-driven government scheme discovery and support platform, which has been developed with heavy focus to modularity, scalability, security and well-defined separation of concerns. At the top level, architecture is classified into the Frontend Layer, Backend Application Layer and Database Layer all of which have a different but interdependent role in proving an intelligent and user-driven digital service. It has user-friendly and responsive user-facing interfaces, including Home Page, Scheme Search Interface, Eligibility Checker UI, and AI Chat Assistance UI. Via the home interface and search interface, it is possible to navigate through government schemes by using keywords, categories, or filters like state and type of beneficiary. The eligibility checker allows the user to enter personal, demographic, and socio-economic information, including age, income, occupation, gender, and category in a step-by-step and organized way. Using these inputs, users are able to determine the schemes they are eligible in at a glance. Simultaneously, the AI chat interface provides real-time chat functionality, responding to the questions concerning the eligibility requirements, application process, documents needed to be provided, and time limits. The frontend communications are safely transported to the backend via API calls, which provides a guarantee of privacy and trustworthy communication. The backend layer is the centre of processing and intelligence of the platform. It reveals a collection of role-specific APIs, which work on a specific business capability. The Scheme API is used to manage the retrieval, the storage and the updates of the scheme-related information. The Search and filter API allows quick and effective querying, hence the users can find the required schemes even when using big datasets. The Eligibility Evaluation API uses pre-defined rule based logic to process user inputs and systematically checks the conditions and determines applicability of the scheme. In addition to these services, the AI API Gateway serves as a regulated gateway between the platform and the AI engine, allowing contextual reactions and natural-language clarifications and customized directions. The database layer offers persistent and organized data storage, which can be scaled or updated or replaced individually and is made to enhance the maintenance as well as the long-term extensibility. It normally comprises of a Schemes Database that has all the detailed information like eligibility rules, benefits, documentation needs and application links. Database, which provides user profiles and entered inputs and

history of interactions. The backend APIs interface with these databases to retrieve correct information, authenticate user data and saving the results in a secure place. It is via proper indexing, access control and data validation that efficient queries and data integrity as well as adherence to security requirements are ensured. In general, this three-level architecture will allow an effective flow of data, safe processing, and smooth integration of AI. The separation of presentation, logic, and data layers resulting in the system gives a high level of scalability, enhances maintenance and reliability. The outcome is a convenient, intelligent, user-oriented online platform that will streamline the process of finding the scheme within the government, minimize confusion, and improve digital inclusion with the help of AI.

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IV. EXPERIMENTAL ANALYSIS

Figure 3 is the Eligibility Matching Accuracy, which measures the efficiency with which the system matches the government schemes that correctly cover an eligibility profile of a user. This indicator compares the plans recommended by Eligibility Wizard with the ground-truth eligibility policies specified on the scheme. In experimental findings, the rule-based matching algorithm demonstrates a high level of accuracy, though averaged, of around 92 percent when using various individual user profiles, which proves that the algorithm by the rule is capable of reliably taking demographic and socio-economic output of age, income, occupation, category, and state.

Figure 3 Eligibility Matching Accuracy

The accuracy is high, which shows that the structured questionnaire and the logic of validation work well to make sure that there are fewer wrong or irrelevant scheme recommendations.

Figure 4 Recommendation precision

Figure 4 Represent the Recommendation Precision measures the relevance of schemes returned by the Recommendation Module especially the proportion of the best rank schemes to be actually applicable to the user. Top-N recommendations after eligibility filtering and ranking are computed in terms of precision. The findings show that the top-1 recommendation has a precision of 90 percent, which gradually decreases with the rank of the suggestions, with an average precision of about 85 percent. This would confirm that the scoring and ranking process is able to give priority to the most relevant schemes so that the information overload is minimized and the process of decision making by users becomes more efficient..

A. Dataset

The dataset in this research is over 4,000 government schemes of welfare, which are central and state-based ones. The scheme records are structured with attributes, which are associated to the eligibility requirements, benefits, and administrative data. This information is stored in a JSON format and it is normalized to facilitate effective filtering, matching of eligibility and generation of recommendations.

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Attribute Name	Description	Data Type	Example value
Scheme_ID	Unique identifier for Scheme	String	GS1023
Scheme_Name	Official name of the scheme	String	PM KisansammanNidhi
Category	Sector of the scheme	Categorical	Agriculture
state	Applicable state	String	All India

Table1:DatasetsUsed

B. Output

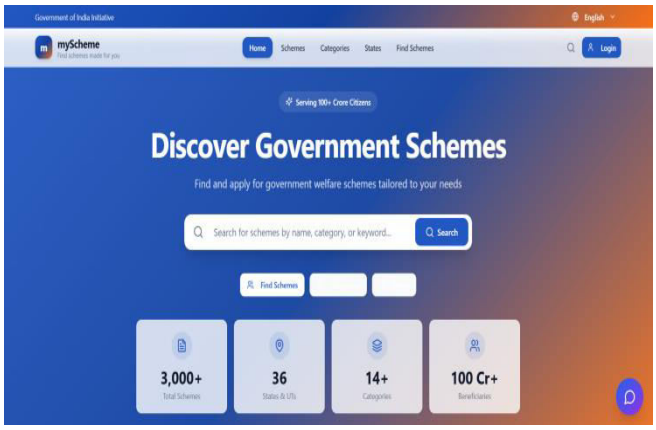

Figure 5 Home Page

The figure 5 signify the Home Page and is the main point of entry of the site where a user is supposed to find the schemes of the government fast and intuitively. The main heroic contributes greatly to the international assortment of the search bar on the page, which helps a customer to offer schemes either by their name or category or a keyword, thus enabling quick access to pertinent welfare programs. Under the search box, the essential statistics of the platforms are presented, including the number of schemes in total, states and UTs served, the category of services available, and the number of beneficiaries served to build credibility and magnitude. The upper level navigation menu features organized access to Schemes, Categories, States and Featured Schemes and login options provide people with an opportunity to customize their experience.

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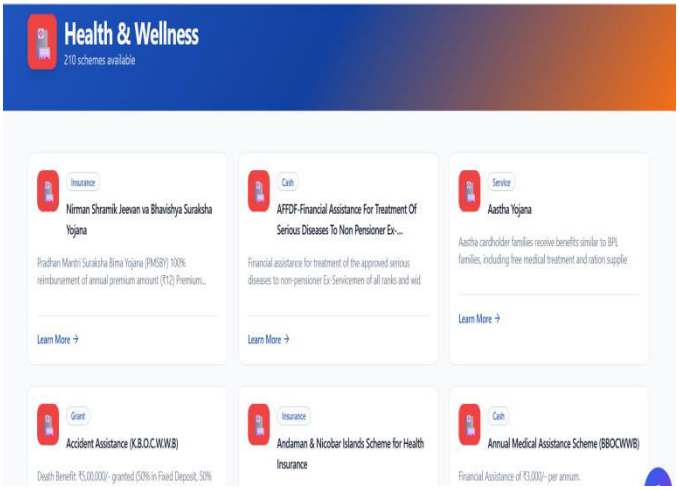

Figure 6 Scheme Page

Figure 6 represents The Scheme Page shows government welfare schemes in a clear card-based format dedicated to a particular area, which in this case is Health and Wellness. The page has a summary at its top indicating the category chosen as well as the available schemes in total. All the schemes are shown in separate cards with the name of the scheme, type of the benefit (cash, grant, insurance or a loan), and a brief description of the purpose it serves. Each card has a "Learn More" link where one can proceed to a specific scheme page where they will find the eligibility criteria, the benefits, documents needed and the application procedure.

V. CONCLUSION AND FUTURE

The purpose of the paper was to introduce a single and smart web-based support service which will facilitate better access to government welfare programs provided to users through the consolidation of the scattered central and state-level information in one convenient user interface. The system is a combination of a structured scheme dataset and rule-based Eligibility Wizard, a customised Recommendation Engine, and an AI-driven conversational assistant to make the process of assessing eligibility and finding a scheme easy. The proposed approach was proved to be effective because experimental evaluation showed that the high eligibility was equal to accuracy and high recommendation precision. Smart filtering, multilingual support, and an easy-to-use interface contribute to better accessibility and user interaction, as well as make the site less informational overloaded. Future work will aim at incorporating real-time government API, adopting advanced machine learning models to do adaptive recommendation, allowing voice and regional language interaction, and implementing automated document verification and applications tracking to further contribute to scalability and real-life applicability.

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