A Data-Driven Machine Learning Approach to Public Welfare Scheme Recommendation

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Abstract- The government provides numerous public welfare schemes that are meant for helping citizens with healthcare facilities, education, jobs, financial support, and social security benefits. However, despite having such facilities available, many people are still not able to access them because they are not aware of how and where they can find information on such schemes and how such schemes are relevant to them. This is because such schemes are not being utilized to their maximum potential.

This article suggests a data-driven approach using machine learning techniques for providing suggestions on relevant public welfare schemes available for citizens based on their socioeconomic status. The information is collected through a web interface by providing relevant information such as age, gender, state, category, income, and occupation. The information is then preprocessed and fed into the Random Forest algorithm for determining eligibility and providing relevant suggestions on schemes available for citizens.

This approach will help in making it easier for citizens to find information on schemes and will also help in raising awareness of government schemes available for citizens. This will reduce the complexity of finding information and will also be helpful in making it easier for citizens to access such schemes and become aware of them.

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Keywords: ***Public Welfare Schemes, Machine Learning, Random Forest, Recommendation System, Eligibility Prediction, Digital Governance, Social Welfare Accessibility.***

I. INTRODUCTION

Public welfare schemes are important because they are created to raise people up by improving their healthcare, education, employment, financial support, housing, and security measures. The objective is clear: reach out to the economically weaker sections of society, the marginalized groups, and the most vulnerable populations. However, despite all the different schemes in existence, a major chunk of eligible people remain unaware of what they can benefit from.

The major problem is that information is dispersed and impersonal in nature, with details about different schemes available on numerous websites and other sources too. It requires a lot of time and effort to search and read about different schemes and determine whether or not they are eligible to apply. It is time-consuming and can often lead to confusion due to the lack of understanding of different websites and their information. Therefore, people who should be benefiting from different schemes remain in the dark.

With the advancements in digital technology and machine learning, there is hope to solve this problem with the help of ML, which can process information and make decisions based on that information. By analyzing different attributes of people, such as their age, gender, income level, occupation, category, and geographical location, we can develop a model that can predict what people can benefit from and what schemes they should apply to.

The study aims to develop a data-driven recommendation system using machine learning to bridge the gap between people and the government through its welfare schemes. It will allow users to

input their information on a web interface, and based on that information, a classifier will determine what schemes they can apply to the use of AI in the context of public welfare schemes is important because it is in line with the concept of digital governance and inclusive development strategies. It can provide accurate and timely information to people about different welfare schemes that they are eligible to apply to.

II. LITERATURE REVIEW

Public welfare programs have always been at the center of discussions concerning financial inclusion, poverty reduction, and overall socio- economic growth. The role and influence of public welfare programs in economic growth and the socio-economic growth of marginalized, economically disadvantaged groups have been a major area of research. The common conclusion has been that public welfare programs can help stabilize the economy and uplift marginalized groups in society. The problem has always been that, despite the existence of such programs, people remain unaware of their existence and accessibility.

Earlier, the major focus was to evaluate the performance of public welfare programs, such as the target groups, depth of penetration in rural areas, financial penetration, and gender differences. These studies, although helpful, have mostly relied on statistical results and not directly addressed the problem of people becoming aware and accessing the right public welfare programs.

With the emergence of digital governance, researchers have started to look at the role played by technology in public welfare programs. The digital revolution has led to greater transparency and reduced administrative costs in public welfare programs. The problem, in this case, is left to the people, who have to find and access the right public welfare programs on their own.

More recent developments in machine learning and data-driven approaches provide new avenues to make personalized recommendations and automate decisions. Recommendation systems, which are now ubiquitous in online platforms, can be used to analyze the characteristics of users and make personalized recommendations. By using this logic to apply to the realm of welfare, we can potentially align citizen characteristics with the most suitable schemes according to their socio-economic status. Ensemble classification models, which work effectively with structured data, have shown promising accuracy in determining the eligible class.

However, there is still a disconnect in that very few studies have attempted to develop an integrated platform that combines ML-based determination with a web interface that provides personalized recommendations to users. Most platforms currently provide generic information that is not personalized in nature. Therefore, there is a clear need to develop a data-driven approach that can make the determination process more accessible and easier to understand. This study attempts to fill this research void by presenting a machine learning-based recommendation system that analyzes the characteristics of users and makes personalized recommendations regarding welfare schemes.

III. EXISTING SYSTEM

However, today if people want to learn about welfare schemes and support schemes offered by the government, they are mainly relying on government websites and brochures and such sources of information. These sources of information clearly outline information from numerous government departments. The only drawback is that information is available on numerous websites and portals. Therefore, if people want to benefit from these schemes and support offered by the government, they have to switch between numerous sources of information and try to understand which schemes they are eligible for on their own. The information available on numerous online platforms is mainly generic information regarding the schemes offered by the government, such as what the schemes are for and how people can apply for them. This is somewhat helpful for people because they will be able to understand what schemes are offered and how they can apply for them. However, people still have to go through numerous guidelines and try to understand whether they are eligible for these schemes or not by juggling information such as age, income, profession,

social group, and so on.

Because of this complexity, a large number of eligible individuals do not apply for the welfare schemes and do not receive the benefits they deserve. The opportunities that people deserve slip out of their hands simply because they are not aware of the schemes or cannot correctly interpret the eligibility criteria for the welfare schemes. Moreover, currently, there is no central system that encompasses all the welfare schemes and offers recommendations based on the individual profile.

Currently, without the availability of such a system, individuals seek the assistance of agents, intermediaries, and other sources of information regarding the various welfare schemes provided by the government. The dependency on such sources of information makes the individual vulnerable to the risk of misinformation and misinterpretation. It becomes evident that the

need for an intelligent decision support system that can analyze the individual profile and recommend the welfare schemes accordingly cannot be ignored. The current scenario makes it evident that the need for smart decision support systems cannot be ignored.

IV. PROPOSED SYSTEM

The proposed system is a smart, centralized platform that provides relevant public welfare schemes based on the socio-economic details of the individuals. The primary objective of the proposed system is to remove the hassles associated with the traditional approach, which requires individuals to search and check their eligibility to avail the schemes. The proposed system achieves this by using the power of machine learning to provide individuals with precise, efficient, and easily accessible information.

The proposed system works by first retrieving the relevant information of the users, such as their age, gender, state, category, income, and occupation, using a clean interface with the help of a web interface. The information collected is then processed to check its correctness and compatibility with the ML algorithm. The processed information is then fed into the supervised classification algorithm, which checks the eligibility of the individuals to avail the government schemes by comparing the information with the eligibility criteria.

After processing the information, the proposed system provides the users with the list of welfare schemes that are relevant to the users' information. The list contains the relevant information, such as the name of the scheme, a short description, and the link to the government website to obtain the relevant information. This will help the users to easily understand the eligibility criteria and proceed with the process without getting confused.

The proposed system is a centralized platform that provides the users with the relevant information regarding the welfare schemes, which will be helpful in removing the hassles associated with the traditional approach to providing the users with the relevant information regarding the government schemes. The proposed system achieves this by using the power of machine learning to provide the users with precise, efficient, and easily accessible information regarding the government schemes.

V. SYSTEM ARCHITECTURE

This Public Welfare Scheme Recommendation System is designed as a modular, layered system where user interaction, data processing, machine learning, and output are integrated. It ensures smooth data flow between modules and efficient communication between them.

The users are required to input socioeconomic data like age, gender, state, category, income, and occupation. This input is facilitated through a web interface designed using HTML, CSS, and Bootstrap. The backend is based on Flask, which processes user requests and ensures secure data transfer.

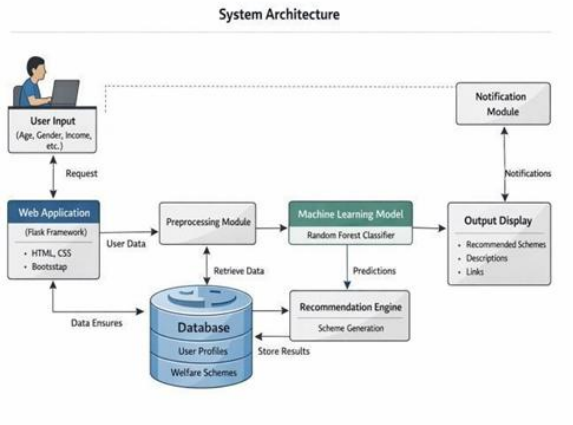
The user data is sent to the preprocessing block, where data cleaning, variable encoding, and normalization are done. At the same time, the required data on welfare schemes is retrieved from the database during preprocessing.

Finally, the data is analyzed through a machine learning model based on the Random Forest classifier. It checks the user data based on fixed eligibility

criteria and gives predictions on the welfare schemes. These predictions are used in the recommendation engine, where the best schemes are arranged for the user.

The database stores user data, schemes, and output data. Finally, the output display module shows the recommended schemes with descriptions and official links. It is in a structured format. There is also an option for the notification module, where users can be notified of new schemes, thus staying engaged.

This design ensures efficient user eligibility, recommendations, and output through integration.



VI. METHODOLOGY

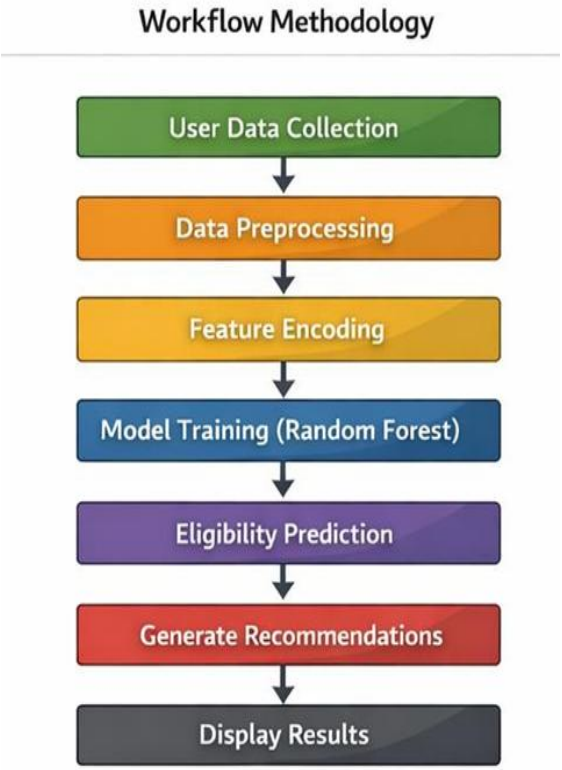
The system follows a well-structured and stepwise methodology for making recommendations regarding public welfare schemes that match the user's socio-economic profile. The methodology follows a series of steps: data collection, data preprocessing, model training, qualification testing, and making recommendations. The steps have been designed to keep the results precise, quick, and reliable.

First, the user is required to submit the data through the web interface. The user will be asked to submit some basic information such as age, gender, state, category, income, and occupation. The data will be validated to prevent missing or conflicting values. At the same time, the database will store a set of welfare schemes with the details of the people who qualify for them and the facilities that these schemes offer.

The second step involves data preprocessing. The categorical data will be converted into numerical data, and the numerical data will be scaled appropriately. The missing values will be handled systematically to keep the data clean and consistent. The data will be fed into the machine learning model for better prediction accuracy.

The machine learning model used for making the recommendations will be a supervised machine learning model, specifically the Random Forest classifier. The model will be trained with the historical data regarding the welfare schemes and will be able to recognize the different socio- economic factors that map to the welfare schemes. Once the user has entered the data into the system, the model will compare the data with the criteria and make the recommendations accordingly.

Finally, the recommendation engine will rank the schemes for which the user qualifies. The user will be shown the name of the schemes, the description of the schemes, and the official link to the schemes. The results will be stored in the database for future use and for the betterment of the system.



VII. CONCLUSION

This project aims to present a data-driven, machine learning-based system to provide the right public welfare schemes to individuals based on their socio-economic characteristics. The system addresses the major challenge that individuals are not aware of the welfare schemes they are eligible for. Furthermore, the process of obtaining this information is laborious. The system will utilize a supervised learning algorithm in combination with a simple web- based system to make the process easier for individuals to access government welfare schemes.

A supervised learning algorithm called the Random Forest classifier will be used to predict the results. The algorithm will be trained to take various parameters like age, gender, income level, occupation, category, state, etc., as input. The results will be provided in the form of scheme names, descriptions, and official links. The system will be a step forward in digital governance by efficiently disseminating welfare scheme information. The system bridges the gap between citizens and government welfare schemes. The system will be helpful in delivering welfare benefits to the right individuals at the right time. In conclusion, this system demonstrates how machine learning can be used to improve public service delivery to contribute to socio-economic development.

VIII. FUTURE WORK

The system could be extended even further to improve its accuracy, scalability, and user experience. The next step could be integrating it with government databases in real-time so that users are able to access information on schemes and eligibility criteria directly from the application.

You could also try experimenting with different algorithms like gradient boosting that could improve the accuracy of your predictions even further.

Adding user feedback mechanisms will also help refine your application based on user experiences and results.

Adding multilingual support and developing a mobile application could significantly improve its accessibility and reach, especially for people living in rural areas. Adding features like voice support and chatbots could also improve user experience even further. Adding robust security features and implementing different authentication techniques could also improve user safety and security. All of these changes could improve the application significantly and make it even more “intelligent and adaptable.”

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