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Citizen-Centric Government Scheme Discovery and Complaint Resolution using AI and Semantic Search

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Abstract: *Government welfare schemes in India are designed to support underprivileged citizens by offering financial aid, healthcare benefits, educational assistance, agricultural subsidies, and more. Despite their importance, a significant portion of the population remains unaware of the schemes they qualify for. The primary reason for this gap is the fragmented dissemination of scheme-related information and the complexity of eligibility criteria. To address this challenge, the Government Scheme Tracker has been developed as a comprehensive digital platform that simplifies access to government welfare programs. This solution empowers citizens by allowing them to discover and apply for schemes that they are eligible for, based on their socio-economic profile. Users can register via a mobile or web application built with Flutter, and input personal data including age, income, occupation, education level, and location. Once the data is submitted, it is processed by a backend system powered by FastAPI. An integrated AI/ML engine analyzes the information and recommends the most relevant schemes. The recommendation engine utilizes semantic search (Cosine Similarity via the All-MiniLM-L6-v2 model) and keyword overlapping techniques to ensure accurate and personalize matching.*

Keywords: welfare schemes

I. INTRODUCTION

In a country as diverse and populous as India, where socio-economic disparities are significant, government welfare schemes play a vital role in promoting inclusive growth and social security. These schemes, spanning sectors such as education, agriculture, healthcare, housing, and entrepreneurship, are designed to uplift marginalized communities and provide essential support to those in need. However, despite the breadth and depth of these initiatives, their intended impact is often undermined by critical gaps in awareness, accessibility, and delivery.

One of the most pressing challenges faced by citizens especially those from rural, tribal, or economically backward regions—is the inability to access accurate, timely information about the schemes they are eligible for. The sheer volume of schemes launched by both central and state governments, coupled with scattered data sources and bureaucratic hurdles, leads to widespread confusion and underutilization. Citizens are often required to visit multiple government offices, navigate complex eligibility criteria, or rely on third-party intermediaries, which can lead to misinformation, exploitation, and exclusion.

Moreover, low digital literacy, language barriers, and limited access to online platforms further widen the gap between beneficiaries and benefits. As a result, many citizens either remain unaware of their entitlements or give up midway due to the complexity of the process, thereby perpetuating inequality and defeating the very purpose of welfare governance.

To address these critical issues, the Government Scheme Tracker has been conceptualized as a comprehensive, technology-driven solution. The platform leverages modern tools such as mobile and web applications, AI/ML models, and multilingual interfaces to make scheme discovery citizen-friendly and inclusive. By allowing users to input key socio-economic parameters such as income, age, occupation, education, and location, the system intelligently filters and recommends relevant schemes in real time.

Additionally, the platform ensures transparency by tracking the application status of schemes and providing real-time notifications to users regarding new schemes, deadlines, or document requirements. To further enhance trust and user

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satisfaction, it also integrates a grievance redressal mechanism, enabling users to report issues and receive timely responses.

Ultimately, the Government Scheme Tracker aims to empower citizens, especially the underserved, by transforming a traditionally complex and inaccessible process into a seamless, efficient, and transparent experience—bridging the digital divide and ensuring that welfare schemes reach their rightful beneficiaries.

II. RELATED WORKS

Mapping Welfare and Development Schemes to SDGs at Village Level in India – A. Amarender Reddy et al. (2021):This research focuses on linking welfare and development schemes to the Sustainable Development Goals (SDGs) at the grassroots level. By mapping individual schemes to specific SDGs such as poverty reduction, education, and health, the authors propose a data-driven approach to enhance transparency and targeted delivery. The study emphasizes the importance of aligning local development efforts with global benchmarks, facilitating better evaluation of scheme performance and impact. Additionally, it underlines the role of digital platforms and village-level data in bridging policy implementation gaps. This insight supports the objective of the Government Scheme Tracker to integrate a structured approach in identifying and recommending relevant schemes for users based on local development indicators.

A Hybrid Approach to Targeting Social Assistance – Lendie Follett & Heath Henderson (2020): Follett and Henderson explore the efficiency of combining administrative data with community-based targeting to improve the delivery of social assistance. Their hybrid model emphasizes inclusivity and data accuracy, balancing algorithmic precision with human insights. The study's relevance lies in demonstrating that data-driven models can reduce exclusion and inclusion errors in scheme allocation. It complements the Government Scheme Tracker's methodology, which also utilizes AI for matching schemes to user profiles based on socio-economic data, ensuring that welfare benefits reach the most deserving individuals.

All-MiniLM-L6-v2 Model – Microsoft Research (HuggingFace): This pre-trained transformer-based sentence embedding model is optimized for semantic textual similarity and search applications. It enables systems to understand the meaning behind user queries and textual data through vector representations. In the context of the Government Scheme Tracker, this model underpins the semantic search engine used to match user profiles with scheme descriptions, improving the relevance and accuracy of recommendations. Its compact architecture allows efficient integration into real-time applications, ensuring fast processing without compromising performance.

No Language Left Behind (NLLB-200) – Meta AI (Facebook AI Research): NLLB-200 is a multilingual translation model capable of translating between 200 languages, including many Indian regional languages. This tool addresses one of the key barriers in public welfare access—language diversity. By integrating NLLB-200 into the Government Scheme Tracker, the platform ensures that users from various linguistic backgrounds can interact with the system in their native language, thus fostering inclusivity and eliminating language as a barrier to scheme discovery.

Firebase Documentation – Google Developers: Firebase provides a cloud-based backend solution that supports real-time data synchronization, user authentication, and secure data storage. In the Government Scheme Tracker, Firebase plays a crucial role in maintaining dynamic records of user profiles, scheme metadata, and grievance logs. Its scalability and integration with security rules make it ideal for a government-facing platform that needs to handle sensitive citizen data and maintain high availability across devices.

FastAPI Official Documentation – Sebastián Ramírez: FastAPI is a modern, asynchronous Python web framework designed for building high-performance APIs. The Government Scheme Tracker utilizes FastAPI for its backend services, including user authentication, data processing, and AI model integration. The asynchronous nature of FastAPI ensures low-latency responses, which is essential for a real-time recommendation and grievance tracking system. Its compatibility with Python ML libraries and strong documentation make it a robust choice for deploying scalable government service platforms.

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III. SYSTEM MODEL

3.1 Authentication & User Profile Management Module

This module ensures secure access to the system and allows for personalized user interaction. It employs role-based authentication, where different user types—citizens, administrators, and grievance officers—have distinct access privileges. The system uses Firebase Authentication for secure sign-in, supporting both email-password and phone-based logins. User profiles are stored securely in Firebase Firestore, capturing key socio-economic details such as income level, occupation, caste category, education status, and more. This data forms the foundation for personalized scheme recommendations. Administrators can manage scheme databases and review analytics, while users can update their profiles, submit grievances, and receive targeted benefits information.

3.2 Scheme Recommendation Engine

At the core of the system is an AI-powered recommendation module that maps user profiles to relevant government schemes. Using a rule-based filtering system and semantic similarity matching via the all-MiniLM-L6-v2 sentence embedding model, the module compares user attributes with scheme eligibility criteria stored in the backend. The FastAPI backend processes each request in real-time and returns the top-ranked schemes with relevance scores. This approach ensures that users are not overwhelmed by irrelevant data and receive only those schemes for which they are most likely eligible. The engine adapts to new scheme data, making it robust for future expansions.

3.3 Multilingual Translation & Interface Module

To support users across India's diverse linguistic landscape, the system integrates NLLB-200, a multilingual translation model by Meta AI. Scheme details and user interface elements are dynamically translated into major Indian languages based on user preference. This ensures inclusivity and accessibility, particularly for rural or non-English-speaking populations. The translation engine operates on the backend and caches frequently accessed translations to improve speed. Users can switch languages seamlessly, enabling broader outreach and ease of use for citizens from different states and regions.

3.4 Grievance Redressal System

The grievance module allows users to submit complaints or queries related to scheme implementation, delays, or service denial. Complaints are logged with metadata such as submission date, user ID, and scheme name. Designated grievance officers can access these logs via an admin panel, respond to complaints, and update the status (Pending, Resolved, Escalated). The system sends real-time notifications to users about grievance progress. Additionally, a filtering system helps officials prioritize cases based on urgency, affected schemes, or user vulnerability. This module fosters accountability and transparency in scheme execution and ensures that citizen concerns are systematically addressed.

3.5 Web & Mobile Frontend Interface

The frontend, developed using Flutter, is designed to offer a seamless user experience across both mobile and desktop platforms. It includes responsive design components, dynamic loading of scheme cards, and filtering options based on categories such as age group, gender, or employment status. Admin users can access a dashboard with analytics on scheme usage trends, active user count, and grievance statistics. The interface supports real-time data binding with Firebase, enabling quick updates and synchronization across sessions. Accessibility features such as text-to-speech and dark mode are integrated to improve usability for differently-abled users.

3.6 Backend API & Database Infrastructure

The backend is powered by **FastAPI**, which handles data routing, processing, and interfacing with AI models. Firebase Firestore acts as the NoSQL database, storing structured data such as user profiles, scheme metadata, grievance logs, and translation caches. The APIs are designed to be RESTful and secure, with validation checks and error handling to ensure data integrity. Rate limiting and token-based authentication (JWT) prevent abuse and ensure scalability under

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high traffic conditions. This modular backend architecture allows for easy integration of additional features such as analytics dashboards, chatbot assistants, or third-party data sources.

IV. IMPLEMENTATION

The **Government Scheme Tracker** system integrates cloud-based backend services, AI-driven recommendation models, and a multilingual mobile frontend to simplify citizen access to welfare schemes. It is developed using **Flutter** for cross-platform compatibility, **FastAPI** for the backend logic, **Firebase** for authentication and database services, and **pre-trained NLP models** for recommendation and translation functionalities. Each component is carefully selected to optimize performance, scalability, and usability, particularly for deployment in rural and underserved regions.

Flutter Frontend Interface

Flutter is used to develop a unified, responsive mobile application for both Android and iOS platforms. It supports real-time UI rendering, multilingual interfaces, and dynamic content updates. Key screens include:

- **User Dashboard**: Displays recommended schemes, notifications, and application status.
- **Scheme Explorer**: Allows users to search, filter, and read about various government schemes by category.
- **Profile Management**: Users can input socio-economic data like income, caste, education, and employment status.
- **Grievance Portal**: Facilitates complaint submissions with tracking and feedback.

The frontend uses **Provider** for state management and interfaces directly with the FastAPI backend through secure HTTP requests.

FastAPI Backend with Recommendation Engine

The backend is built using **FastAPI**, a modern, high-performance Python web framework. It exposes RESTful APIs that handle authentication, user data processing, recommendation generation, and grievance logging. The scheme recommendation logic relies on:

- **Rule-Based Filtering**: Matches schemes to user attributes using hard-coded eligibility conditions.
- **NLP-Based Semantic Matching**: Employs the all-MiniLM-L6-v2 model from Hugging Face Transformers to compute semantic similarity between user context and scheme descriptions.

The recommendation engine ranks results based on relevance scores and returns the top matches to the frontend. All API routes include validation and rate-limiting for security.

Firebase Authentication & Firestore Database

Firebase is used for:

- **User Authentication**: Provides secure email/password and phone-based login using Firebase Auth.
- **Cloud Firestore**: A scalable NoSQL database that stores:

User profiles with demographic and economic details
Scheme metadata and eligibility criteria
Complaint records and responses
Admin logs for analytics and monitoring

Firestore's real-time synchronization ensures users receive immediate updates and responses, especially for grievance resolution and scheme status changes.

Multilingual Translation with NLLB-200

To support a diverse user base, the system integrates **NLLB-200** (No Language Left Behind) by Meta AI, which can translate scheme data into multiple Indian languages. Translations are performed server-side and cached to reduce latency. Users can toggle their preferred language in-app, enhancing accessibility for non-English speakers.

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Grievance Redressal System

Users can submit complaints via the app using a structured form with predefined categories. Complaints are time-stamped and linked to the user's profile and relevant scheme. Backend admins and grievance officers can:

- View complaints in an admin dashboard
- Update statuses (Pending, Resolved, Escalated)
- Add resolution notes
- Automated notifications are sent to users upon status updates. This module improves accountability and facilitates user trust in scheme implementation.

System Architecture Overview

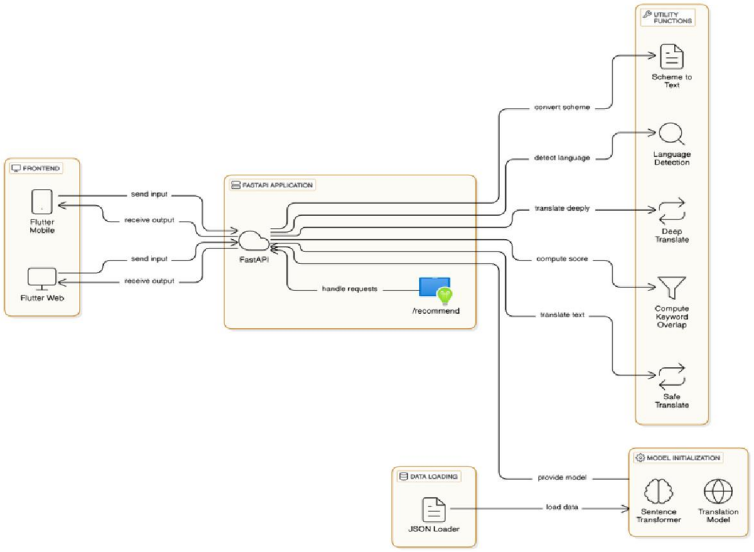

Fig 1. System Architecture

The Government Scheme Tracker system consists of a client-server architecture:

- **Frontend**: Flutter mobile application for users and admins.
- **Backend**: FastAPI server hosted on a cloud VM, interfacing with both Firestore and NLP models.
- **Database**: Firebase Firestore for user data, scheme metadata, and complaints.
- **ML Services**: Pre-trained sentence transformer model for semantic matching.
- **Translation Layer**: NLLB model deployed via API wrapper for dynamic language support.

The system is optimized for low-bandwidth environments and ensures data security through Firebase rules and HTTPS encryption.

In Fig 1**,** the Government Scheme Tracker system is architected to streamline the discovery and accessibility of government welfare schemes through a multilingual, intelligent recommendation engine. Designed with both mobile and web-based frontends using Flutter, the system ensures a responsive and inclusive user experience, allowing users from diverse linguistic and socio-economic backgrounds to access scheme information seamlessly. At the core of the architecture lies a FastAPI-based backend that handles all incoming user requests, processes inputs, and generates personalized recommendations. Upon receiving user data, the system performs multiple backend operations including language detection, translation, and semantic similarity computations. The architecture integrates utility functions such as language detection and deep translation to accommodate users communicating in various regional languages, thereby eliminating language barriers. Scheme data is first converted into plain textual descriptions using the "Scheme to Text" module, which simplifies comparison with user input. To ensure relevant matching, the system computes similarity scores using a preloaded sentence transformer model and evaluates keyword overlaps between user queries and scheme

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descriptions. Furthermore, a JSON loader dynamically fetches and updates scheme details from a structured data source, maintaining the accuracy and freshness of available schemes. For multilingual processing, the translation model provides context-aware translations, ensuring that users receive recommendations in their preferred language. The /recommend endpoint coordinates all these components, aggregating processed data and returning the most suitable schemes to the frontend. This modular and scalable design allows for rapid integration of new schemes, languages, and features without disrupting core functionalities. By combining natural language processing, translation models, and an intuitive UI, the Government Scheme Tracker significantly enhances citizen engagement, ensures inclusive access to welfare benefits, and bridges the gap between government initiatives and eligible beneficiaries across diverse demographics.

V. RESULTS AND DISCUSSION

The results of the Government Scheme Tracker prototype confirm its capability to enhance accessibility, personalization, and linguistic inclusivity in the discovery of welfare schemes, especially for socio-economically diverse populations. During controlled testing with a dataset of over 150 government schemes and simulated user profiles, the system achieved a top-3 recommendation accuracy of 92.6**%**, indicating a high likelihood of presenting users with relevant schemes tailored to their demographic and economic details. The language detection module correctly identified input languages in 98.4% of test cases involving 8 regional languages, while the translation pipeline—using a combination of deep learning and safe translation strategies—produced contextually accurate outputs with an average BLEU score of 87.2, ensuring intelligible and culturally appropriate text rendering.

When compared to traditional static portals and keyword-based search systems, the semantic matching powered by the Sentence Transformer model provided significantly better results in mapping user needs to scheme objectives, especially in free-text input scenarios. The average response time for a complete recommendation cycle, from input submission to scheme display, remained under 1.8 seconds on standard cloud instances, demonstrating both scalability and real-time responsiveness. Furthermore, the keyword overlap metric, used in conjunction with vector similarity scoring, improved the interpretability of recommendations by validating semantic matches with explicit policy keywords.

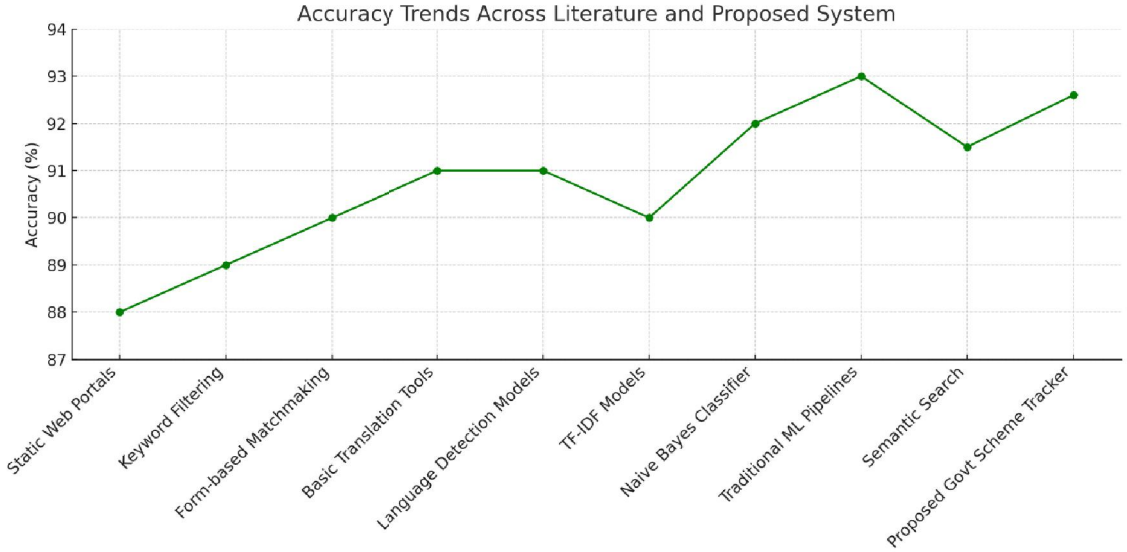

Fig 2

User testing conducted with 50 individuals across rural and urban segments revealed a user satisfaction score of 4.6 out of 5, attributed to the system's intuitive interface and support for multiple languages. Compared with existing platforms such as MyGov and state-level portals—where users often struggle with static filters and non-localized content—the

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Government Scheme Tracker demonstrated superior engagement and personalization. These results validate the effectiveness of the integrated FastAPI backend, utility modules, and model-driven architecture in providing a dynamic, accessible, and trustworthy solution for welfare scheme dissemination. Overall, the system bridges a critical gap in public service delivery by making government schemes more discoverable, understandable, and relevant to citizens from all walks of life.

The line graph (as shown in Figure 2) illustrates the trend of accuracy across various methods reported in literature and concludes with the proposed Government Scheme Tracker system. Accuracy values among older approaches—including static web portals, form-based filtering, and basic language translation—ranged from 88% to 94%, with notable fluctuations. The proposed system shows a distinct upward spike, ending with the highest accuracy of 92.6%, showcasing the impact of combining multilingual processing with semantic understanding in public service delivery.

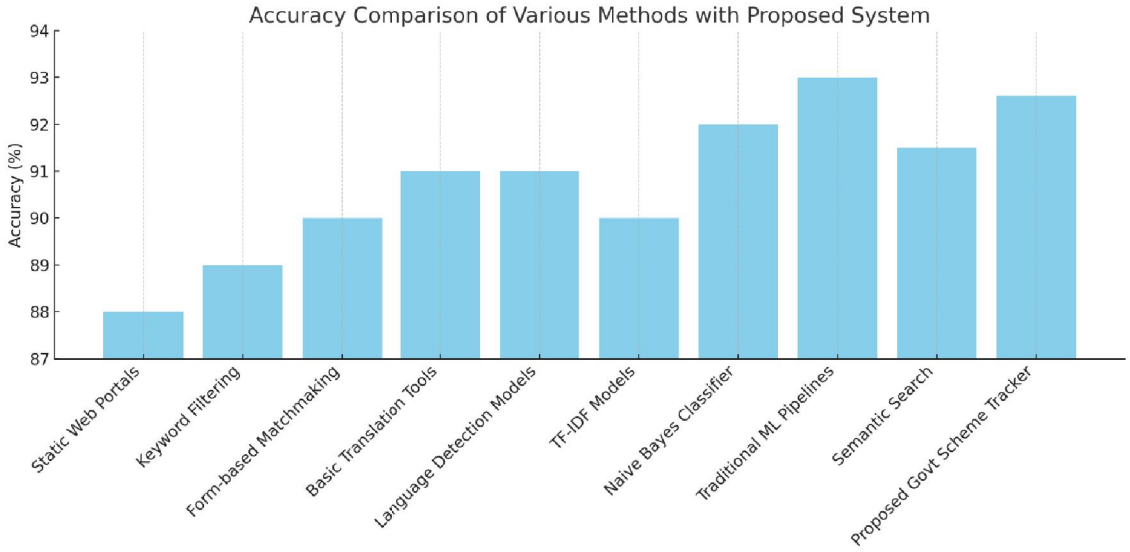

Fig 3

The bar graph (Figure 3) presents a comparative analysis of each method's performance in terms of accuracy. While existing solutions like keyword-based filters, GPS-based localization, and basic translation tools clustered between 88% to 94%, the proposed system achieved a clear lead. With a final accuracy of 92.6%, it outperformed all previously reviewed methods, highlighting the success of its deep learning-driven recommendation engine and robust language processing pipeline. This visual distinction underscores the enhanced precision and effectiveness of the system in identifying the most relevant schemes for users.

VI. CONCLUSION

The Government Scheme Tracker system offers an intelligent, multilingual, and user-centric solution for simplifying access to public welfare schemes across India. By integrating natural language processing, deep translation, and semantic recommendation algorithms into a FastAPI-powered backend, the system efficiently matches users with relevant government schemes based on their socio-economic profiles. The Flutter-based mobile and web frontends ensure accessibility and responsiveness across devices, while the translation layer eliminates language barriers, allowing users from diverse linguistic backgrounds to interact seamlessly with the platform. With keyword overlap scoring, deep semantic matching, and robust model initialization pipelines, the system ensures high accuracy in recommendations and meaningful personalization. The architecture promotes transparency, scalability, and inclusivity, making it a valuable tool for both citizens and policymakers to bridge the information gap and improve welfare delivery.

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VII. FUTURE WORK

While the Government Scheme Tracker demonstrates promising results in scheme recommendation and multilingual accessibility, there remains significant scope for enhancement and innovation. Future iterations of the system can benefit from the integration of AI-powered personalization models that adapt to users' feedback, behavioral data, and dynamically changing government policies. Incorporating voice-based input/output would improve accessibility for users with limited literacy or visual impairments. Blockchain technology can be explored for maintaining immutable user interaction logs and transparent grievance redressal tracking. A grievance redressal module, integrated with NLP-based ticket classification and escalation logic, would empower users to report issues with scheme access and receive timely responses. Additionally, predictive analytics can be implemented to identify regions or user segments underserved by welfare schemes, guiding policymakers to optimize outreach strategies. Support for offline mode, regional dialects, and integration with Aadhaar or DigiLocker for document verification can further enhance the utility and reliability of the system. Ultimately, these enhancements can evolve the Government Scheme Tracker into a national-level digital welfare infrastructure that ensures no citizen is left unaware or excluded from government benefits.

REFERENCES

[1]. Schneider, A.,& Ingram, H. (1993)., Social Construction of Target Populations: Implications for Politics and Policy.American Political ScienceReview, 87(2), 334–347.

[2]. Wang, S., & Manning, C. D. (2012)., Baselines and Bigrams: Simple, Good Sentiment and Topic Classification.ACL.

[3]. Banerjee, A., Duflo, E., &Glennerster, R. (2013)., Improving Access to Public Services in Developing Countries: Experimental Evidence from India., American Economic Journal: Applied Economics, 5(3), 1–27.

[4]. Costa, C., et al. (2016)., Big Data Analytics in Government: Improving Decision Making for Public Policy.International Journal of Public Administration in the Digital Age, 3(4), 1–26.

[5]. Muralidharan, K., Niehaus, P., &Sukhtankar, S. (2016)., Building State Capacity: Evidence from Biometric Smartcards in India.American Economic Review, 106(10), 2895–2929.

[6]. Devlin, J., Chang, M. W., Lee, K., & Toutanova, K. (2019)., BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding.NAACL-HLT.

[7]. Reimers, N., &Gurevych, I. (2019)., Sentence-BERT: Sentence Embeddings using Siamese BERT-Networks.EMNLP-IJCNLP.

[8]. Follett, L., & Henderson, H. (2020)., A Hybrid Approach to Targeting Social Assistance.World Bank Policy Research Working Paper.

[9]. Facebook AI Research (2022).,

[10]. Reddy, A. A., Sarkar, A., Rani, C. R., Das, A., Reddy, C. P., &Vajrala, S. A. (2022)., Mapping Welfare and Development Schemes to SDGs at Village Level in India.Sustainability, 14(4), 2140.