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VillTech : The Smart Management System for Municipal Services

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Abstract: ***In India, due to the lack of direct and efficient communication between the government and citizens, it often takes a long time to solve issues. The proposed web-based application aims to bridge this gap by providing citizens, especially in rural areas in the state of Maharashtra at the Gram Panchayat level, with the opportunity to raise their grievances with the concerned government authorities. The application will allow citizens to communicate effectively with the government, which will result in transparency and prompt response to their issues. The proposed application will cater to three main stakeholders: Users, Officers, and Admins. Users will be able to register, login, submit complaints, track their complaint history, escalate their complaints if not resolved, and provide feedback. Similarly, Officers will be able to view complaints, address the issues, and Admin will manage the entire process to ensure transparency. To improve the accuracy of the application, Google Maps API will be used to locate the user's precise location. Additionally, SMS will be used to update citizens about the status of their complaints and scheduled meetings with officers. The proposed application will improve the efficiency of grievance redressed mechanisms by removing bureaucratic hurdles and promoting transparency between citizens and government authorities. In the future, voting can be implemented to allow villagers to vote for their representatives to promote transparency in governance.***

Keywords: Grievance Redressal System, E-Governance, Gram Panchayat, Rural Governance, Citizen Complaints, Transparency, Accountability, Google Maps API, SMS Notifications, Public Administration, Digital India, Local Government, Web-Based Application, Civic Engagement, Maharashtra

I. INTRODUCTION

In today's digital age, good communication between citizens and local governments is necessary to keep urban services up to par. Visiting municipal offices or writing down complaints are examples of traditional ways to file complaints that are often time-consuming, ineffective, and not very clear. An Online Complaint Management System (OCMS) for municipal services is amodern,tech-basedwaytomakeiteasiertofile,track, and resolve complaints. Residents can use an Online ComplaintManagementSystemtoreportproblemswith city services like trash collection, water supply, street lighting,roadmaintenance,andsanitationthroughaweb or mobile platform that is easy to use. This system not onlymakesiteasierforpeopletovoicetheirconcerns,
butitalsohelpscitydepartmentsdealwithcomplaintsin amoreorganizedway.Automatedtrackingandfeedback systems make sure that communication happens in real time, problems are solved faster, and people are more accountable. Municipalities can improve transparency, speed up the process, and build public trust by making the complaint management process digital. In the end, putting such a system into place leads to better governance, better service delivery, and the growth of smart, responsive cities.

II. LITERATURE REVIEW

A. AI-generated Web complaint management system with Risk Analysis

Thestudyinpaper[1]proposesanintelligentweb-based complaint management framework that leverages machine learning techniques for automated complaint classification and risk assessment. The system utilizes Multinomial Naïve Bayes and Aggressive Classifier algorithms to categorize complaints and detect potentially fraudulent or duplicate submissions. By incorporating automated risk analysis mechanisms, the system improves operational efficiency and reduces manual intervention in complaint processing. Experimental evaluation demonstrated an accuracy of 89%, indicating the feasibility of AI-driven solutions in managinglargevolumesofcomplaintdata.However,the system's performance is highly dependent on dataset quality and requires further optimization for real-world large-scale deployment.

B. AutomatedTexttoAudioconversionusing OCR

The work presented in paper [2] focuses on the development of an automated text-to-audio conversion system aimed at improving accessibility for visually impaired users. The proposed framework integrates Tesseract OCR for text extraction from images and scanned documents, while image preprocessing is performed using OpenCV and Pillow to enhance recognition accuracy. Extracted textual data is then converted into speech using Google Text-to-Speech technology. The system demonstrates the effectiveness ofcombiningcomputervisionwithspeechsynthesistobuild assistive technologies. Despite promising results, challenges such as recognition accuracy under poor image quality and multilingual text extraction remain open research issues.

C. MultilingualSpeechandTextTranslation for Indian Regional Languages

Inpaper[3], the authors present a multilingual speech and text translation framework tailored for Indian regional languages, addressing the linguistic diversity challenge in natural language processing applications. The system employs the IndicTrans2 deep learning model implemented in PyTorch to perform machine translationtasksacrossmultiplelanguages.Additionally, gTTS (Google Text-to-Speech) is utilized for speech generation from translated text.Theintegration of speech recognition, machine translation, and speech synthesis enables seamless multilingual communication. Experimental evaluation confirms the system's capability to facilitate cross-lingual interaction; however, scalability and computational efficiency remain significant concerns for real-time deployment.

D. PredictingconsumercomplaintsDisputes in Finance using ML

The research presented in [4] investigates the application of machine learning techniques to predict dispute outcomes in consumer financial complaint datasets. The proposed pipeline employs multiple classification models, including Support Vector Machine (SVM), Long Short-Term Memory (LSTM), MultilayerPerceptron(MLP),andBidirectionalLSTM networks**,** to analyze historical complaint data and identify patterns associated with dispute escalation.

Among the evaluated models, deep learning-based architectures demonstrated superior predictive capability, achieving an accuracy of 94%. This predictive framework enables financial institutions to proactivelyidentifyhigh-riskcomplaintsandimplement early intervention strategies. Nevertheless, the model requires extensive labeled datasets and may face challenges related to data imbalance andinterpretability.

E. Cooperation of Human and Active learning-basedAIforFastandPrecise Complaint Management

The study in [5] introduces a human-in-the-loop machine learning framework that integrates active learningtechniqueswithexpertfeedbackforcomplaint classification. The system iteratively improves model performance by selectively requesting human annotationforuncertainpredictions.Thiscollaborative approach significantly reduces complaint processing time by approximately 86%, thereby enhancing operational efficiency. However, the classification accuracy reported in the study was relatively low (37%), indicating limitations in feature representation and model generalization. Future improvements may involve integrating advanced NLP models such astransformer-basedarchitecturestoenhance classification performance.

F. Dynamic NLP enable chatbot for Rural India

In [6], the authors propose a Natural Language Processing (NLP)-enabled conversational chatbot designed to provide digital information services in rural regions. The system leverages Dialogflow and deep learning-basedNLPmodelstointerpretuserqueriesand generate contextually relevant responses. The chatbot architecturesupportsmultilingualinteractionsandcanbe applied in domains such as healthcare, agriculture, and government services. Experimental evaluation reported an accuracy of 95%, demonstrating the effectiveness of conversational AI in enhancing accessibility to information services. However, real-world deployment may require improvements in contextual understanding and handling of complex queries.

G. CommoditiesPricepredictionusingvarious ML methods

The study presented in [7] explores the application of machine learning algorithms for forecasting commodity prices based on historical market data. The proposed predictive framework utilizes Linear Regression, RandomForest,andDecisionTreealgorithmstoanalyze price trends and generate future predictions. Among these methods, ensemble learning techniques such as Random Forest demonstrated improved predictive performance. The system achieved an accuracy of 93%, indicating the potential of data-driven models in supporting decision-making for farmers and traders. Nevertheless, the model's predictive capability may be influenced by external economic factors that are not captured in the dataset.

H. Multilingual translation end-to-end speech

In [8], the authors developed an intelligent voice-based assistantforInternetofThings(IoT)systemsusing machinelearningtechniquesfornaturallanguage recognition.Thesystemenablesuserstocontrol IoT devicesthroughvoice commandswithoutrelyingheavily oncloud-basedinfrastructure.Theproposedarchitecture improvesprivacyandreduceslatency byperforming processing locally. Experimental evaluation reported an accuracyof87%,demonstratingthefeasibilityof deployinglocal voiceassistantsinIoTenvironments.

I. Investigationanddevelopmentofintelligent Voice assistant for IoT using ML

The work presented in [9] proposes a multilingual end- to-end speech translation architecture based on sequence-to-sequence neural networks. The system integrates Recurrent Neural Networks (RNN), Bidirectional Long Short-Term Memory (BLSTM), Neural Machine Translation (NMT), and Automatic SpeechRecognition(ASR)componentstoperformdirect speech translation across multiple languages. The proposed universal sequence-to-sequence framework significantly outperforms conventional bilingual translationpipelinesbyreducingintermediateprocessing steps. The study highlights the effectiveness of deep learning architectures in enabling real-time multilingual communication,althoughcomputationalcomplexityand large training data requirements remain key challenges.

III. CONCLUSION

Improving the way complaints are handled at the rural municipal level is the main objective of the Smart Complaint Management System developed for this project. Many complaint systems these days are either slow or challenging to use, which results in delays. In an attempt to expedite the process, the proposed system makes use of an AI-based voice interface and a complaint tracking tool. It is now easier for users with basic IT skills to raise complaints. A user can independently track the status of a complaint once they have filed it. Users can verify the system's status without having to go to offices or keep asking for updates. As a result, both parties save time and effort. Another advantage of the method is its capacity to provide clarity. Each complaint is precisely recorded and tracked, making it easier for the municipal authorities to manage them. It also guarantees that complaints are neither ignored or neglected. It will also decrease response time and organize the complaint process better. It will facilitate communication between residents and the government. Users can listen to official messages in their mother tongue as the system is multilingual. Municipal departments can use these services to improve public service and handle complaints in a more structured, easier and faster way.

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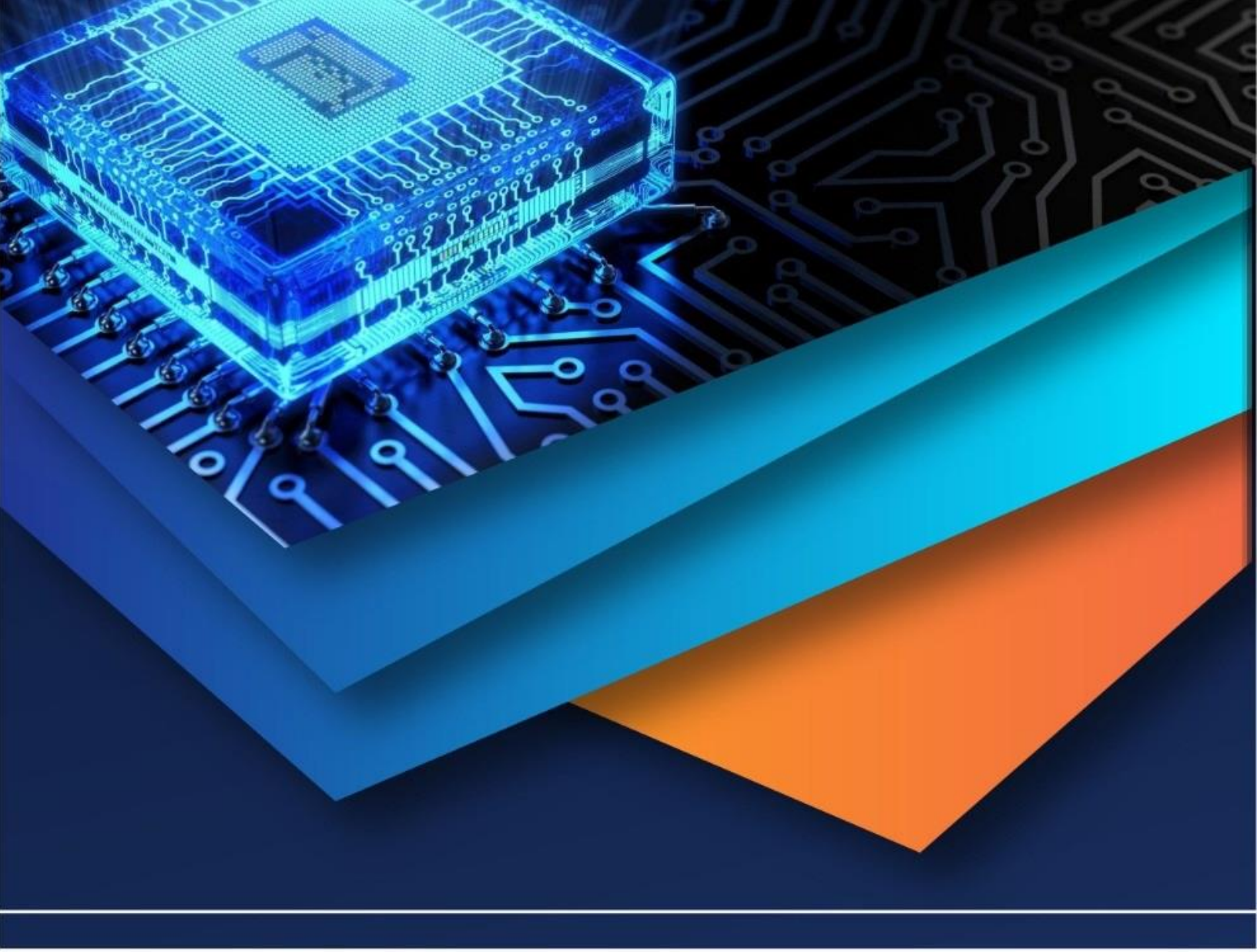

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