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Deep Learning-Driven Complaint Intelligence System with Multilingual and Voice Support

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Abstract: Organizations receive complaints through several channels, and the information submitted may differ in language, format and level of detail. When each message must be read and assigned manually, the process can become difficult to manage as the volume of submissions increases. This paper presents a complaint intelligence system designed to support the handling of text- and voice-based complaints. The proposed workflow combines natural language processing (NLP), deep-learning-based text analysis, language identification and speech-to-text conversion. After a complaint is received, the system prepares the text for analysis and derives information such as its likely category, sentiment and urgency. These outputs can support prioritization and referral to the relevant department. Multilingual input is intended to make complaint submission more accessible to users who prefer regional languages, while voice input provides an alternative to typing. The system also includes provisions for storing complaint records, monitoring their status and presenting recurring issues through an administrative dashboard. The paper describes the proposed architecture and processing stages, together with the intended role of each component. Quantitative performance claims are not made here because a verified dataset, test configuration and measured evaluation results were not included in the supplied report. Such measurements should be added after systematic testing.

Keywords: complaint management, complaint classification, deep learning, natural language processing, multilingual processing, speech-to-text, sentiment analysis, priority assessment, text analytics**.**

I. INTRODUCTION

Complaint handling is an important activity in organizations that provide products, public services or internal support. Users may report service interruptions, payment disputes, technical faults, infrastructure concerns and other difficulties. These messages can arrive in large numbers and may be submitted in different languages or through different communication channels. For an organization, the challenge is not limited to receiving a complaint: the information must also be understood, categorized, assigned and followed until an appropriate response is provided.

A workflow that depends heavily on manual reading and assignment can place a considerable burden on staff. Similar complaints may be handled separately, urgent reports may not be recognized promptly, and the quality of categorization may vary between operators. A system that stores submissions without helping interpret their content offers only limited assistance with these tasks. The growing use of text analytics and language technologies provides an opportunity to support the initial examination of complaints and make the resulting information easier to organize.
This work proposes a complaint intelligence system that accepts written and spoken submissions. Speech input is converted into text before language and content analysis. NLP and deep-learning methods are intended to identify the subject of a complaint and estimate its sentiment and priority. The resulting information can be presented to administrators to assist with routing, tracking and the examination of recurring issues. The system is designed as a decision-support tool: automated labels can help staff organize incoming reports, while final decisions and responses remain subject to organizational review.

A. Background

Complaint records are typically expressed as free-form messages. Users may describe the same issue in different words, include irrelevant details or write in a language that is not commonly used by the receiving organization. Text-processing methods can help convert these messages into structured information. Classification assigns a message to a predefined issue group, sentiment analysis estimates the expressed attitude, and priority assessment helps identify

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reports that may require earlier attention. Speech recognition can extend the same workflow to spoken submissions by producing text for subsequent processing.

B. Problem Statement

The central problem addressed in this work is the difficulty of organizing and assessing complaints when intake, interpretation and assignment rely largely on manual effort. Differences in language and the absence of voice-based submission can create additional barriers for some users. The proposed system therefore aims to provide a common workflow through which text and speech submissions can be converted into analyzable records, assigned useful labels and made available for administrative follow-up.

C. Need for the System

A structured complaint intelligence workflow can reduce repetitive handling tasks and make complaint information easier to review. Language support can improve accessibility for users who are more comfortable communicating in a regional language. Voice submission can assist users who find typing inconvenient. Classification, sentiment estimation and priority indicators can help staff identify the nature of a report before assigning it. A dashboard and status-tracking facility can further support oversight of open and recurring issues.

D. Proposed Approach

The proposed application accepts a complaint as text or audio. Audio is passed through a speech-to-text component, while written input proceeds directly to text preparation. The resulting text is checked for its language and processed into a form suitable for the analysis stage. The model then produces the complaint category and other intended indicators, including sentiment and urgency. The record and its analysis are stored so that an administrator can review the submission, route it to the appropriate department and monitor its status. Aggregated records can be examined to identify repeated topics and common sources of dissatisfaction.

E. Objectives

- Develop a unified intake workflow for written and spoken complaints.
- Support complaint submission in multiple languages, subject to the languages implemented and tested.
- Convert voice submissions into text for downstream analysis.
- Apply NLP and deep-learning methods to identify complaint categories.
- Estimate sentiment and urgency to assist administrative prioritization.
- Store complaint details and analysis outputs for review and status monitoring.
- Present complaint summaries and recurring patterns through an administrative view.

II. LITERATURE REVIEW

Research on automated text analysis provides several methods that are relevant to complaint management. The studies cited in the source manuscript cover ticket categorization, prioritization, language-model-based classification, bug triage, neural-network analysis and sentiment detection. Together, these areas show how unstructured messages can be transformed into labels or decision-support information.

The work attributed to Selvi et al. [1] concerns the categorization of support tickets using NLP. This area is relevant because a complaint often resembles a service ticket: both describe an issue that must be assigned to a suitable category or team. Vairetti et al. [2] are cited for a multi-criteria approach to prioritization. Such approaches are useful where urgency cannot be inferred from a single characteristic and several factors may need to be considered.

Aldunate et al. [3] are cited for the use of BERT transfer learning in complaint classification. Contextual language models can represent relationships between words and phrases, which may help distinguish messages that use similar terms but describe different problems. Ahmed et al. [4] examine machine-learning techniques for bug prioritization. Although software defects and general complaints are not identical, the task of deciding which report should be addressed first has a useful conceptual connection.

Blümel and Zaki [5] are referenced in relation to neural-network-based complaint analysis, while Olujimi et al. [6] discuss text classification and sentiment analysis. These topics are directly related to extracting categories and user sentiment from written feedback. The source manuscript also cites work on deep-learning-based customer complaint classification [7] and a hybrid LSTM–RoBERTa approach for context-aware classification and sentiment analysis [8]. The latter illustrates an approach in which sequential and contextual representations may be combined.



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The present proposal brings these research areas together in a single complaint-handling workflow that includes multilingual intake and an optional voice channel. Its intended contribution is the integration of speech-to-text conversion, language processing, complaint categorization, sentiment estimation, priority indication and administrative tracking. The exact performance and comparative advantage of this combination must be established through experiments using a documented dataset and suitable baselines; the supplied report does not provide enough measurements to make such a claim.

III. PROPOSED SYSTEM

The proposed system is organized around a sequence of intake, text preparation, analysis, storage and administrative review. A user can enter a complaint in written form or submit an audio recording. If audio is selected, a speech recognition component produces a text transcript. Both input paths then converge on the language-processing pipeline so that the complaint can be analyzed using a common representation.

The analysis stage is intended to identify the complaint topic and produce sentiment and priority indicators. The categorized record is saved with its relevant details. Based on the category and priority information, the application can suggest or perform routing to the responsible department according to the configured organizational rules. Administrators can inspect the complaint, update its status and review summaries of recurring issues. Automated output should be treated as assistance for staff rather than as an unquestionable decision.

A. Main Components

Text and voice intake: Provides the user interface for submitting a written complaint or an audio message.
Speech-to-text conversion: Transforms supported speech input into text so that it can enter the same analysis pipeline as typed complaints.
Language identification and multilingual processing: Determines the language of the submitted text and applies the language-handling process supported by the implementation.
Text preparation: Normalizes the input and removes noise that may interfere with subsequent analysis, while retaining the meaning of the complaint.
Complaint classification: Assigns the message to one of the categories defined for the application, such as technical, service or payment-related issues.
Sentiment and priority assessment: Estimates the sentiment expressed in the message and identifies an urgency or priority level according to the system's configured logic.
Database and complaint tracking: Stores the complaint, its analysis and status information for later review.
Administrative dashboard and trend view: Displays complaint records and supports review of categories, priority levels, status and recurring topics.

IV. METHODOLOGY

The methodology follows the lifecycle of a complaint from submission to administrative follow-up. The stages below describe the intended processing sequence. The exact model architecture, libraries, dataset and deployment configuration should be stated in the final version only after they have been confirmed from the implemented application.

1. **User registration and login.** A user accesses the application through the registration and authentication interface. Access control should ensure that users can view only the records permitted by their role.
2. **Complaint submission.** The user submits a complaint either by entering text or by recording an audio message. The application captures the submission and associates it with the relevant user and time information.
3. **Speech-to-text conversion.** For an audio submission, a speech recognition service or model generates a text transcript. The transcript should be reviewed for recognition errors where necessary, since transcription quality can affect later analysis.
4. **Language identification.** The system determines the language of the text so that the appropriate processing path can be selected. The supported language list must match the languages actually implemented and evaluated.
5. **Text preprocessing.** The text is normalized to reduce avoidable noise. Depending on the selected model, preparation may include handling punctuation, repeated whitespace, encoding issues and other non-informative elements. Preprocessing should not remove words that carry complaint meaning.
6. **Multilingual text handling.** The complaint is represented in a form that the selected NLP model can process. This may involve a multilingual model or a translation-based pipeline; the final paper must identify which method the implementation actually uses.

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7. **Feature representation.** The processed text is converted into a numerical or contextual representation required by the classification model. The representation method should be named in the implementation description.
8. **Complaint classification.** The model predicts a category from the application's predefined complaint classes. Examples in the source project include technical, service and payment complaints; the complete class list should be documented.
9. **Sentiment analysis.** The system estimates whether the message expresses positive, negative or neutral sentiment. This label is an analytical indicator and should not be treated as a complete measure of the user's experience.
10. **Priority and urgency assessment.** The application assigns a priority indicator using the implemented model or decision rules. The criteria and priority levels must be explicitly defined so that administrators can interpret the result consistently.
11. **Complaint storage.** The original submission, transcript where applicable, predicted labels and status details are saved in the database. Appropriate safeguards should be applied to personal and sensitive information.
12. **Routing and referral.** The complaint is directed or recommended to the department associated with its predicted category and priority. Staff should be able to correct an incorrect assignment.
13. **Administrative dashboard.** Authorized personnel can view complaint details and their category, sentiment, priority and current status.
14. **Trend and insight analysis.** Stored records can be grouped to identify frequently reported categories or recurring issues. These summaries depend on the quality and volume of the stored data.
15. **Status tracking.** The application records status changes so that users and administrators can follow the progress of a complaint, subject to the access rules of the system.
16. **Model evaluation.** The classification and sentiment components should be assessed on a held-out labelled dataset. Suitable measures include precision, recall and F1-score; accuracy may also be reported where class distribution makes it meaningful. Speech recognition can be evaluated separately using word error rate or another appropriate measure.
17. **Output.** The system presents the complaint record and its analysis to the user or administrator. The output supports organized handling, but resolution still depends on the responsible department.

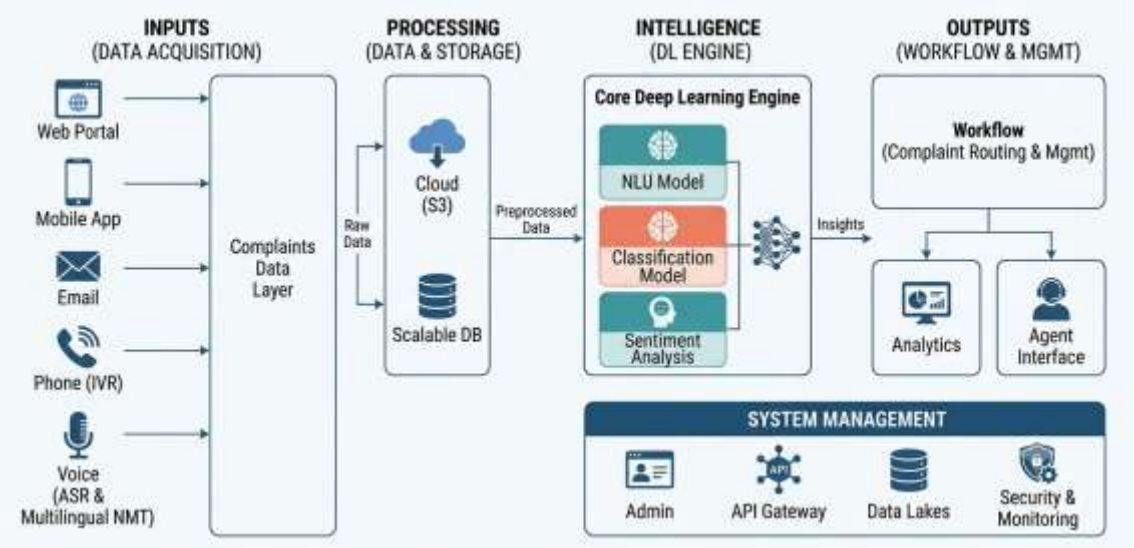


Figure 1 : System Architecture Diagram

V. RESULTS AND DISCUSSION

The supplied manuscript describes the intended system behavior and includes references to a system architecture diagram, a priority diagram and a sequence diagram. It states that the application accepts text and voice complaints, converts spoken input into text, analyzes complaint content and organizes records for administrative use. These descriptions explain the expected workflow; however, the source report does not provide a dataset description, sample size, test protocol, confusion matrix or numerical evaluation values.

For this reason, the present revision does not assign an accuracy percentage or claim a measured improvement in processing time. Such values would need to be calculated from actual test runs. The final experimental section should report, at minimum, the number of complaints tested, the language distribution, the category labels, the

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train/validation/test split, the model configuration and the evaluation results. For classification, precision, recall and F1-score should be shown for each class as well as an overall or macro-averaged result. For voice input, the speech recognition method and transcription quality should be evaluated independently.

The system's functional evaluation should also include representative examples covering typed complaints, voice submissions, different supported languages, category predictions, sentiment outputs, priority assignments, routing and status updates. Screenshots may be included to demonstrate the interface, but they should be accompanied by a brief explanation of what each test verifies. Any statement that the system reduces workload or improves response speed should be supported by a comparison with a defined baseline.

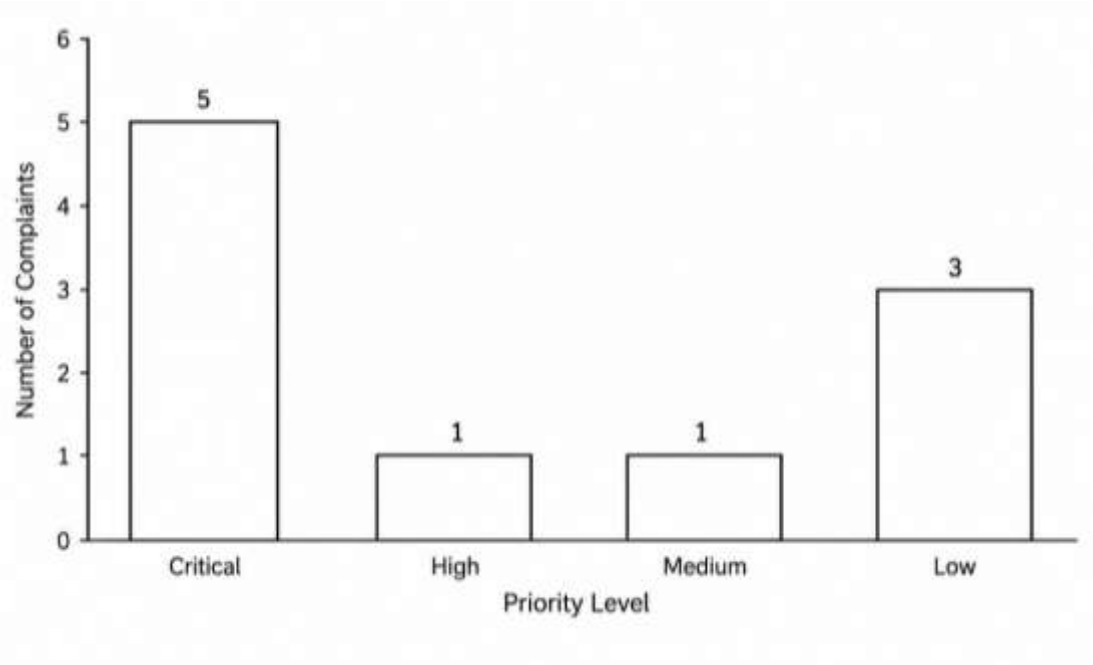


Figure 2: Priority diagram

VI. CONCLUSION

This paper has presented a design for a complaint intelligence application that combines text and voice-based submission with language processing and administrative tracking. The proposed workflow converts spoken complaints into text, prepares submissions for analysis and uses NLP and deep-learning methods to derive complaint categories and indicators such as sentiment and urgency. The resulting information can help staff review incoming reports, assign them to relevant departments and examine recurring issues. Multilingual processing and voice input are intended to make the submission process more accessible to users with different communication preferences.

The approach offers a structured way to connect complaint intake with analysis and follow-up. Its practical value, however, depends on the quality of the language models, the accuracy of speech transcription, the coverage of supported languages and the reliability of the priority rules. Further validation on a representative dataset is required before making quantitative claims about accuracy, efficiency or organizational impact. Human review, clear status communication and protection of personal information should remain part of the complaint-handling process.

VII. ACKNOWLEDGMENT

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VIII. FUTURE SCOPE

Several extensions could improve the usefulness and reliability of the proposed system. First, the complaint classifier can be trained and evaluated on a larger dataset containing a wider range of issue types, writing styles and supported languages. This would help determine how well the model performs on messages that differ from its training examples. Second, priority assessment could be refined by combining complaint category, expressed urgency, service impact and organizational response policies. The criteria should be transparent and periodically reviewed by the responsible staff.
A further extension is the detection of duplicate or closely related complaints. Grouping reports about the same incident may help administrators understand the scale of a problem without losing the individual records. The application could also provide notifications and multilingual status updates so that users can follow progress more easily. Voice processing may be improved by testing different accents and noisy recording conditions. Finally, future development should strengthen privacy controls, access management, data retention practices and checks for language-related or model-related bias. These improvements should be validated through user testing and documented experiments.

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