VIDYASHILP UNIVERSITY

Artificial Intelligence[COMP301]

Voice to text and bucketing of complaints into correct type/sub types through AI for Indian Railways

Submitted on : 31/03/2025

Submitted by:

Name :	**UEN:**
Vismaya MP	2023UG000169
Thanushree.NH	2023UG000165
Sania Naveed	2023UG000179
Manjushree MR	2023UG000175

Mohit Varma M 2023UG000167

Phalguna S 2023UG000171

Table of Contents:

1. Introduction…….3-4
2. Problem Statement……..4
3. Objectives……4-5
4. Solution Overview
   4.1 High-level Description of the Proposed Solution…….6
   4.2 Block diagram or simplified solution architecture……7
5. Technical Stack Used
   5.1 Programming languages, frameworks, and libraries used…….8-9
   5.2 Databases and APIs utilized……...9-10
6. System Architecture
   6.1 Detailed architecture diagram……10
   6.2 Explanation of how different components interact……11-12
7. Implementation Details
   7.1 Steps followed to build the solution ……..12-13
   7.2 Innovations or unique approaches used …….13
   7.3 Challenges Faces and How they were overcome……...13-14
8. LLM and AI Integration
   8.1 Which LLM (Large Language Model) was used? ……14
   8.2 How AI components (Speech-to-Text, NLP, etc.) were integrated……...14-15
9. Frontend & UI Design
   9.1 Snapshots of the User Interface (UI) ……...16-19
   9.2 Explanation of UX decisions……20
10. Code Structure & Execution Guide
    10.1 Folder structure explanation ……..20-21
    10.2 Steps to set up and run the code…….22-24
11. Results & Output
    11.1 Performance metrics……...24-25
    11.2 Screenshots of working solution…….25-31
12. Demo Video Link……32
13. Individual Contributions…….33
14. Impact of the Solution
    14.1 Who benefits from this project? ……..33-34
    14.2 Expected real-world impact……..34-35
15. Future Enhancements……35-36
16. Conclusion…….36
17. References & Citations……37

Abstract:

This project is about creating a Railway Station Complaint Management System that makes it easier for people to report problems at railway stations. Instead of filling out long complaint forms, users can simply speak their complaints, and the system will convert their voice into text. The system will support 23 languages, making it accessible to people from different regions across India. After the complaint is recorded, it is sent to the admin panel, where it is categorized before being submitted directly to the railway authorities via email. Complaints are processed in a structured manner and reach the right officials who can resolve the issue. This makes the whole process quicker, more transparent, and efficient so that issues in the stations are resolved promptly.

1. INTRODUCTION:

Railway stations are extremely crowded areas through which thousands of passengers pass every day. In order to keep stations clean, safe, and in good condition, any issue should be reported and resolved without delay. But complaints are not reported by many because it is a complicated and time-consuming process to complain. Conventional complaint procedures can involve lengthy forms to be filled out, visiting railway offices, or waiting too long for a reply. Consequently, most issues remain undetected and unresolved.

To address this issue, this project introduces a Railway Station Complaint Management System that allows passengers to voice their complaints and type them. If you choose voice The system automatically converts speech into text, making the complaint recorde process easier and more accessible. Furthermore, it supports 23 languages, ensuring that users from different regions of India can file complaints in their preferred language. Before submitting a complaint, users are required to enter their phone number and PNR number. If a valid PNR number is not provided, they will not be able to complain, ensuring that only genuine passengers can access the system. Once submitted, the complaint is categorized and forwarded to the relevant railway department via email for prompt resolution. By

automating the complaint process and ensuring that issues reach the right authorities without unnecessary delays, this system enhances efficiency, transparency, and responsiveness in railway station management. Passengers can report issues more conveniently, while railway authorities receive well-organized complaints, allowing them to take swift action to improve station conditions

2. Problem Statement:

Railway stations face many issues, such as unclean surroundings, faulty machines, and broken infrastructure, but these problems often go unreported because passengers find it difficult and time-consuming to complain. The current complaint systems require passengers to write complaints manually, make phone calls, or visit railway offices, which many people avoid due to the hassle. Another major problem is that most systems do not support multiple languages, making it hard for people who do not speak the default language to report their issues.

Another major issue is the presence of irrelevant complaints, which can burden railway authorities and delay the resolution of genuine issues. allowing anyone to submit complaints, even those who may not be actual passengers. This leads to unnecessary workload and inefficiency in addressing real concerns.

To Solve This Problem to make it easier for passengers to file complaints by allowing them to speak instead of typing. The system converts their speech into text, and they can edit it if needed or type their complaint manually. After submitting, the system will automatically analyze the complaint and assign it to the right category and subcategory. To prevent misuse, passengers must enter their phone number and PNR number before submission. Once the complaint is categorized, the admin reviews it and forwards it via email to the relevant railway department. This ensures that complaints are handled efficiently, making railway stations safer, cleaner, and more organized.

3. Objectives:

The primary objective of the Railway Station Complaint Management System is to simplify and modernize the complaint registration process, making it accessible to a wide range of passengers. Many people have time to fill out lengthy complaint forms. Additionally, some individuals may not be able to type or write efficiently due to being uneducated, some people are handicapped, not aware of digital platforms. To overcome these challenges, the system allows users to record their complaints as audio and type them. Furthermore, users who have already recorded their complaint on their mobile device can upload the pre-recorded audio, ensuring flexibility and convenience in registering issues. This feature makes the complaint process inclusive and user-friendly for all passengers.

Another crucial objective is to prevent irrelevant or spam complaints, which often burden railway authorities and delay the resolution of genuine issues. To achieve this, the system requires passengers to enter their phone number and a valid PNR number before filling a complaint. If a passenger does not have a valid PNR number, they will not be able to submit a complaint, ensuring that only genuine travelers can use the system. This adds an extra layer of security and authenticity, reducing unnecessary complaints while protecting the system from misuse. Additionally, linking complaints to PNR numbers helps track the journey details of the complainant, making it easier for railway authorities to verify the complaint and take appropriate action.

The system also aims to categorize complaints efficiently based on their nature whether they are related to cleanliness, ticketing issues, security concerns, or infrastructure problems. Once a complaint is submitted to the admin panel, The admin enters the assigned password, which displays the phone number, PNR number, selected language, and transcription of the complaint. Upon clicking "Process Complaint", the category, sub-category, assigned station, and phone number appear. After submitting, the complaint is saved to the database, displayed on the page, and an email is sent to the assigned email IDs associated with that particular category. This structured approach improves response time and efficiency, leading to faster resolution of passenger grievances.

Ultimately, this project seeks to enhance railway station maintenance, improve passenger safety, and create a more efficient complaint resolution mechanism. By integrating voice-

based inputs, multi-language support, and valid PNR numbers, the project ensures that railways remain clean, secure, and well-maintained. This contributes to a seamless and hassle-free travel experience for passengers across India.

4. Solution Overview:

4.1 High-level Description of the Proposed Solution

The proposed railway complaint system is an AI-driven web application that allows passengers to file complaints efficiently through voice input or typing. The system is designed to improve the current complaint resolution process by leveraging speech recognition. Users can submit complaints by speaking into the system, which converts their speech into text.

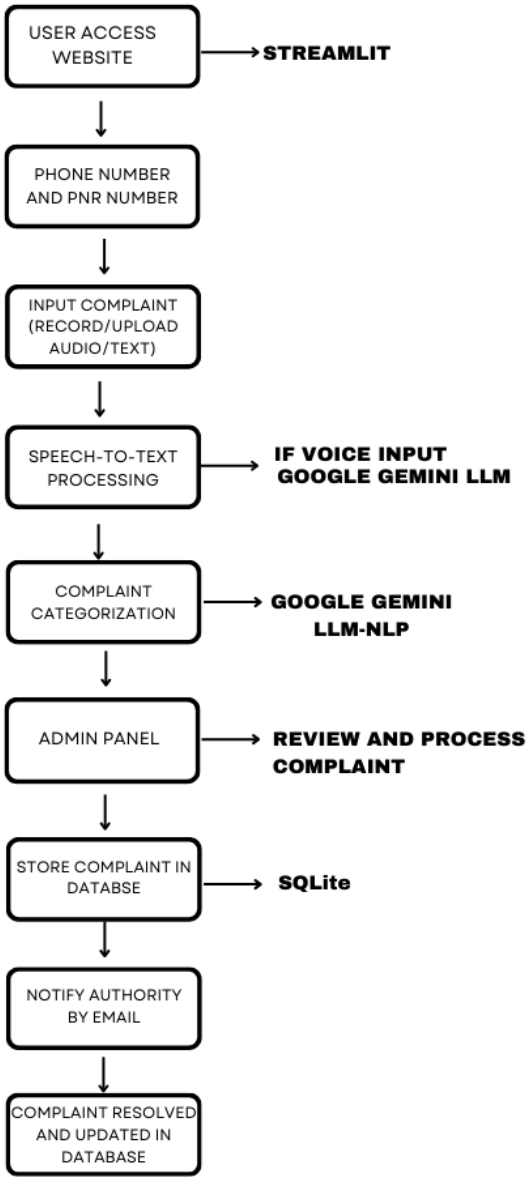
Once submitted, the system uses Google's Gemini AI to automatically categorize the complaint into predefined types such as Security Issues, Coach Cleanliness, Food Quality, Staff Behaviour, etc. If the AI cannot determine the correct category, or if the issue does not fit into any predefined category, the complaint is placed under a Miscellaneous section for manual review. Additionally, if a user provides incorrect audio, is unable to speak properly, or submits an empty audio file, the system will also classify the complaint under Miscellaneous. This classification helps ensure that the complaint is sent to the correct railway department.

The categorized complaint, along with user details, is stored in SQLite. The email process is handled by the admin, ensuring accuracy before sending it to the relevant railway department based on the complaint's category and subcategory. The email includes the correct reason, the station from which the complaint was filed, and the passenger's PNR number.

The system is built entirely using Streamlit and Python. It is designed to be simple, fast, and efficient, allowing passengers to submit complaints without hassle. Supporting 23 languages, it ensures accessibility for people from different regions. This solution enhances

the railway complaint process by reducing delays, improving accountability, and making it easier for passengers to voice their concerns.

4.2 Block diagram or simplified solution architecture:



5. Technical Stack Used:

5.1 Programming languages, frameworks, and libraries used

This project is a Railway Complaint System implemented using Python, Streamlit and also html in streamlit(for UI styling), leveraging AI-powered classification and email-based complaint submission.

Programming Language

- **Python:** The primary programming language used for implementing the entire project, including UI development, AI classification, email handling, and speech recognition.
- **HTML:** The programming language used for UI styling inside the streamlit.

Frameworks and Libraries Used

- Streamlit: Creates a user-friendly web interface for submitting and viewing complaints.
- Google Generative AI: Analyzes complaint text to auto-generate summaries or suggest responses using AI.
- SpeechRecognition: Transcribes spoken complaints from users into written text.
- SoundDevice: Captures live audio input from a microphone for voice-based complaints.
- Wave: Processes and saves recorded audio files in WAV format for further use.
- Tempfile: Temporarily stores audio recordings before they're processed or transcribed.
- Smtplib: Automatically sends email notifications about submitted complaints to relevant parties.
- EmailMessage: Formats the complaint details into a structured email for sending.
- Pandas: Organizes and stores complaint data in a structured Excel file for record-keeping.
- OS: Handles file system tasks, such as checking for or creating the complaint Excel file.

- Collections: Groups complaints by type or status for easy tracking and analysis.
- NumPy: Manipulates audio data during recording or processing for clarity and quality.
- Sqlite3: Stores complaint data in a lightweight database for efficient querying and retrieval.
- Datetime: Adds timestamps to complaints to track when they were submitted.
- Random: Randomly assigns complaints to staff or selects sample complaints for review.

5.2 Databases and APIs utilized:

SQlite Database: The system uses SQlite to store all complaint details in a structured way. It saves information like the user's phone number, PNR number, language selected, complaint text, category, subcategory, the time the complaint was submitted, railway station where the incident happened and its phone number. Using SQlite makes it easier to search, update, and manage complaints efficiently. Railway authorities can quickly access and analyze complaints, helping them resolve issues faster and keep track of trends in passenger concerns.

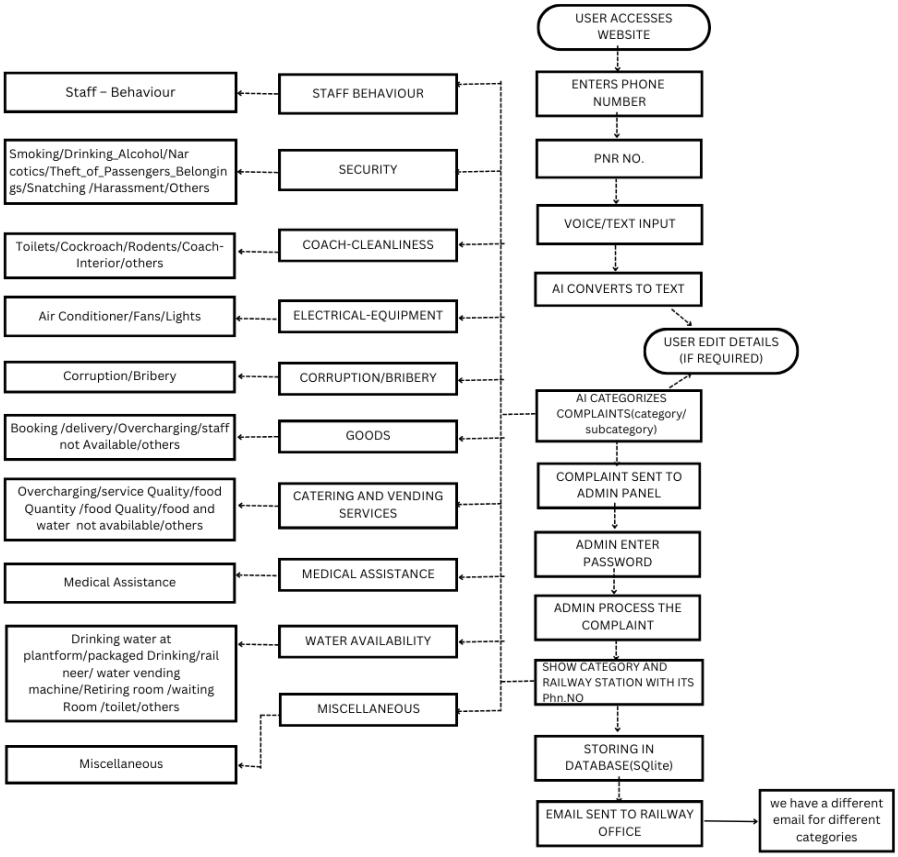
Google Generative AI API: The system uses Google Generative AI (Gemini API) to automatically categorize complaints. Instead of manually sorting complaints, the AI reads the complaint text and assigns it to the correct category and subcategory. This reduces human effort, speeds up processing, and ensures complaints are sent to the right department quickly. This helps authorities handle issues more effectively and improves the overall complaint resolution process.

Google Speech-to-Text API (Optional Improvement): Currently, the system uses the SpeechRecognition library to convert speech into text, but it could be improved by integrating Google Speech-to-Text API. This API provides better accuracy, especially for different Indian languages. With this improvement, passengers could record their complaints in their preferred language, making the system more accessible and user-friendly.

SMTP (Simple Mail Transfer Protocol) for Email Notifications: To ensure complaints reach the right authorities, the system uses SMTP for sending emails automatically. Once a complaint is categorized, it is forwarded to the correct department's email address. This process eliminates delays, ensures that complaints are received by the right people, and helps authorities respond quickly. This automated email system makes communication smoother and more efficient.

6. System Architecture

6.1 Detailed architecture diagram



6.2 Explanation of how different components interact

1. User Access & Input

- User accesses the website
- They enter the following details
  - ➔ Phone Number
  - ➔ PNR Number
  - ➔ Complaint Input (via Voice or Text).
- If voice input is provided, AI converts it to text.
- The user can edit details if necessary.
- Submit complaint.

2. Complaint Categorization

   The system utilizes AI to categorize the complaint into relevant categories:

   - Staff Behaviour
   - Security (Smoking, Alcohol, Theft, Harassment, etc.)
   - Coach Cleanliness (Toilets, Cockroaches, Rodents, etc.)
   - Electrical Equipment (AC, Fans, Lights, etc.)
   - Corruption & Bribery
   - Goods (Booking, Overcharging, Delivery, etc.)
   - Catering & Vending Services (Food Quality, Water Availability, etc.)
   - Medical Assistance
   - Water Availability (Drinking Water, Toilets, Waiting Rooms, etc.)
   - Miscellaneous Complaints

3. Admin Panel Processing
   - The complaint is sent to the Admin Panel.
   - The admin enters a password to access complaint details.
   - The admin processes the complaint after that category and subcategory will be shown.
   - The system displays the railway station details along with its contact number.
4. Data Storage & Notification
   - The complaint is stored in an SQLite database.

- The system sends an email to the relevant railway department based on the category.

5. Email Routing

   The diagram highlights that each category has a different designated email recipient to ensure proper handling and escalation.

7. Implementation Details

7.1 Steps followed to build the solution

The first step in building this system was to analyze the requirements and identify the key features needed. The primary objective was to develop a user-friendly complaint registration system where railway passengers could easily submit their grievances. The system needed to support voice input for complaints, allow users to edit their submissions, store complaint records efficiently, and send mail notifications to keep users informed. Once a complaint was submitted, it would be stored in a SQLite database and made available for review by railway authorities.

After defining the requirements, the system architecture was designed. The architecture includes a frontend built using Streamlit with HTML for UI styling, providing a smooth and interactive experience. The backend, developed in Python, processes complaints and handles interactions between the frontend and the database. A Google Gemini-powered speech-to-text module is integrated, enabling users to record complaints instead of typing them.

Once the architecture was finalized, frontend development began. The Streamlit web interface, styled with HTML, ensures a clean and easy-to-navigate design. A voice input button was implemented to allow users to speak their complaints, which are then converted into text for submission. The interface also includes a form where users can enter phone number, PNR number, language and complaint details before submitting the complaint

For backend development, Python was used to handle essential functionalities such as speech-to-text conversion via Google Gemini, validating user inputs, and storing complaint

records in SQLite. The system enables railway authorities to track and manage complaints efficiently, ensuring that all submissions are logged and processed properly.

For storing data, a relational database SQlite was used. The database stored details like user information, complaint records, and station. This helped in keeping track of each complaint and ensuring a proper response from railway authorities.

7.2 Innovations or unique approaches used

One of the most unique features of this system is the voice input for complaint submission. Instead of typing, users can simply speak their complaint, making the process much faster and easier. The Google Speech-to-Text API ensures that the spoken words are accurately converted into text.

The system includes an AI-powered complaint categorization feature. Instead of manually sorting complaints, it leverages Google Gemini's speech-to-text processing to transcribe user complaints and store them in a structured format. The system then organizes complaints into categories such as infrastructure issues, staff behavior problems, or Catering issues etc.. using a database-driven approach. This automation reduces the workload for railway staff and speeds up complaint resolution.

To make the system more user-friendly, the web interface was designed to resemble the official railway website, ensuring that passengers feel familiar and comfortable using it.

7.3 Challenges faced and how they were overcome

During the development of our AI-Driven Real-Time Speech Translations, we faced many challenges but overcame them through research, trial and error, and watching tutorials. One major issue was that when Kannada translation worked, Hindi wouldn't, and the complaint text wasn't being processed correctly. We solved this by refining the translation logic and improving the speech-to-text system. Another issue was that our code was not executing in the right order, so we separated different parts, tested them individually, and then combined them properly. Email integration was also difficult, as Python wasn't sending emails

correctly. After watching YouTube tutorials, we enabled two-step verification, generated an App Password, and successfully implemented it. Additionally, the system wasn't categorizing complaints correctly, to make it more accurate. Lastly, MySQL wasn't storing data even with the right credentials, so we switched to SQLite, which worked better. By continuously learning, debugging, and refining our approach, we managed to build a working system.

8. LLM and AI Integration:

8.1 Gemini LLM and AI Integration

The Gemini 1.5 Flash model from Google, which you've integrated via the google.generative ai library, is a lightweight, fast, and efficient LLM designed for tasks like text generation, classification, and understanding natural language. In your application, it's primarily used to categorize user-submitted railway complaints into predefined categories and subcategories (e.g., "STAFF BEHAVIOUR - Staff – Behaviour", "SECURITY - Theft"). This AI-powered categorization automates what would otherwise be a manual process, improving efficiency and scalability.

The AI integration leverages Gemini's natural language understanding capabilities to interpret user complaints (whether typed or transcribed from audio) and map them to a structured set of complaint categories and subcategories defined in the CATEGORY_MAP dictionary.

8.2 How AI components (Speech-to-Text, NLP, etc.) were integrated

This uses two important AI technologies to make the complaint process easy and The system leverages AI to enhance the efficiency of complaint registration and processing. Google Gemini's speech-to-text feature has been integrated to allow users to submit complaints through voice input. This feature automatically transcribes spoken complaints into text, eliminating the need for manual text entry and improving accessibility. The transcribed text is then stored in a structured SQlite database, ensuring easy retrieval and management.

Speech-to-Text (STT) – Converting Voice into Text:

The first step in handling a complaint is converting a user's voice into text. This is done using a tool called speech_recognition, which acts like a digital ear. It listens to what the user says and writes it down.

Users have two ways to submit their complaint using voice:

1. Live Voice Input: The user can speak directly into the microphone for up to 10 seconds.
2. Audio File Upload: The user can upload a pre-recorded audio file in formats like WAV or MP3.

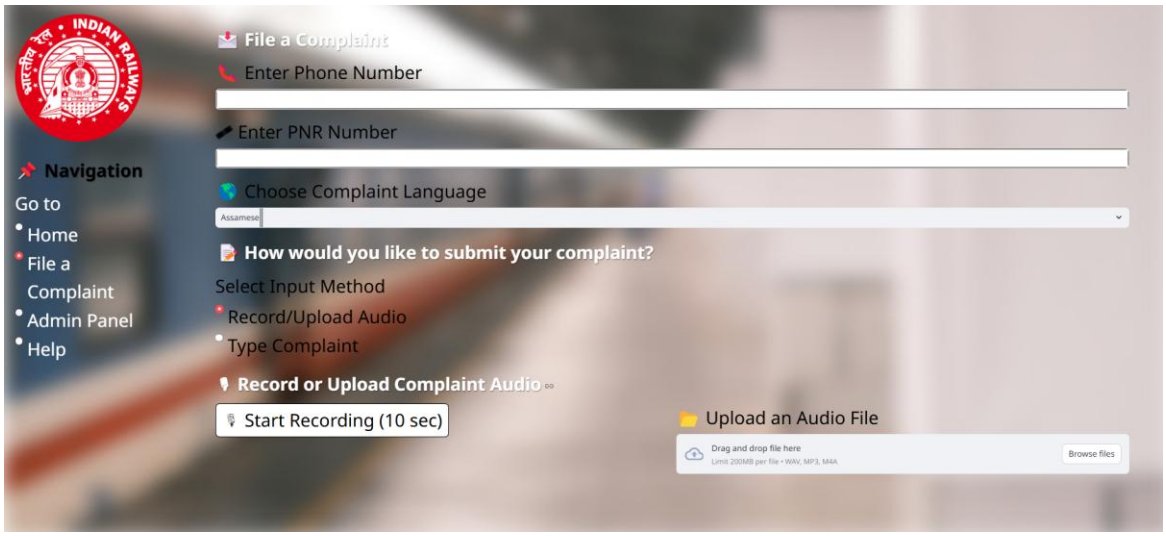
Once the website receives the audio, it sends it to Google's speech recognition service, which carefully listens and converts it into text. The app supports 23 languages, so people can file complaints in the language they are most comfortable with.

However, if the audio is not clear due to noise, low volume, or unclear speech, the system may not be able to understand it. In such cases, the app will show an error message like "I can't understand this" or "Something went wrong. Please try again." This lets users know they need to record or upload a better audio file. After the speech is converted into text, the app allows users to edit the text manually before submitting the complaint. This way, if there are any mistakes in the text, the user can fix them before moving forward.

9. Frontend & UI Design

9.1 Snapshots of the User Interface (UI)

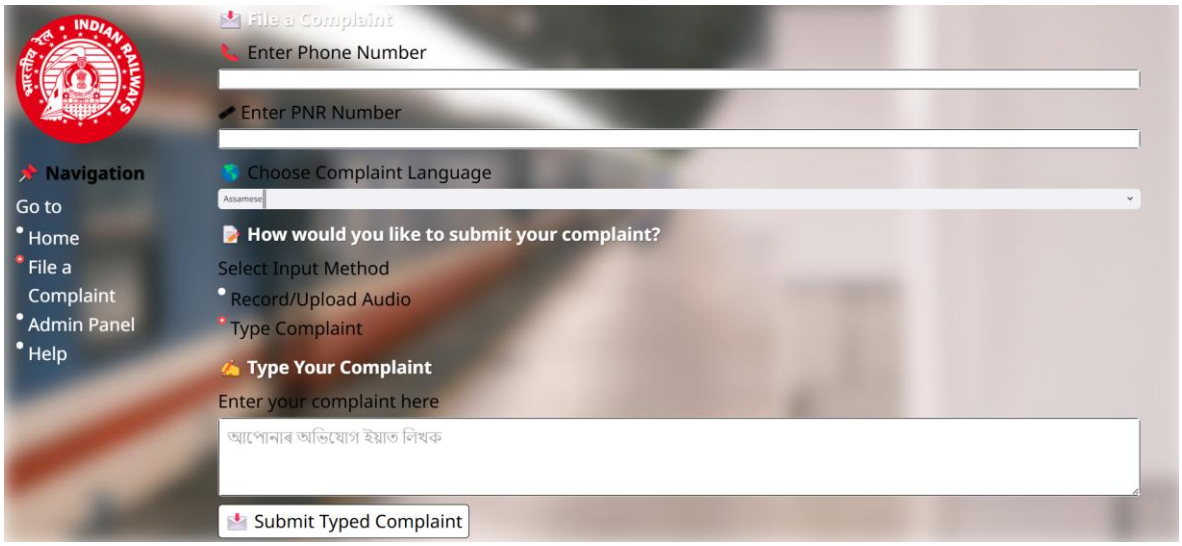
The home page of the Railway Complaint System has a simple and user-friendly design with a blurred railway platform background. The Indian Railways logo is displayed at the top left, along with the system title and an icon. A navigation menu on the left provides quick access to important sections, including Home, File a Complaint, Admin Panel, and Help. The design ensure clarity, making it easy for users to navigate and access the complaint system efficiently.



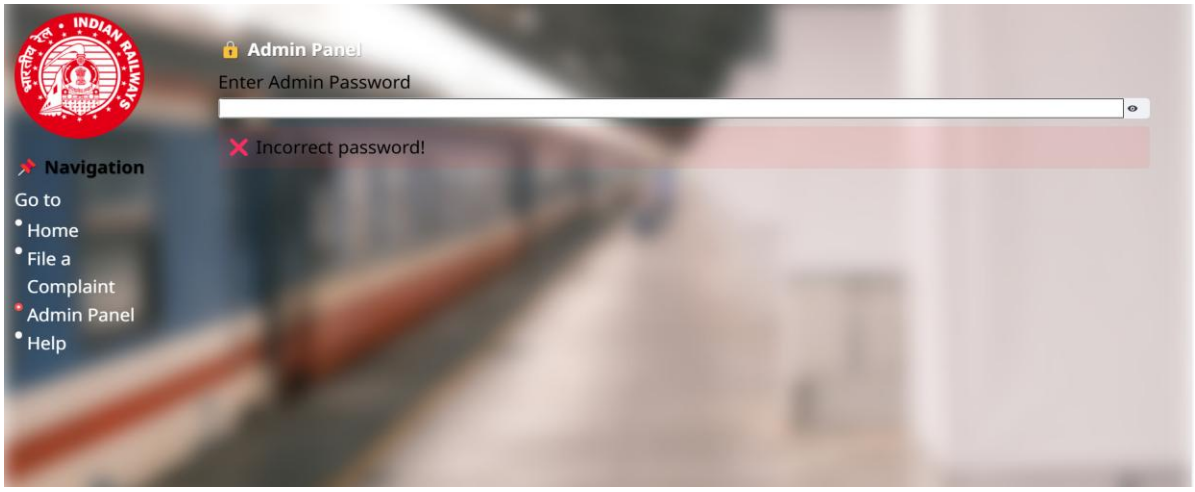
This page is the "File a Complaint" section of the Railway Complaint System, allowing users to submit complaints conveniently. The form includes several fields and options for complaint submission:

- Enter Phone Number & PNR Number: Users must enter their phone number and Passenger Name Record (PNR) Number to verify their travel details and ensure complaint tracking.
- Choose Complaint Language: A dropdown menu lets users select their preferred language, making the system accessible to diverse passengers.
- Select Input Method: Users can choose how to submit their complaint—either by typing or through audio recording/upload.
- Record or Upload Complaint Audio: If users prefer voice input, they can either record a 10-second audio message or upload an audio file (WAV, MP3, M4A).
- Upload an Audio File: This section allows users to drag and drop an audio file or browse their device to upload a pre-recorded complaint.

The system provides a flexible complaint submission process, accommodating both text and audio inputs, for all passengers.

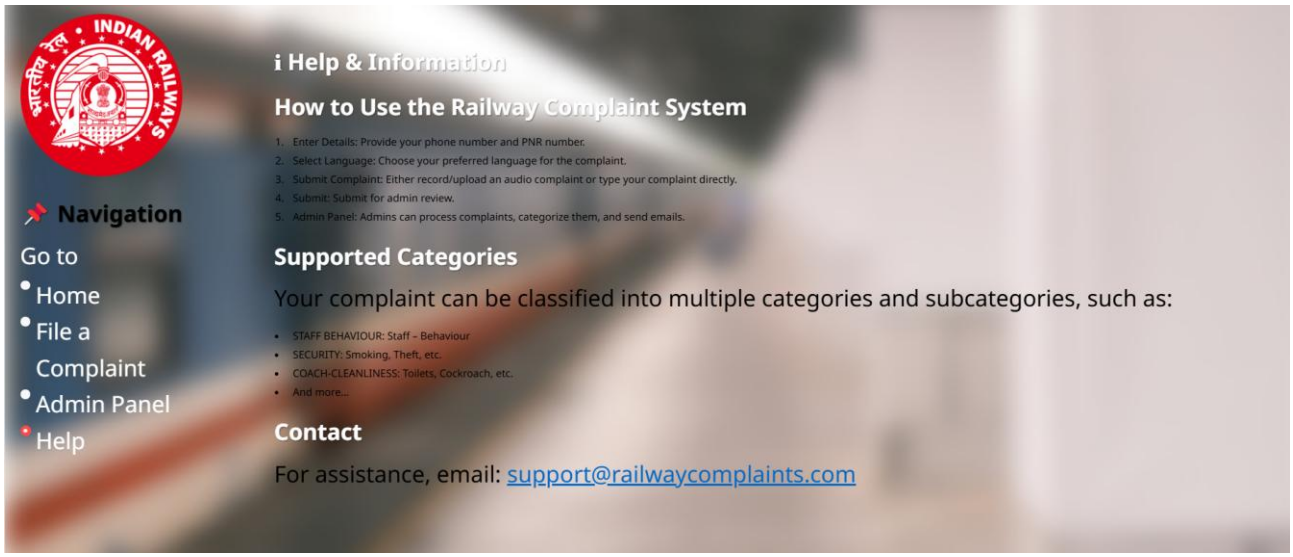


- Select Input Method: Users can choose between "Record/Upload Audio" or "Type Complaint". In this case, the "Type Complaint" option is selected.
- Type Your Complaint: A text box is provided where users can manually enter their complaint. The placeholder text suggests that the system supports multiple languages, as seen with the Assamese text.
- Submit Typed Complaint: A button at the bottom allows users to submit their complaint once they have finished typing.



This is the Admin Panel login page of the Railway Complaint System, which is restricted to authorized personnel. The interface includes:

- Enter Admin Password: A password input field where administrators must enter their credentials to access the system.
- Incorrect Password!: A red error message indicating that the entered password is incorrect, prompting the admin to re-enter the correct one.
  This panel is designed to allow only authorized railway officials to manage and respond to complaints while ensuring security through password protection.



This is the Help & Information page of the Railway Complaint System, guiding users on how to file complaints effectively. It provides step-by-step instructions:

a. Enter Details: Users need to input their phone number and PNR number.
b. Select Language: Choose a preferred language for submitting the complaint.
c. Submit Complaint: Users can either upload/record an audio complaint or type it directly.
d. Submit: The complaint is sent for admin review.
e. Admin Panel: Railway officials process complaints, categorize them, and take necessary actions.

The Supported Categories section lists various complaint types, such as staff behaviour, security issues (e.g., theft, smoking), and coach cleanliness (e.g., toilets, pests). A contact

email is provided for further assistance. This page ensures users understand the process and available complaint categories.

9.2 Explanation of UX decisions

The Railway Complaint System is designed with a user-friendly interface to ensure accessibility, ease of navigation, and efficiency in filing complaints. The navigation panel on the left provides quick access to essential sections like Home, File a Complaint, Admin Panel, and Help, ensuring users can move through the system seamlessly.

The complaint submission form is designed to be intuitive, requiring users to enter their phone number and PNR number, which helps in tracking complaints. A language selection option enhances usability for a diverse user base. Users can choose between typing their complaint or recording/uploading an audio file, catering to different preferences and accessibility needs.

The admin panel includes a secure login, ensuring only authorized personnel can process complaints. Error messages, such as "Incorrect Password," improve user feedback and security. The Help & Information page provides clear guidance on system usage, supported complaint categories, and contact details for assistance.

10. Code Structure & Execution Guide

10.1 Folder structure explanation

1. **Root Directory**
    - main.py → The entry point of the application. Running this file starts the Streamlit web interface.
    - requirements.txt → Lists all the dependencies required for the application. Install them using pip install -r requirements.txt.
    - config.py → Stores configuration settings like API keys and database connection details.
2. **database/ (Database Setup and Storage)**

- database_setup.py → Script to create and initialize the SQLite database.
- complaints.db → SQLite database storing all complaint records.
- queries.sql → SQL queries for managing and retrieving data from the database.

3. **website/ (Core Backend Logic)**
    - complaint_processing.py → Handles storing, retrieving, and processing complaints.
    - voice_processing.py → Converts voice complaints to text using Google Gemini API.
    - ai_categorization.py → categorize complaints into predefined
    - categories and subcategories.
    - email_notifications.py → Sends email alerts to relevant departments when a complaint is processed.
4. **pages/ (Frontend Pages for Navigation)**
    - home.py → Displays the home screen with the title "Railway Complaint System".
    - file_complaint.py → The page where users enter phone number, PNR, language, and choose voice or text to file complaints
    - admin_panel.py → Admin login page that shows all complaints, allows categorization, and saves data in SQLite.
    - help.py → Provides instructions on how to file a complaint.
5. **assets/ (Static Files - UI Elements and Styles)**
    - styles.css → Custom CSS styles for improving the UI design.
    - images/ → Stores images used in the UI, such as the railway background.
6. **logs/ (Logging System for Debugging and Monitoring)**
    - error_logs.txt → Stores error messages for debugging.

- access_logs.txt → Keeps track of admin logins and complaint submissions.

10.2 Steps to set up and run the code

1. **Install Required Dependencies**

   Before running the application, ensure that Python (version 3.8 or later) is installed on your system. The project requires several Python libraries, which can be installed using the following command:

   pip install -r requirements.txt , pip install SpeechRecognition,

2. **Set Up the Database**

   The complaint system uses SQLite to store complaint records. To set up the database, run the following command in the terminal

   python database/database_setup.py

   This script will create a database file (complaints.db) in the database/ folder. The database will store complaint details such as phone number, PNR number, complaint description, category, and processing status.

3. **Configure API Keys**

   The system integrates Google Generative AI for speech-to-text processing and smtplib for sending email. These services require API keys, which need to be configured before running the system.

   - Open the config.py file and add the Google Generative AI API key:

     GENAI_API_KEY = "your_google_api_key"

   - Add smtplib credentials to send mail:

     EMAIL_CREDENTIALS = email id : app passwords

4. **Run the Application**

To start the Railway Complaint System, execute the following command in the terminal:

streamlit run main.py

This command will launch the web application in the default web browser.

5. Navigating Through the System

The system has four main sections accessible via a navigation bar:

1. Home Page

Displays the Railway Complaint System title and an introduction.

2. File a Complaint

- Users enter their phone number, PNR number, and language selection.
- They can submit a complaint by either recording/uploading a voice complaint or typing a complaint.
- The system supports 23 Indian languages.
- After submission, the system categorizes the complaint using AI and sends it to the Admin Panel.

3. Admin Panel

- Requires an admin password to access.
- Displays all submitted complaints along with user details, PNR number, and complaint description.
- After reviewing, the admin processes the complaint, it shows category, subcategory, assigned railway station and its phone number, and it is stored in the SQLite database.
- An email notification is sent to the respective railway department.

4. **Help Panel**

   Provides guidance on how to file a complaint.

6. **Testing and Verifying the System**

To ensure the system functions correctly, follow these test cases:

Filing a Complaint

- Enter a phone number and PNR.
- Submit a complaint using voice or text.
- Verify that the system categorizes it correctly and forwards it to the Admin Panel.

Admin Panel Access

- Enter the admin password and check if complaints are displayed.
- Process a complaint and verify that it gets saved in the database.

Email Notification

Check if a confirmation email is sent after complaint processing.

Database Check

Open complaints.db using an SQLite viewer where complaints are stored properly.

11. Results & Output

11.1 Performance metrics

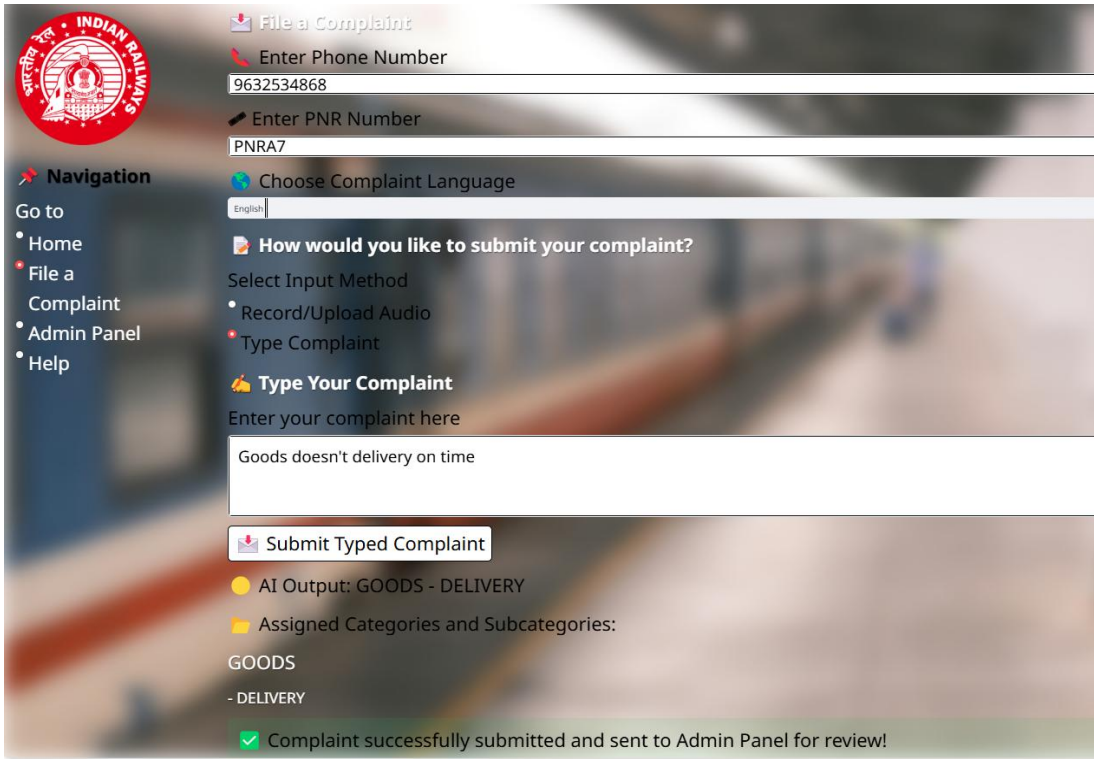
To check how well the Railway Complaint System is working, we use these key measurements:

1. System Performance Metrics

- Response Time: How fast the system reacts when a user submits a complaint.
- Server Load Time: How well the system handles multiple complaints at once.
- Database Speed: How quickly complaint data is stored and retrieved.

2. **System Reliability Metrics**
   - Error Rate: How often the system fails or has issues.
   - Uptime: How much time the system is working without crashing.
   - Successful Complaint Handling: The number of complaints processed without problems.
3. **Security Metrics**
   - Unauthorized Login Attempts: How many times someone tries to access the admin panel without permission.
4. **Data Safety**
   - Ensures complaint details are stored correctly without loss.

1.2 Screenshots of working solution



1. User Inputs Complaint Details

- Phone Number: The user enters a contact number (9632534868).
- PNR Number: The user enters a partial PNR (PNRA7).
- Language Selection: The user selects English as the complaint language.

2. Complaint Submission Method

The system allows two ways to submit a complaint:

- Record/Upload Audio (not selected)
- Type Complaint (selected in this case)

3. User Types the Complaint

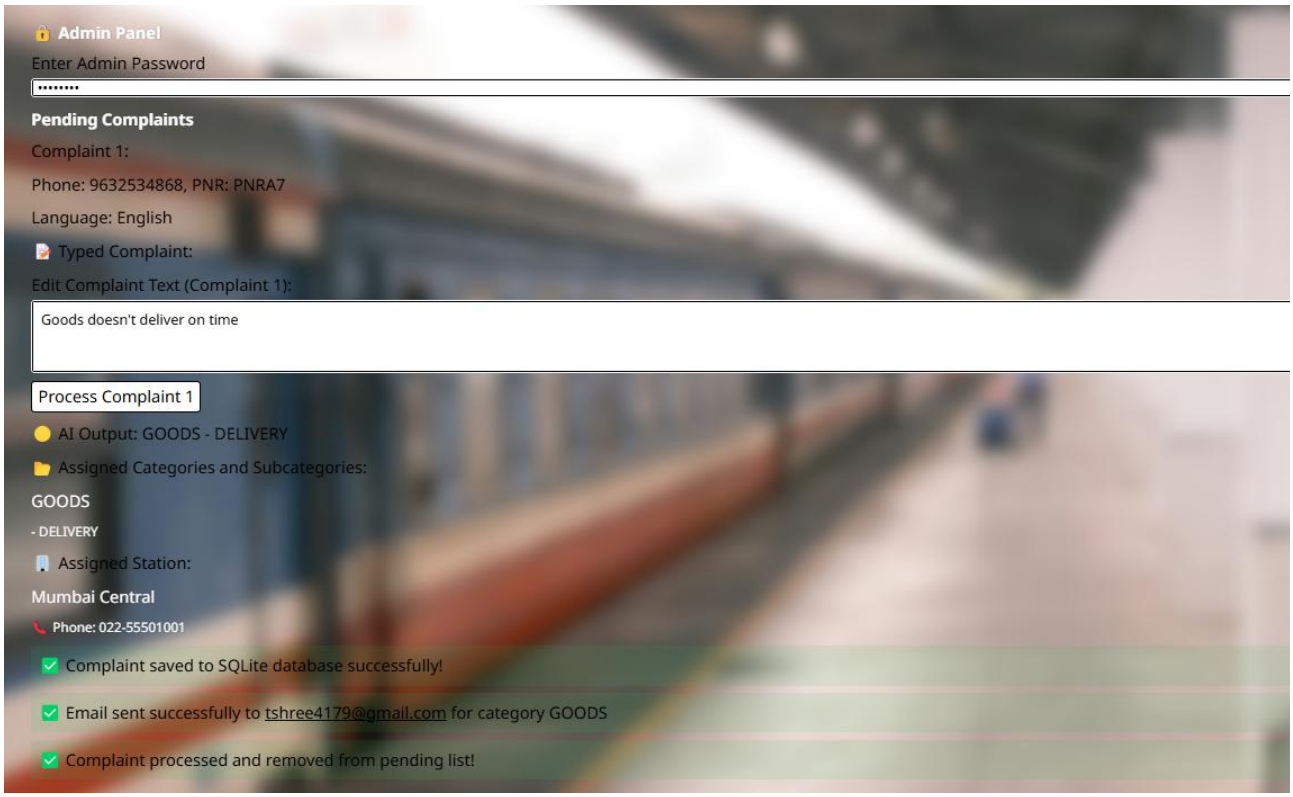
- The user enters: "Goods don't deliver on time" (which has a grammatical mistake).
- This complaint is related to Goods Delivery Issues.

4. AI-Based Categorization

- The system automatically detects that the complaint belongs to the category: GOODS - DELIVERY
- This means the system likely uses Natural Language Processing (NLP) to analyze and classify complaints.

4. Complaint Submission & Confirmation

- The user clicks "Submit Typed Complaint".
- The system confirms "Complaint successfully submitted and sent to Admin Panel for review!", meaning:
  - The complaint is stored in the database.
  - It is forwarded to the Admin Panel for further processing.



1. **Admin Login**
    - The admin enters their password to access the pending complaints**.**
2. **Viewing Pending Complaints**

    A complaint is displayed:

    ➔ Phone: 9632534868

    ➔ PNR: PNRA7

    ➔ Language: English

    ➔ Complaint Type: Typed Complaint

    ➔ Complaint Text: *"Goods doesn't deliver on time"*

3. **Editing the Complaint (Optional)**
    - The admin has an option to edit the complaint text before processing it.
4. **AI-Based Categorization**

- The system automatically assigns the complaint to the category:

  GOODS - DELIVERY

5. **Assigning to a Station**

   The complaint is assigned to:

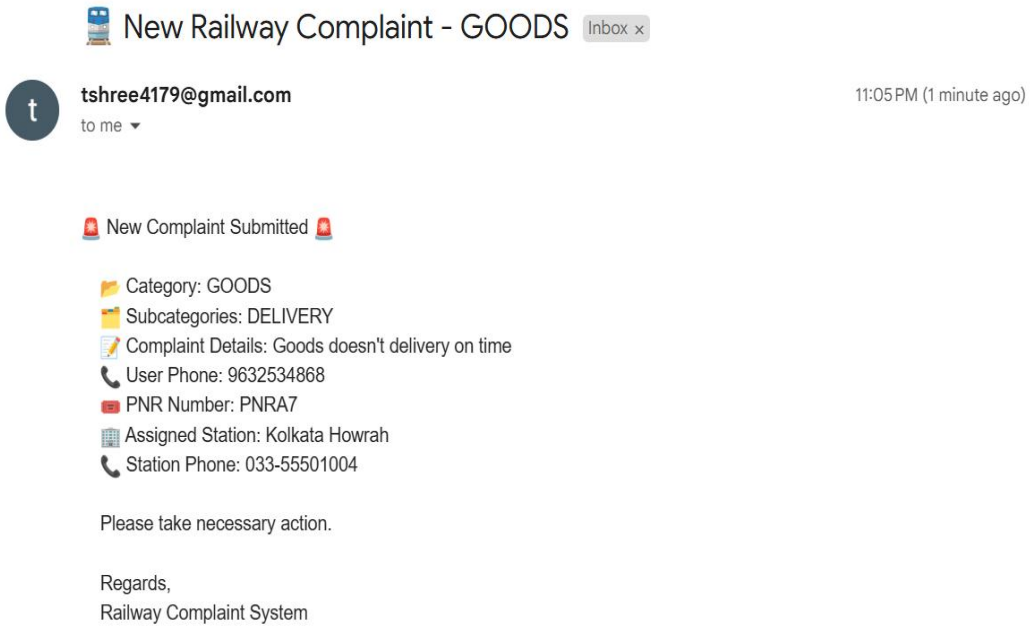
   Mumbai Central

   Station Contact: 022-5550101

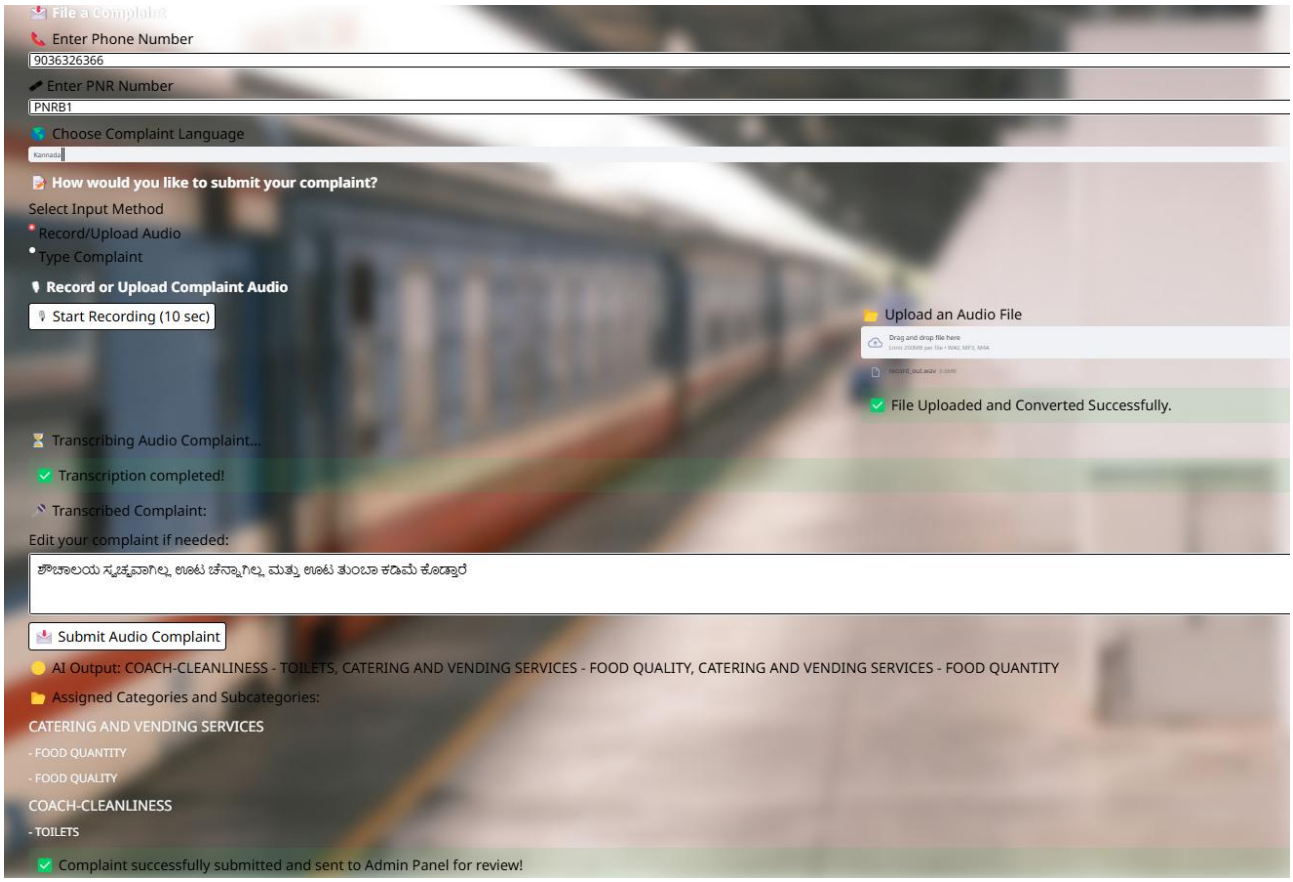
6. **Processing the Complaint**

   - The admin clicks “Process Complaint 1”, triggering:
   - Complaint saved to SQLite database successfully
   - Email notification sent to the responsible person (tshree4179@gmail.com).

     Complaint removed from the pending list.



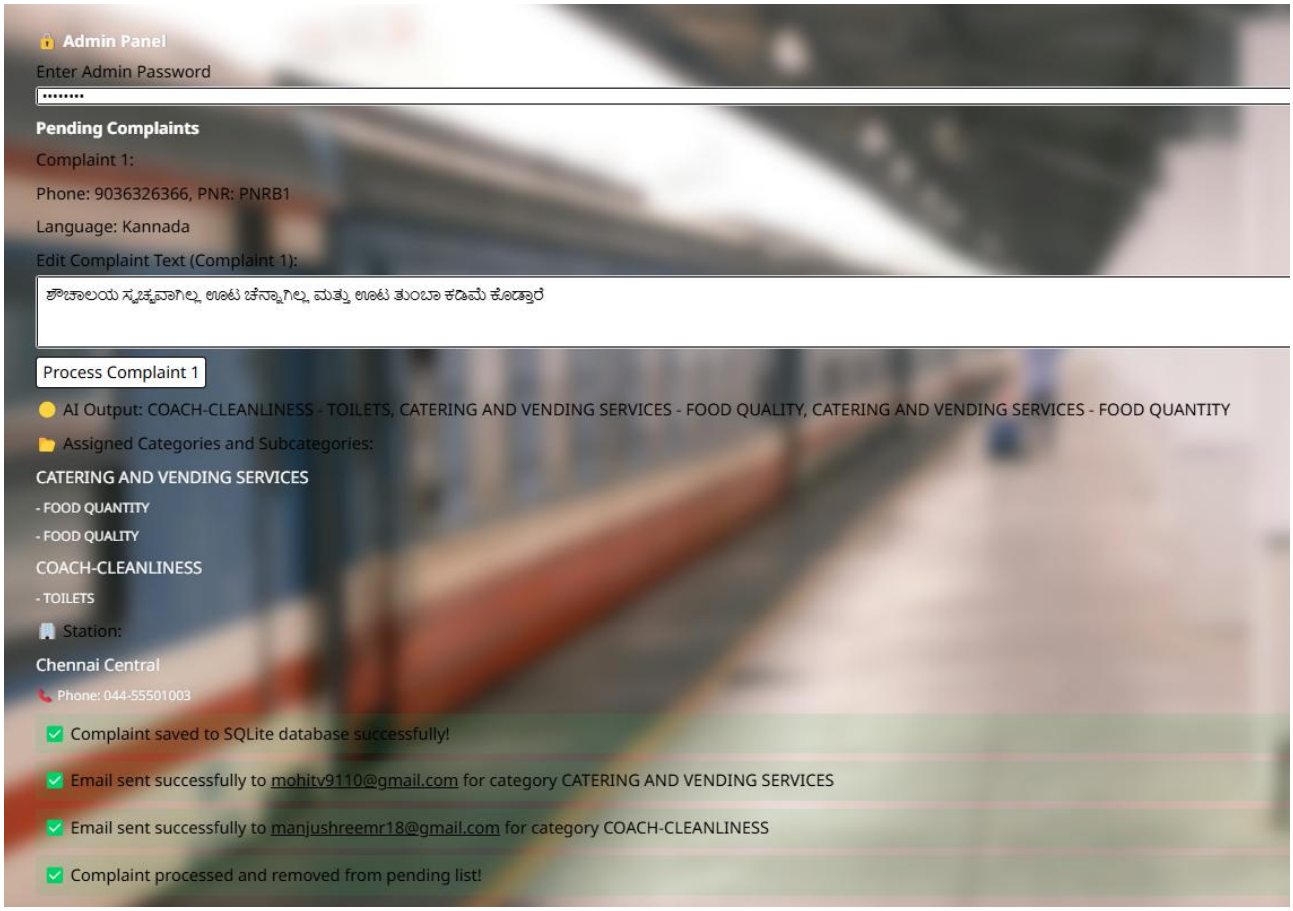
The email notification from the Railway Complaint System, confirming a newly submitted complaint regarding goods delivery. This email is sent to the concerned railway authorities for further action.



1. **User Inputs:**
    - The user is entering a phone number and PNR number (Passenger Name Record, used in railway ticketing).
    - They are selecting a language for the complaint.
2. **Complaint Submission Methods:**
    - The system offers two options: Record/Upload Audio or Type Complaint.
    - The user has chosen to record or upload an audio complaint.
3. **Audio Upload & Transcription:**
    - The user uploaded an audio file, which was successfully transcribed into Kannada.
    - The transcription reads: "ಶೌಚಾಲಯ ಸ್ವಚ್ಛತೆಸಂಬಂಧಿ, ಆಹಾರ ಗುಣಮಟ್ಟ, ಮತ್ತು ಆಹಾರ ಪ್ರಮಾಣ ಬಗ್ಗೆ ತಕರಾರು" (translated: "Complaint regarding toilet cleanliness, food quality, and food quantity").

- The user has the option to edit the transcribed complaint if needed.

4. **Complaint Submission:**
   - The user clicks Submit Audio Complaint.
   - The AI system categorizes the complaint into:
     - COACH-CLEANLINESS: Toilets
     - CATERING AND VENDING SERVICES: Food quality and food quantity.
   - A message confirms that the complaint has been successfully submitted and sent for review.



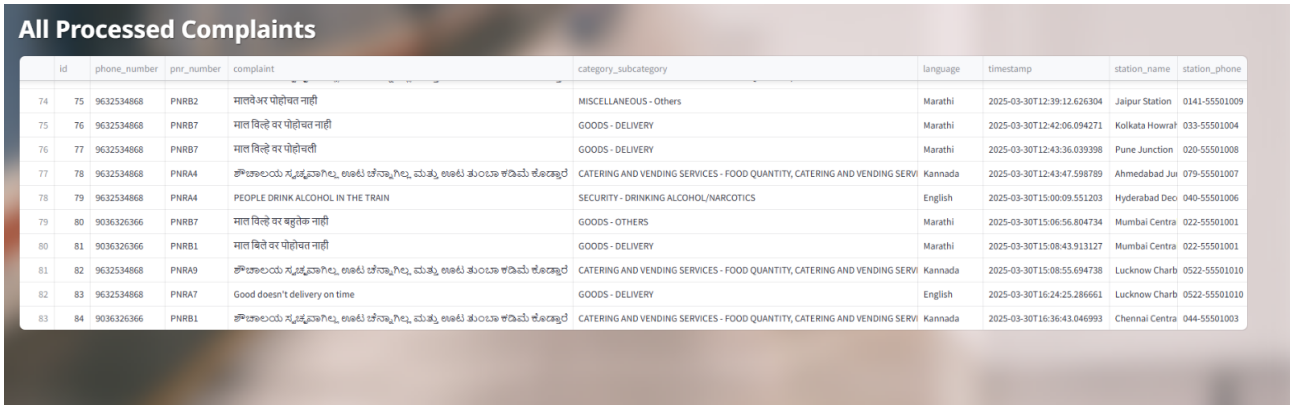
Admin Actions & System Responses

- Complaint saved to SQLite database successfully
- Emails sent automatically to the concerned department heads:
    - mohitv9110@gmail.com (for CATERING AND VENDING SERVICES)
    - manjushreemr18@gmail.com (for COACH-CLEANLINESS)

Final message: Complaint processed and removed from pending list

What This Shows

- The system supports regional languages like Kannada.
- AI is able to understand and categorize multi-topic complaints correctly.
- The system automatically sends emails to different departments based on the issue type.
- All actions are logged and confirmed to ensure the complaint is properly handled.



	id	phone_number	pnr_number	complaint	category_subcategory	language	timestamp	station_name	station_phone
74	75	9632534868	PNRB2	मालवेअर पोहोचत नाही	MISCELLANEOUS - Others	Marathi	2025-03-30T12:39:12.626304	Jaipur Station	0141-55501009
75	76	9632534868	PNRB7	मात विल्हे वर पोहोचत नाही	GOODS - DELIVERY	Marathi	2025-03-30T12:42:06.094271	Kolkata Howrah	033-55501004
76	77	9632534868	PNRB7	मात विल्हे वर पोहोचली	GOODS - DELIVERY	Marathi	2025-03-30T12:43:36.039398	Pune Junction	020-55501008
77	78	9632534868	PNRA4	ಶೌಚಾಲಯ ಸ್ವಚ್ಛವಾಗಿಲ್ಲ, ಊಟ ಚೆನ್ನಾಗಿಲ್ಲ, ಮತ್ತು ಊಟ ತುಂಬಾ ಕಡಿಮೆ ಕೊಡ್ತಾರೆ	CATERING AND VENDING SERVICES - FOOD QUANTITY, CATERING AND VENDING SERVI	Kannada	2025-03-30T12:43:47.598789	Ahmedabad Ju	079-55501007
78	79	9632534868	PNRA4	PEOPLE DRINK ALCOHOL IN THE TRAIN	SECURITY - DRINKING ALCOHOL/NARCOTICS	English	2025-03-30T15:00:09.551203	Hyderabad Dec	040-55501006
79	80	9036326366	PNRB7	मात विल्हे वर बहुतेक नाही	GOODS - OTHERS	Marathi	2025-03-30T15:06:56.804734	Mumbai Centra	022-55501001
80	81	9036326366	PNRB1	मात बिले वर पोहोचत नाही	GOODS - DELIVERY	Marathi	2025-03-30T15:08:43.913127	Mumbai Centra	022-55501001
81	82	9632534868	PNRA9	ಶೌಚಾಲಯ ಸ್ವಚ್ಛವಾಗಿಲ್ಲ, ಊಟ ಚೆನ್ನಾಗಿಲ್ಲ, ಮತ್ತು ಊಟ ತುಂಬಾ ಕಡಿಮೆ ಕೊಡ್ತಾರೆ	CATERING AND VENDING SERVICES - FOOD QUANTITY, CATERING AND VENDING SERVI	Kannada	2025-03-30T15:08:55.694738	Lucknow Charb	0522-55501010
82	83	9632534868	PNRA7	Good doesn't delivery on time	GOODS - DELIVERY	English	2025-03-30T16:24:25.286661	Lucknow Charb	0522-55501010
83	84	9036326366	PNRB1	ಶೌಚಾಲಯ ಸ್ವಚ್ಛವಾಗಿಲ್ಲ, ಊಟ ಚೆನ್ನಾಗಿಲ್ಲ, ಮತ್ತು ಊಟ ತುಂಬಾ ಕಡಿಮೆ ಕೊಡ್ತಾರೆ	CATERING AND VENDING SERVICES - FOOD QUANTITY, CATERING AND VENDING SERVI	Kannada	2025-03-30T16:36:43.046993	Chennai Centra	044-55501003

The table titled "ALL PROCESSED COMPLAINTS" will be displayed under the admin panel in a section dedicated to managing customer feedback or complaints. This section might be labeled something like "Complaints," "Customer Support," or "Feedback Management." Within that section, there is likely a specific tab or sub-section called "Processed Complaints," where administrators can view, sort, and manage all resolved complaint records. This placement ensures easy access to processed complaint data within the admin interface.

12. Demo Video Link

Railway_complaint_AI_Demovideo

13. Individual Contributions And Github Repository

1. **Vismaya**: Worked on code, the code to store databases on SQLite, and language processing and also handled categorization (category & subcategory) of complaints and contributed to the report.
   https://github.com/Vismaya251/railway_complaint_AI.git
2. **Thanushree:** Focused on the code, specifically on sending emails to assigned categories, handling multiple category & subcategory selection, and contributed to the report.
   https://github.com/thanushree7102/railway_complaints_stastions_trains-.git
3. **Sania Naveed:** Contributed to the project report, ensuring clarity, organization, and proper formatting.
   https://github.com/sanianaveed700/railway-complaints-.git
4. **Manjushree:** Contributed to the project report, ensuring clarity, organization, and proper formatting.
   https://github.com/Manjushree2006/Railwaycomplaints.git
5. **Mohit Varma:** Worked on the PowerPoint presentation (PPT), designing slides and structuring the content for better presentation
   https://github.com/MOHIT11118888/Railwaycomplaint.git
6. **Phalguna**: Worked on the PowerPoint presentation (PPT), designing slides and structuring the content for better presentation
   https://github.com/SPhalguna17/railwaycomplaint.git

14. Impact of the Solution

The Railway Complaint System is a website that helps people tell the railway about problems they face on trains. You can type what's wrong or send a voice recording, and the system uses what the issue is like dirty seats or bad food etc. It then picks a train station to

fix it, saves the complaint on the computer, and emails the right railway worker. This makes life better for lots of people.

14.1 Who benefits from this project?

1. **Passengers (Primary Beneficiaries)**

- Easier Complaint Filing: Users can file complaints quickly via voice or text.
- Faster Resolution: Categorized complaints reach the right department without delay.
- Transparency: Users know that their complaints are stored and sent to the appropriate authorities.
- Improved Travel Experience: Resolving issues like cleanliness, security, and overcharging leads to better railway services.

2. **Railway Administration & Staff**

- Streamlined Complaint Management*: Complaints are automatically categorized and stored, reducing manual work.
- Improved Efficiency: Admins can process complaints faster and address issues systematically.
- Data-Driven Decision Making: Stored complaints in SQLite provide insights into recurring problems, helping in policy improvements.

3. **Railway Authorities & Government**

- Enhanced Passenger Satisfaction: A well-managed complaint system ensures better services, boosting public trust.
- Accountability & Compliance: Complaints related to security, corruption, or misconduct can be tracked and addressed effectively.
- Operational Improvements: Identifying frequently reported issues helps authorities improve railway infrastructure and services.

4. **Railway Employees**

- Fair Feedback System: Staff complaints related to behaviour, service quality, or equipment failures can be addressed systematically.
- Better Work Environment: Identifying and resolving workplace concerns leads to improved working conditions.

5. **Emergency & Medical Services**

- Faster Response for Medical Emergencies: Medical assistance requests can be prioritized and sent to the relevant department immediately.
- Improved Passenger Safety: Issues related to accidents, health concerns, or security threats can be handled more efficiently.

6. **Catering & Vendors**

- Quality Control: Complaints about food quality, overpricing, or water availability help vendors improve their services.
- Compliance with Regulations: Ensuring vendors adhere to hygiene and pricing guidelines benefits both passengers and the railway authority.

7. **Public:**

   Even people who don't use trains benefit from this system. It makes complaining easy for everyone, no matter where they live or what language they speak. When trains improve like cleaner stations or safer journeys it helps everyone in India, even those just sending goods. This makes the railway system better and fair for all.

14.2 Expected real-world impact

1. **Faster Complaint Resolution**

   The AI-driven categorization and automated email notifications, complaints will reach the right department quickly, reducing response time and improving efficiency.

2. **Improved Passenger Experience**

   Passengers will find it easier to report issues using voice or text in their preferred language, leading to better engagement and satisfaction that complain about what they say.

3. **Reduced Workload for Railway Staff**

   Automating complaint categorization and routing reduces manual effort, allowing railway staff to focus on resolving issues rather than sorting complaints.

4. **Better Railway Services**

   Data insights from complaints can help railway authorities identify recurring problems, improve cleanliness, enhance security, and address staff behavior issues more effectively.

5. **Enhanced Accessibility**

   The system's support for 23 Indian languages ensures that passengers from diverse linguistic backgrounds can file complaints without language barriers.

6. **Increased Transparency and Accountability**

   Users receiving complaint status updates and the ability to track progress will ensure accountability within the railway system, making complaint handling more transparent.

7. **Railway Trust and Reputation**

   A structured and efficient complaint-handling system will lead to increased passenger trust in railway services, improving the overall public perception of railway management.

8. **Scalability for Other Public Services**

   The same AI-driven approach can be adapted for complaint management in other public sectors like transportation, municipal services, and government helplines.

15. Future Enhancements

- Mobile App Integration – Develop a mobile app for easier complaint registration and tracking.
- Real-Time Complaint Tracking – Allow users to track complaint status in real time.
- AI-Powered Response System – Implement AI chatbots to provide instant replies and updates.

- Automated Call Support – Integrate IVR (Interactive Voice Response) for complaint filing via phone calls.
- Enhanced Data Analytics – Use AI to analyze complaints and predict common issues for better planning.
- Integration with Railway Helplines – Connect with existing railway helpline services for faster resolutions.
- Feedback System – Allow users to rate the complaint resolution process for service improvement.
- Automated Escalation – If a complaint is unresolved within a set time, it will be escalated to higher authorities.

16. Conclusion

The Railway Complaint Registration System makes it easy for passengers to file complaints and get them resolved quickly. It supports 23 Indian languages, so anyone can use it without trouble. The system lets users either record or type their complaints, making it flexible for different people.

Once a complaint is submitted, AI automatically sorts it into categories and subcategories, saving time for railway staff. The Admin Panel is protected by a password, ensuring only authorized personnel can access and process complaints. After a complaint is reviewed, it is saved in an SQLite database and an email is sent to the right department, like cleanliness, food, or security.

Everything is designed to be simple and clear, so users don’t get confused. The system replaces manual complaint handling, making the process faster and more efficient. In the future, features like real-time tracking, chatbot support, and better analytics can be added to improve it even more. Overall, this project helps both passengers and railway staff by making the complaint process quick, organized, and hassle-free.

17. References & Citations

- OpenAI ChatGPT – Used to assist with code structure, explanation writing, formatting, and overall guidance during the project
- Referred to the codes which were done in practical classes.
- https://medium.com/@srinandh28/create-web-applications-quickly-and-easily-with-streamlit-0c40b04fc8e0.
- https://youtu.be/_GivO-FX-3Q?feature=shared
- https://youtu.be/girsuXz0yA8?feature=shared
- https://youtu.be/g_j6ILT-X0k