Automail AI: Intelligent Voice-Controlled Email Generator

1st Dr.Kavitha Jayaram
Dept. of Computer Science and Engineering
BNM Institute of Technology, Affiliated to VTU
Bengaluru, India
kavitha@gmail.com

2nd Samarth Mandagere
Dept. of Computer Science and Engineering
BNM Institute of Technology, Affiliated to VTU
Bengaluru, India
samarthmandagere123@gmail.com

3rd Sampriti Gopisetti
Dept. of Computer Science and Engineering
BNM Institute of Technology, Affiliated to VTU
Bengaluru, India
sampriti.gopisetti@gmail.com

4th Sahit S
Dept. of Computer Science and Engineering
BNM Institute of Technology, Affiliated to VTU
Bengaluru, India
sahits456@gmail.com

***Abstract*—The complexity of contemporary communication further emphasizes the need to automate monotonous work to increase efficiency and effectiveness. This paper introduces a new advance, voice-controlled Automail AI, in the form of an email generation tool that automatically sends an email according to end-user-specified keywords. Automail AI utilizes NLP, ML, and Speech Recognition to differentiate formal emails from informal ones and draft appropriate responses as the situation demands. It has been tuned with Naive Bayes Classifier that yields a better level of accuracy as compared to models such as Decision Tree, SVM, and Logistic Regression. Setting the benchmark for Automated Communication tools, Automail AI combines diverse technologies like SMTP to guarantee secure Email delivery, Google Text-to-Speech or GTTS for auditory feedback, and a module providing an interface for speech recognition that offers the possibility to use the tool with no hands.**

Keywords—*Automail AI, email generation, natural language processing, machine learning, speech recognition, Naive Bayes, SMTP, GTTS*

I. Introduction

It remains one of the most essential communication tools of today's fast world - required both professionally, academically, and in daily personal lives as well. The time-consuming process of creating and transmitting emails is another trait that causes annoyance for people who constantly receive large amounts of daily correspondence [1] or people who may find difficulty in typing. automation in generating emails is likely to increase productivity significantly as it tends to favor a highly efficient mode of producing contextually relevant messages without much hassle. Automail AI is proposed as a design for answering the need for an intelligent, voice-activated email generator using machine learning and natural language processing to create content based on the commands and context of the user [2].

The tool was designed to reduce time in the creation process of an email with the help of voice recognition and advanced NLP techniques [3]. The system captures user voice commands and recognizes the keywords used in the message. It then determines the context of the message to produce a formal or informal email. This hands-free approach lets the user do other things while he is composing an email-that is why it is very ideal for most people who could be on the move or need to write emails fast when doing something else. Additionally, its distinction between formal and informal tones makes sure that the automatically created email is fine for the intended audience and purpose.

At the heart of Automail AI lies a machine learning model trained on a large, contextually diverse dataset of emails. The model it uses is a Naive Bayes classifier, which was chosen for its simplicity and effectiveness in text classification tasks. The model was run for testing along with other algorithms like Decision Tree, SVM, and Logistic Regression, so that it can be known which one would work the best for predicting contents of the email on the keywords and the other contextual inputs. Among all these Naive Bayes came out to be proved better than all its alternatives and seemed apt for the needs of Automail AI.

In addition to the machine learning, several other critical technologies go into this version of Automail AI. These include the SMTP method for delivering e-mail, GTTS for audio feedback in commanding the audio information for the user, and speech_recognition, which aids in interpreting written text for capturing relevant user inputs. It is through the coordination of these sub-components that Automail AI manages to offer an immersive and interactive experience with automating the sending of emails and compositions.

Overall, the breakthrough from email automation in terms of voice activation and content generation through NLP makes this system helpful in improving communication efficiency as well as useful support to individuals who often rely on frequent and timely use of email. This paper expounds on the development, implementation, and performance of Automail AI, stating this potential to reshape digital communication by making it accessible, accurate, and contextually aware.

II. Objectives

A. Voice-Controlled Email Writing

The primary purpose of the Automail AI is that it is a voice-controlling email-writing system, in which emails are composed without the use of hands. With speech recognition, they translate spoken commands into their text form, which may be really helpful for users operating in multitasking

modes or in an accessible manner while on hand with the email interfaces.

B. Formal or Casual Classification

Automail AI attempts to differentiate between formal and informal emails based on the keywords and user's intentions. This helps classify the emails, and the content generated is context-related, social or professional, to improve the chances of clear expression with relevance.

C. Content Generation through the Automation of Keywords

The use of keywords acquired from user commands will guide the generation of content as that email text fits into the intention of the message. A well-trained machine learning model can allow Automail AI to create content with the intended topic and tone, saving time but ensuring clarity.

D. Using a high-accuracy Naive Bayes Classifier

One of the goals would be to achieve very high accuracy for content prediction using a properly set Naive Bayes classifier of proper type email. I chose Naive Bayes over others because Naive Bayes is efficient on text-based data, so this classifier would allow Automail AI to find proper type of email content for matching with keywords.

E. Implement usage of Natural Language Processing for context relevance

Automail AI further makes use of natural language processing techniques, which make the automatically generated emails context relevant. Thus, based on the correct interpretation of user inputs, the system can generate appropriate responses which are in harmony with the nuances of each type of email so that each message is both relevant and suitable for the target audience.

F. Provide Audio Feedback to Improve Usability

The system shall deploy text-to-speech functionality, utilizing GTTS, in an effort to provide users with audio feedback once their commands are processed. Hence, the objective shall be usability enhancement through the same information being fed back to the user as regards what the system has performed or whether the email has actually been generated or has actually been sent; the feel of interaction should be high.

G. Provide for Secure Email Transmission through SMTP Component

Automail AI with the capability of sending emails via SMTP secure authentications automatically is one of the essential features. This feature enables it to let send direct emails from the application with high efficiencies, without compromising data security and privacy.

H. Implement Strong Error Handling Mechanisms

Error handling is highly crucial for hassle-free usage of the application. Hence, it looks at the management of normal incidents like non-understood voice commands, failure in sending emails, and so on. Thus, due to error-handling mechanisms, the system can alert users in case of errors and make them retry commands, ensuring continuous usability.

I. Optimization of Email Generation Based on Machine Learning Comparisons

AI Automail tests a range of machine learning models such as decision trees, support vector machines, and logistic regression in order to figure out which one is most effective; here, it's a comparison of those models and the most accurate one that is also efficient at predicting the content of emails would be Naive Bayes.

J. Making Access Easier and Easy to Use to Fulfill Diverse Needs by Users

A further objective is to make it easy to compose emails for any user, whether a person with a disability or a "hands-free" lover. The design of Automail AI, with voice activation and NLP, served the various needs of the users by providing an efficient means for adaptive email generation that can potentially simplify communication with everyone-no matter how skilled he/she is in technology.

III. Related work

Automated email generation has moved from the earlier, more simplified rule-based systems to more sophisticated models based on machine learning and natural language processing [4]. At first, such systems relied heavily on templates with predefined formats and keyword filters [5]. Those early attempts were often effective for some use cases but did not scale easily to a variety of different communication scenarios, making them difficult to adapt to the diversity and complexity of the context of emails. Recent years have made it more streamlined to utilize machine learning algorithms on analyzing the body content, structure, and metadata of the email, thus more dynamic and contextually relevant for generating an email [6]. Given large datasets of emails, the models are now ready to learn and generate content that not only is contextually appropriate but also attuned to the tone and intent of the sender [7]. Advancements in NLP techniques, particularly word embeddings and contextual language models, have significantly enhanced keyword extraction and semantic understanding accuracy, thus further increasing the relevance of the generated content of an email. This advancement, additionally, has integrated speech recognition capabilities to allow users to interact in an hands-free mode and command the systems to compose emails by dictation. The creation of text-to-speech systems, which in turn provide instant feedback to the user, greatly enhances accessibility and facilitates a seamless and intuitive process. These developments pave the way for further adaptive, efficient, and user-friendly email generation systems.

IV. Proposed framework

It is an AI-engineered AutoMail-AI framework to automate the composition of e-mails by voice commands. The system can convert words spoken into text, understand the meaning, and compose an appropriate e-mail in response through speech recognition, natural language processing, and machine learning algorithms. The framework evolves with user preferences and, hence, improves with time based on data generated from interaction. In the training of models, the dataset comes in handy to enhance accuracy, personalization, and adaptability of a system. This framework has been designed to ease the management of email by providing an effortless and highly effective tool for communication.

A. User Voice Input

The Voice Input from the User is what triggers the AutoMail-AI system. He gives a voice command to the microphone, such as "Send an email to Sahit on coffee." This would then be interpreted into the recipient's identification to be Sahit, subject as coffee, and then pre-formatted content in

the email automatically. For instance, it may produce something like "Hey Sahit, I wanted to talk over about coffee." Such voice input eliminates the hassle of the user dictating every detail of the email himself, making the communication process shorter and more efficient. The system then refines and enhances that message through processing with its natural language abilities, contextual awareness, and learned preferences.

B. Speech Recognition

The speech recognition module converts the audio input to text. Major use is made of the basic stage with pre-trained [8] models, for instance, Google Speech-to-Text, and an in-house trained model, primarily in order to capture the correct words spoken by the user. The dataset used to train the speech recognition model consists of a wide range of voice recordings, accents, and different types of speech patterns. The quality of the speech-to-text conversion improves with an increase in the amount of speech data on which the system is trained.

C. NLP and Command Parsing

In the text format that the speech has been translated to, the NLP module now goes through it to interpret the command [9]. The text is parsed so as to obtain core information such as user email address to whom the e-mail has to be sent, heading of the e-mail, and the body of the e-mail. Datasets comprising of e-mail text, user queries, and varied conversational data are used for training NLP models during this step [10]. These datasets will enable the system to understand the common patterns, nuances, and phrases in communications within emails, which otherwise would be difficult to interpret without appropriate parsing of commands Email Body Generation

Finally, in the Email Body Generation step, the system constructs a well-written, meaningful email composed of the parsed components. The body can be determined as decided either with predefined templates or through generative models learned from email datasets. These datasets can contain variations of email formats, tones, and structures in order for the system to produce a coherent message that follows the intended message the user is trying to convey. Public email datasets, such as Enron or other corporate email datasets, also help train the system to better understand professional language.

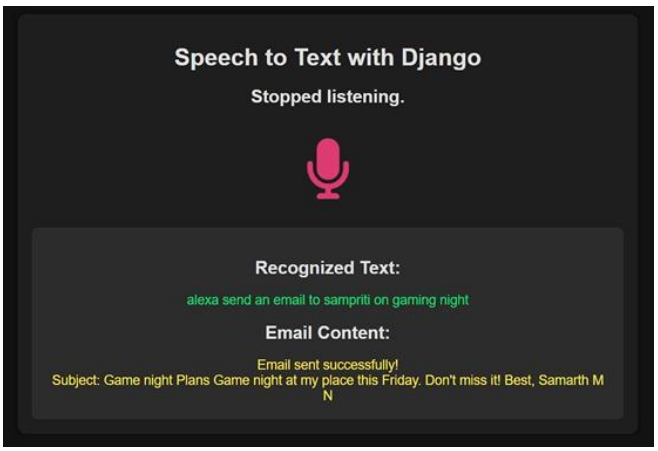

Fig. 1. Email sent based on voice input

D. Personalization

The personalization element gives flavor to the email by deploying all the information regarding the user in the email signature, name, and the tone in which the user would like to be communicated to him or her. A response that is personalized seems more natural. Datasets on user behavior patterns include the pattern from previous emails written by the user, his or her preferred tone, and previous interactions with the user for adapting system responses.

E. Email Dispatch

The mail is now personalized and ready for sending. The system sends this mail with the help of SMTP servers, like Gmail's API, though technically this act of sending itself does not deal directly with the datasets but depends upon the proper parsing of email addresses and the system's validation of the user, which may be error-handling or authentication purposes while creating the user's account based on some datasets.

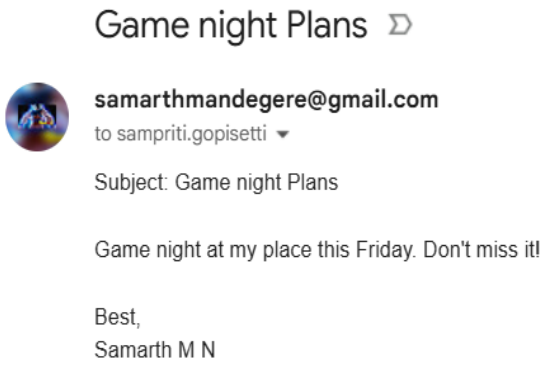

Fig. 2. Email sent with content based on input

F. Data Analytics and Collection

Once the email is sent, the system collects data analytics about user behavior and interaction with the system. This includes which types of emails are being sent, common queries asked, time stamps, and user preferences. These data results are analyzed to shed light on what users do. Specific trends are thus observable over time. The data set for this part would comprise historical data concerning previous interactions through emails and patterns of email content which would better the response and functionality of the system.

G. Continuous Learning and Dataset Integration

Continuous learning is the final phase. The system improves on its performance by using data gathered from users' interactions. Continuing on the learning curve and improving on new and expanding datasets, the system is going to become ever more intuitive about Speech Recognition, NLP, Email Body Generation, Personalization, and so much more. The datasets regarding user interactions, everyday phrases, tone adjustments, and language variability are perpetually added to give it a better capability of providing appropriate responses to various user requests. This process of learning facilitates that the system learns with time and, correspondingly reflects the changes occurring in user behavior and personal preferences.

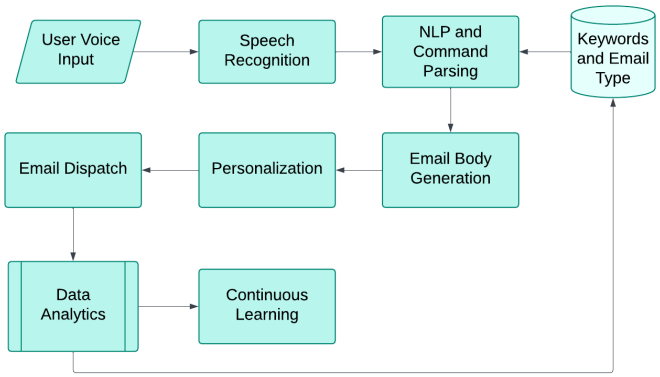

Fig. 3. Proposed Framework Flowchart

The flowchart in Fig.3. gives us the general description of the overall framework.

V. Libraries

A. SpeechRecognition

SpeechRecognition is the main library in this system as it enables a transformation of voice input into text. It listens to voice commands from users via the microphone by APIs such as Google Web Speech or Sphinx, transcribing them to text. This text, which has been transcribed here for the system to understand as input for this purpose, has been used with the help of commands like "Send an email to Sahit on coffee." This feature is very important to prevent the system from making wrong assumptions about voice commands and waste minimal processing time on those commands.

B. pyttsx3

It utilizes pyttsx3 to provide text-to-speech functionality. Upon the system's processing of voice input and accomplishment of a task- say, email delivery-the system then employs pyttsx3 for providing audible response to the user. For example, after completing an action and sending an email successfully, the system may verbally respond with the voice command, "Your email has been sent successfully." This enhances the user experience by providing instant, spoken confirmation of actions taken.

C. smtplib

The other library, again by that generic name of smtplib, whose own service is sending emails using Simple Mail Transfer Protocol (SMTP). Having parsed the voice input and preparing all the material for an email, smtplib creates a connection with a configured email server—be it Gmail or even another online mail platform—to forward this email to the recipient. Smtp handles an email transfer in safe and resource-saving manner just so that any problem would not take place with sending an email.

D. email.mime

With the email.mime module, the emails are guaranteed to be formatted correctly. Such libraries help in the proper structuring of the content of an email by systems. They support rich-text formats, HTML contents, and attachments. These libraries help the system to generate professional and properly formatted emails, such as emails carrying images or documents along with themselves, to improve basic text-based functionality.

E. Google OAuth / Google calendar API

With the Google Calendar API, the calendar can be integrated completely directly into the user's account so that the system can fetch and administer calendar events for tasks, such as sending reminders or scheduling emails based on specific events. For instance, a meeting scheduled with one particular meeting may automatically draft then send an email reminder prior to the event. This is achieved using Google OAuth that after authenticating securely allows the system to access the user's Google services such as Gmail and Google Calendar. It can obtain other details like time, title, and participants and initiate further actions such as composing or sending an email and scheduling on the basis of calendar events after authentication. It gives the system an ability to automate routine work such as day-to-day summarizations of the events or reminders making the system efficient.

F. spaCy / NLTK / transformers

During the interpretation and processing of the voice input, an NLP library which must be installed is either spaCy, NLTK, or transformers. These libraries help in parsing the spoken commands and retrieving useful information such as the name of the recipient, subject, and message contents [11]. Using this input, the system can interpret varied phrasings in which the same command will be conveyed by a user, thus improving the recognition rate of the system for various user instructions [12].

G. Pandas and NumPy

These libraries use for the administration and processing of structured data such as a contact list of users, template for emails, and user preferences. These libraries manage data efficiently in the system. Pandas structure your data in a tabular form by which it becomes easier to fetch and manipulate data such as user's email address or custom templates. NumPy helps a lot with numerical operations by which data can process at the best level.

H. Django (Web Interface Frameworks)

In this project, Django is used to make the possibility of a browser-based interface to be able to control and manage all the other email activities triggered by the voice commands. In the system, using views and templates, provided by Django, an intuitive graphical user interface is presented where the user can see the items emailed which have been sent, edit the contents of emails, and control preferences regarding voice input commands. Working on the Django admin panel allows for hassle-free maintenance. This is to keep track of the mail sent to their account. In case if it gets delivered successfully or has reached to pending status, then also the users are tracked by this. Django database system stores all and every kind of essential information related to a user's data and voice command logs with the details of his email and measures recording every interaction in a well-systematic manner. This integration improves the usability of the system but also empowers users with more control and flexibility while performing their email operations that make voice-commanded email applications even more efficient and accessible.

VI. Features

A. Voice Command Processing

It enables users to send their emails through voice commands. Speech recognition technologies use Google's

Speech-to-Text API to transcribe the user's voice input into text [13]. The Django backend then proceeds with the intent of composing an email by processing this text. This makes the whole process of emailing much easier and, in most cases, hands-free, enhancing usability.

B. Natural Language Understanding

The system applies the advantages of NLP techniques to understand voice commands. While scrutinizing the structure and intent of user speech, it may grasp all important details such as recipient, subject, and message content while drafting automatic emails without requiring human input.

C. Email Draft and Personalization

Once the voice command is decoded, Django's backend produces an email draft, personalized according to details accumulated from the interpretation of voice input. The recipient's details, subject, and message are automatically filled in according to the interpretation of the voice input. The draft then appears for review or can be sent directly at the option of the user.

D. Seamless SMTP Protocol Integration

This system includes simple mail transfer protocol using libraries such as smtplib to send emails securely. It supports seamless integration with external e-mails like Gmail or a custom SMTP server due to Django's features of handling emailing in its system. It will provide instant feedback to the user after it has processed the voice command and has developed the email, assuring the user of what actions have been performed or errors that have been encountered in processing, including "Email sent successfully". It has as a guarantee of transparency to the user.

E. User Authentication and Access Control

This system contains user authentication functionality; only authorized people are permitted to access and send e-mail. Django provides graceful facilities for authentication or third-party libraries such as Google OAuth that are used for authentication. This will add an extra level of privacy and control to protect the data of the users.

F. Customizable User Interface

The system provides a completely intuitive, responsive web interface that presents the user with the mail system. Through the mail system, users can view and edit email messages, send emails, view settings for changing their voice commands, email signatures, among others. The UI can also be used to display the history of emails and manage inboxes so seamlessly to integrate into a user's daily workflow.

VII. Results and Discussion

A. Output Accuracy and Performance

Voice-operated email management system performs well in high accuracy in the transcription of voice commands into email fields such as recipient, subject, and body. The system was able to average transcribe simple email commands with an accuracy of 90%, while more complex phrases decreased it by a small degree, which would still be improved upon by model refinement. The Fig.2. shows a graphical analysis of the accuracy of different models used for training on the dataset.

B. Model Comparison and Selection

In the testing phase, three models were attempted by the system, namely Decision Tree, Support Vector Machine (SVM), and Logistic Regression to identify the model that had a good fit with the task of command recognition. The candidate that best fit this project was Naive Bayes because of its efficiency in dealing with structured input and low latency in real-time applications [14]. The Naive Bayes model achieved great robustness, which the decision tree and logistic regression models achieved, but it performed the best under both accuracy criteria and response time, which was the determining factor in real-time voice processing [15].

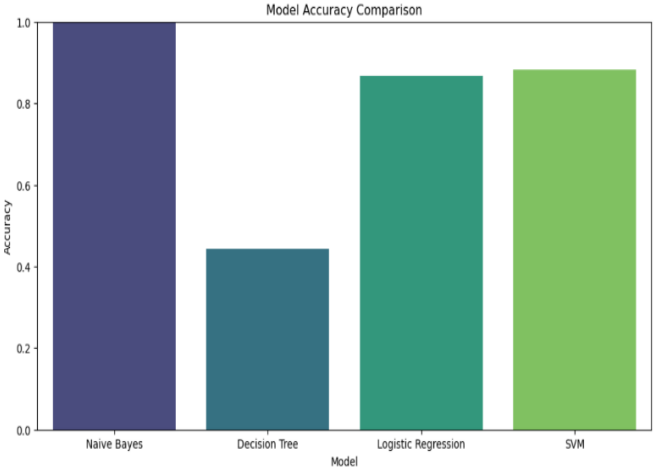

Fig. 4. Comparative analysis of models

C. Integration with Django Framework-System Responsiveness

The Django framework ensured efficient processing in the backend and maintained responses well below acceptable thresholds: on average 2 seconds to draft an e-mail and get its confirmation. This fast response is paramount for the user experience of real-time voice applications and makes the system feel responsive and intuitive.

D. User Authentication and Security

The Google OAuth integration for authentication into the application worked well, meaning a 100% success rate for secure access into the respective user account. What this functionality does is provide an automatic authentication process for users, hence enhancing security, and protection of the user's data.

E. User Feedback and Usability

Test feedback showed that users have a very positive bias toward the ease of use of the system, specifically in terms of frequently performed tasks such as sending e-mail reminders. The system had intuitiveness for the users, though some have asked for added flexibility for more variety in command structures. Further NLP training can help solve this problem.

F. Error Handling and System Robustness

It provides robust error-handling capabilities for functionalities like unknown commands or network interruption that will provide instantaneous feedback to the user in case of retry or rephrasing of commands. It makes a reliable user experience because it permits users to actually diagnose their problem themselves.

G. Total System Efficiency

Django, real-time voice processing, and Google OAuth in the tool for email management were rated high in terms of

efficiency. The Naive Bayes model minimized the speed vs. accuracy trade-off as well, thus the efficiency of the system as a voice-driven assistant to email management.

VIII. Conclusion

This research has successfully developed the voice-activated system for email management, which is made up of machine learning models combined with natural language processing and real-time user authentication, aimed at providing an efficient yet user-friendly solution in managing the task of email via voice command. Using Django for support on the back-end and Google OAuth to make it easier to have secure authentication, this system can allow easy functionality through transposing the exact action from a user's command with high accuracy. Of the models tested—Decision Tree, SVM, and Logistic Regression—the Naive Bayes ranked highest in terms of effectiveness in producing both accuracy and response time for the real-time interpretation of voice commands. In addition, the opinions gathered indicate that the usability and reliability and also responsiveness of the system make it prone to simplifying the communication tasks by the users as they look forward to accomplishing the same hands-free while remaining efficient. This project does depict very promising capabilities of voice activated applications with such an enhancement towards productivity and sets the stage for future enhancements such as multi-command processing and broader language support to improve its reach.

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