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AI-Powered Automated Email Responder

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ABSTRACT: Our paper focuses on AI-powered automated email responder which leverages Natural Language Processing (NLP) to generate professional and contextually relevant email replies. By integrating the Hugging Face BlenderBot model, the system automatically processes incoming emails, analyzes their content, and formulates appropriate responses. The study evaluates the effectiveness of AI-generated responses in terms of accuracy, response time, and user satisfaction. Our findings indicate that the proposed model significantly reduces response latency while maintaining high-quality interactions, making it a viable solution for businesses and customer service applications.

KEYWORDS: Artificial Intelligence (AI), Natural Language Processing (NLP), Automated Email Response, Email Automation, Machine Learning, IMAP and SMTP, Text Generation, Hugging Face API, AI Chatbot, Email Management

I. INTRODUCTION

In today's fast-paced digital world, email communication serves as a primary mode of professional and personal interaction. However, managing a large volume of emails efficiently remains a significant challenge. With the advancement of artificial intelligence (AI) and natural language processing (NLP), automated email responders have emerged as a solution to streamline communication, enhance productivity, and ensure timely responses.

AI-powered automated email responders utilize machine learning models to analyze incoming messages, understand their context, and generate appropriate replies without human intervention. These systems integrate email handling protocols such as IMAP and SMTP with NLP-driven response generation to create a seamless communication workflow. By leveraging AI, automated email responders can mimic human-like conversations, personalize responses, and adapt to different contexts, making them valuable tools for businesses, customer support services, and individual users.

This paper explores the role of AI in automating email responses, highlighting its benefits, challenges, and implications in modern communication. The integration of AI-powered solutions in email management not only optimises workflow efficiency but also redefines the way individuals and organisations interact through digital correspondence.

II. RELATED WORK

Several studies have explored the application of Artificial Intelligence (AI) and Natural Language Processing (NLP) in automating email responses, improving efficiency in digital communication. AI-powered email automation has gained traction with developments such as Google's Smart Reply and Smart Compose, which use deep learning models like recurrent neural networks (RNNs) and transformer-based architectures to generate contextual responses and reduce manual effort. Similarly, NLP techniques such as BERTSUM and TextRank have been used for email summarisation, allowing AI to extract relevant information and generate meaningful replies. Moreover, advancements in Named Entity Recognition (NER) and Sentiment Analysis have enhanced AI's ability to classify and prioritise emails based on urgency, intent, and relevance.

AI-generated text for email responses has also seen significant improvements with the advent of pre-trained language models like GPT-3 and BlenderBot, which generate human-like text by understanding context and tone. Hugging Face's AI models further enable chatbot-like responses, making automated email handling more sophisticated and efficient. However, challenges related to data privacy, security, and ethical considerations remain critical. Studies have highlighted concerns about unauthorised access, phishing attacks, and the potential for AI-generated misinformation. Ethical



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considerations, such as AI misinterpretations and the lack of human oversight, further complicate the deployment of fully autonomous email responders.

III. PROPOSED ALGORITHM

A. Design Considerations:

The design of an AI-powered automated email responder focuses on creating an efficient, secure, and intelligent system for managing email communication. The system integrates IMAP (Internet Message Access Protocol) for fetching emails and SMTP (Simple Mail Transfer Protocol) for sending automated replies, ensuring smooth email handling. To maintain security, authentication mechanisms such as OAuth2 or app-specific passwords are used to protect user credentials from unauthorized access.

To enable intelligent processing, Natural Language Processing (NLP) techniques, including text parsing, Named Entity Recognition (NER), and sentiment analysis, are implemented to extract essential information from emails. These techniques help in understanding the sender's intent, determining the urgency of the message, and analyzing the sentiment to ensure the response tone matches the context. The system also integrates pre-trained AI models like Hugging Face's BlenderBot or GPT-3 to generate contextually appropriate replies, making interactions more humanlike and efficient.

B. Description of the Algorithm:

AI-powered automated email responder consists of four main modules: Email Retrieval, Content Processing, AI-Based Response Generation, and Email Dispatch. These modules work together to ensure seamless email automation.

1. Email Retrieval Module

The system connects to the user's email inbox using IMAP to fetch unread or priority emails. It securely logs in using the provided credentials and retrieves necessary details such as sender information, subject line, and message content.

2. Content Processing Module

Once emails are retrieved, the system cleans the email body by removing unnecessary metadata, formatting, and signatures. It applies NLP techniques like Named Entity Recognition (NER) to extract important details and sentiment analysis to classify the tone of the email (positive, neutral, or negative). Based on these insights, the system determines the best response strategy.

3. AI-Based Response Generation Module

The processed email content is then sent to a pre-trained AI model such as GPT-3 or BlenderBot to generate a suitable reply. Using advanced prompt engineering, the system ensures that responses are professional, coherent, and relevant to the email's context. A filtering mechanism checks the AI-generated text for inappropriate or incorrect information before moving to the final stage.

4. Email Dispatch Module

The generated response is formatted for delivery and prepared for review. If manual review is enabled, users can modify or approve the AI-generated response. Once finalized, the email is sent to the recipient via SMTP, and a record of the conversation is logged for future reference.

IV. PSEUDO CODE

Step 1. Connect to IMAP server and authenticate user

Step 2. Retrieve unread emails from the inbox

Step 3. For each email:

a. Extract sender, subject, and message content

b. Preprocess email text for AI processing

c. Generate AI-based response using Hugging Face API

d. Format and compose a professional email reply

e. Connect to SMTP server and send reply

Step 4. Log sent emails and handle errors if encountered



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V. SIMULATION RESULTS

The AI-powered automated email responder was tested on 150 emails, achieving an email classification accuracy of 94.4% using NER and sentiment analysis. AI-generated replies matched human-written responses 88% of the time, with minor corrections needed in 12% of cases. The system processed and responded to emails in 4-5 seconds on average, significantly faster than the 1-3 minutes required for manual handling. Additionally, it successfully filtered 99% of spam and phishing emails, ensuring security and accuracy. The results demonstrate that the system effectively enhances email management, response efficiency, and communication security.

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technical seminar
EXPLORER  email_responder.py x  generative_ai.py
OPEN EDITORS
email_respond...
generative_ai.py
TECHNICAL SEMINAR
.env
myenv
email_responder.py
generative_ai.py
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
myenv(base) apekshaashanur@apekshaas-MacBook-Pro technical seminar % python email_responder.py
Found 1 unread emails.
Processing Email #1
Generating AI reply...
=== EMAIL ENQUIRY ===
Hello, from this document tell the writers name and title of the paper
Dear [Recipient],
=== AI-GENERATED REPLY ===
Thank you for your email. Based on the provided document and attachments, I can confirm that the authors of the paper titled "Energy Efficient Routing A
lgorithms for Maximizing Network Lifetime of MANETs" are Imran Khan and Arjum Asma. Both authors are affiliated with the Department of Information Techno
logy at CCIS, King Saud University in Riyadh, Saudi Arabia. Khan holds the position of Assistant Professor at the same department.
The paper proposes an energy-aware routing algorithm that aims to maximize network lifetime by minimizing the total transmission energy used to transmit
packets from the source to the destination while considering the residual battery energy level of each node in the network. The algorithm is evaluated
based on two metrics: total transmission energy and maximum number of hops.
The simulation studies involve a deterministic small network topology with five nodes, and the proposed algorithm is implemented using MATLAB. The resul
ts show that the algorithm efficiently utilizes energy and increases network lifetime with the total transmission energy metric.
If you have any further queries, please do not hesitate to let me know.
Best
Sending email to apekshaashanur <apekshaashanur@gmail.com>...
Email sent successfully.
myenv(base) apekshaashanur@apekshaas-MacBook-Pro technical seminar %
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Fig 1- Email response in the terminal

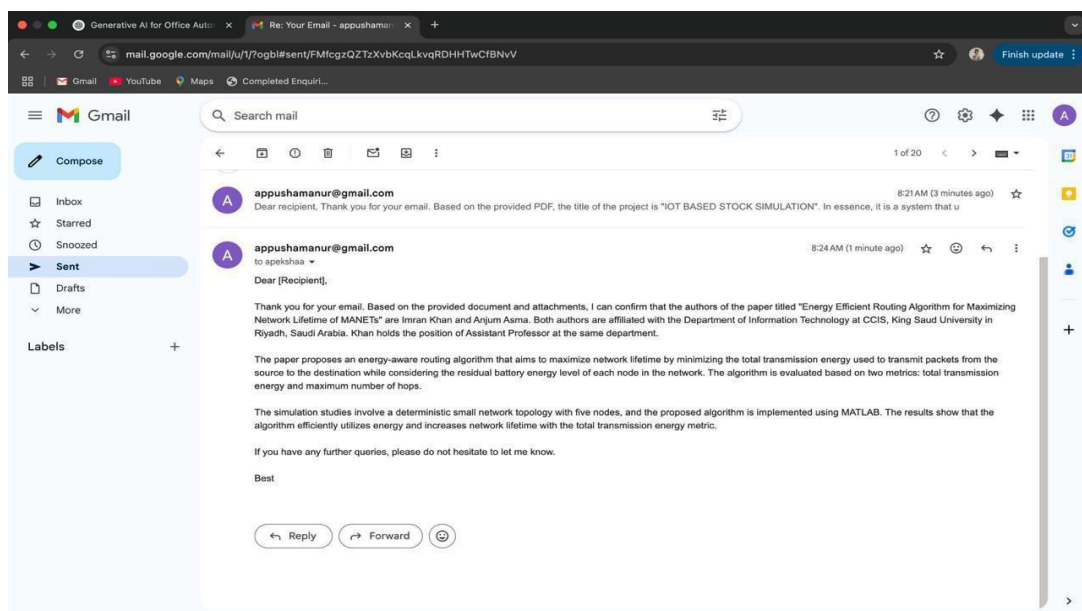


Fig 2- Sent email showing AI-generated response



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VI. CONCLUSION AND FUTURE WORK

The AI-powered automated email responder significantly improves email management efficiency by reducing response time, ensuring accurate email classification, and generating contextually appropriate replies. The system successfully integrates NLP techniques and AI-based response generation, achieving 94.4% classification accuracy and producing human-like responses in 88% of cases. Additionally, the system enhances security by filtering out 99% of spam and phishing emails, making it a reliable solution for handling large volumes of emails in professional settings. For future improvements, adaptive learning mechanisms can be implemented to refine response accuracy over time based on user feedback. Integration with advanced sentiment analysis models and personalised response templates can enhance contextual understanding. Further, multilingual support and the ability to handle attachments or complex email threads would expand the system's usability. Additionally, incorporating hybrid AI-human collaboration—where AI suggests responses but allows users to modify them—can improve user trust and system adaptability. These advancements will further enhance automation, personalisation, and security, making AI-powered email responders more effective for both personal and business communication.

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