International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Smart Unified Email Aggregator with Priority Highlighting and Spam Filtering

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Abstract

Email serves as a vital channel for professional, academic, and personal exchanges today, yet handling accounts across diverse platforms like Gmail, Outlook, and Zoho Mail poses growing difficulties. The surge in spam, promotional content, and low-value messages clogs inboxes, frequently burying critical, urgent correspondence. This paper introduces a Smart Unified Email Aggregator featuring priority-based highlighting and advanced spam detection. It consolidates messages from various providers into one streamlined dashboard. By leveraging machine learning, the system identifies spam versus legitimate emails and sorts the latter into key, promotional, and personal categories via content scrutiny and confidence scoring. This approach boosts inbox efficiency, ease of use, and overall productivity.

Keywords: Email aggregation, spam filtering, priority classification, machine learning

I. INTRODUCTION

Email has become indispensable for professional, academic, and personal interactions in our digital age. As online services proliferate, people routinely juggle accounts across platforms like Gmail, Outlook, and others, gaining convenience but facing mounting organizational hurdles. The relentless stream of incoming messages from diverse sources overwhelms inboxes, hindering users' ability to spot and act on vital communications amid the clutter.

This deluge has intensified lately, fueled by automated notifications, marketing , newsletters, and spam. Crucial updates—such as deadline reminders, meeting invites, financial alerts, job interviews, or official notices—often get lost in the noise of trivial content. While conventional email clients provide rudimentary filters, they fall short on smart prioritization tailored to urgency, relevance, or individual preferences, leading to overlooked opportunities, delayed replies, and productivity dips.

To tackle these issues, this paper proposes a Smart Unified Email Aggregator with Priority Highlighting and Spam Filtering. The system pulls emails from various providers into a single, intuitive dashboard via the IMAP protocol, offering secure, real-time synchronization without the need to toggle between apps. Machine learning drives spam detection, automatically quarantining junk while dissecting legitimate emails by content, sender details, and confidence scores to sort them into important, promotional, or personal buckets.

Beyond classification, it applies high-, medium-, and low-priority labels to flag time-sensitive items for instant focus. Additional innovations like email summarization, voice readout, and proactive reminders boost accessibility and ease. Built as a Streamlit web app, this solution streamlines inbox management, cuts manual work, and elevates communication effectiveness.

II. LITERATURE REVIEW

A thorough literature review helps pinpoint established methods in email management and reveals unmet needs that justify innovative solutions. Numerous works explore machine learning for spam detection, classification, and prioritization. This section examines key studies, highlighting their contributions and shortcomings relative to our proposed system.

A. Machine Learning for Smart Email Handling

In "A Smart Email Management Framework Using Machine Learning" (IEEE Access, 2021) , researchers introduce a framework blending spam filtering, categorization, and priority scoring to combat inbox overload. Their machine learning models parse email content to gauge importance, demonstrating clear gains in productivity and reduced manual sorting. Yet, the approach centers on classification alone, overlooking multi-provider integration or user-focused tools like unified views and accessibility aids.

B. Techniques for Email Classification and Prioritization

The paper "Search and Discovery in Personal Email Collections" (Foundations and Trends in Information Retrieval, 2021) investigates information retrieval and classification strategies for taming vast personal email archives. It emphasizes content analysis, metadata, and user behavior to sharpen search accuracy, underscoring how organized inboxes speed up finding key messages.

While insightful for discovery tools, this work prioritizes retrieval over live spam blocking or dynamic priority flags. It sidesteps multi-account unification and smart inbox displays—critical for users spanning platforms.

C. Rationale for Our Approach

Prior research validates machine learning's power for email sorting and spam control, but gaps persist. Many solutions stick to single-platform setups, ignoring seamless aggregation across services. They also rarely offer confidence-driven prioritization, summaries, voice playback, or smart reminders, leaving a divide between theory and daily demands.

Our Smart Unified Email Aggregator bridges these voids by merging multi-provider emails into one dashboard, powered by machine learning for filtering, sorting, and prioritization. With extras like summarization, audio reading, and alerts, it advances the field toward a holistic, intuitive tool for today's email challenges.

III. PROPOSED SYSTEM

The proposed Smart Unified Email Aggregator streamlines management of multiple accounts via a single, intelligent interface. Its core aim: cut through inbox chaos to boost productivity by smartly filtering spam, sorting messages, and spotlighting critical ones.

Emails pull from providers like Gmail, Outlook, and Zoho Mail through the IMAP protocol, ensuring secure, live syncing without touching original inboxes. Once gathered, preprocessing strips away noise, feeding data into machine learning classifiers that separate spam from legitimate mail. Junk gets auto-binned, freeing users to engage with what matters.

Legitimate emails undergo deeper scrutiny—scanning keywords, sender details, and subject lines—to slot them into important, promotional, or personal folders. A confidence-driven scoring system then tags them high, medium, or low priority, pushing urgent items to the top of the unified view for instant visibility.

Usability shines with extras like concise email summaries, voice narration of key points, and nudge alerts for top-priority messages. Built as a Streamlit web app, it delivers an intuitive, responsive dashboard. This

blend of automation and simplicity transforms fragmented email handling into a seamless, efficient experience.

IV. SYSTEM ARCHITECTURE

The system architecture of the Smart Unified Email Aggregator is designed to support efficient email retrieval, intelligent processing, and user-friendly presentation. The architecture follows a modular approach to ensure scalability, clarity, and ease of integration across multiple email service providers.

The email retrieval module connects to different email platforms such as Gmail, Outlook, and Zoho Mail using the IMAP protocol. This module securely fetches emails in real time and forwards them to the processing layer without altering the original mailboxes. The preprocessing unit cleans the email content by removing unnecessary formatting, symbols, and metadata to prepare it for analysis.

The classification module applies machine learning techniques to categorize emails into spam and non-spam. Spam emails are filtered out automatically, while non-spam emails are passed to the prioritization module. This module analyzes email content, sender details, and subject information to assign categories such as important, promotional, or personal, along with priority levels including high, medium, and low.

The processed emails are displayed through a web-based user interface developed using Streamlit. The interface presents a unified inbox with clear priority indicators, summaries, and alerts, enabling users to access and manage all emails efficiently from a single dashboard.

V. METHODOLOGY

The methodology centers on automated email fetching, smart classification, and priority-driven sorting. It starts with IMAP-based retrieval from multiple providers, delivering secure, live access to mailboxes while leaving source data untouched.

Fetched emails enter preprocessing, where noise like HTML tags, symbols, and excess metadata gets stripped away. Cleaned content converts to structured vectors via feature extraction—drawing from subjects, bodies, senders, and keyword patterns—for machine learning readiness.

A classifier then splits spam from legitimate mail, auto-quarantining junk. Valid emails advance to categorization (important, promotional, personal) based on content cues and features, with confidence scores dictating high, medium, or low priority tags.

Organized results feed into a unified dashboard, augmented by summaries, voice playback, and reminder nudges to sharpen focus on urgent items.

VI. IMPLEMENTATION AND RESULTS

The proposed system is implemented as a web-based application using Python, with Streamlit employed for building an interactive and user-friendly interface. Email retrieval is performed using the IMAP protocol, enabling secure access to multiple email accounts without modifying the original mailboxes. Machine learning libraries are used to implement spam detection and email classification models, while text processing techniques handle feature extraction and content analysis.

During implementation, emails fetched from different providers are processed in real time and classified into spam and non-spam categories. Non-spam emails are further categorized into important, promotional, and personal groups based on content relevance and confidence scoring. Priority levels such as high, medium, and low are assigned accordingly, and the results are displayed in a unified inbox view.

Additional features such as email summarization, voice-based reading, and alert notifications are integrated to enhance usability.

The results demonstrate that the system effectively reduces inbox clutter by filtering spam emails and highlighting important messages. Priority-based organization improves visibility of time-sensitive emails, while summarization and voice features help users quickly understand email content. Overall, the implementation confirms that the proposed system provides an efficient and practical solution for unified and intelligent email management.

VII. CONCLUSION

This paper presented a Smart Unified Email Aggregator designed to simplify email management across multiple service providers. By integrating emails into a single dashboard and applying machine learning techniques for spam filtering, categorization, and priority assignment, the system effectively reduces inbox clutter and improves email visibility. The inclusion of features such as summarization, voice-based reading, and alert notifications further enhances usability and accessibility.

The implementation results demonstrate that the proposed system successfully identifies important emails and ensures timely user attention through priority highlighting. By offering an organized, intelligent, and user-friendly solution, the system improves communication efficiency and supports users in managing large volumes of emails more effectively. Future enhancements may include support for additional email services, improved learning models, and personalized user preferences.

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