AI Email Assistant

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Abstract

This paper describes the design and implementation of an AI Email Assistant system, with an emphasis on applying the principles of HAIID. The project demonstrates how machine learning can augment human capabilities in email processing while maintaining user control, transparency, and ethical considerations. Building on the seminal work of Licklider (1960) and Horvitz (1999), we present a system that embodies the concept of "human-computer symbiosis" through mixed-initiative interactions.

I   Introduction

An AI-powered email assistant helps users process incoming emails more efficiently by providing:

- A concise summary of the email

- Identification of key tasks

- A draft response template

- User-controlled editing and feedback mechanism

As *Licklider (1960)* envisioned in "Man-Computer Symbiosis," our system aims to create "a partnership that will think as no human brain has ever thought and process data in a way not approached by the information-handling machines we know today." This achieved through careful application of HAIID principles that balance automation with human control

II   System Overview

A.   Core Functionality

The system architecture consists of three main components:

1. **Backend (FastAPI)**:

   - `/analyze` endpoint connecting to YandexGPT.Lite (temperature 0.2 for consistent responses)

   - Returns structured JSON with summary, tasks, and reply draft

   - `/feedback` endpoint for user improvement suggestions

2. **Frontend**:

   - Clean UI with Inter font for readability

   - Input field for email text

   - Display sections for summary, tasks, and draft reply

   - Action buttons: "Analyze," "Copy," "Edit," "Clear All," "Send Feedback"

3. **Interaction Flow**:

   - User pastes email → system analyzes → presents interpretation → user reviews/edits → optional feedback

B. Design Philosophy

Following *Horvitz's (1999)* principles of mixed-initiative interfaces, the system is designed to:

- "Consider the costs and benefits of action" (never auto-sends emails)

- "Employ policies that constrain the cost of poor timing" (explicit user initiation)

- "Use models of user's attention and goals" (focused task identification)

III Application of HAIID Principles

A. Explainability and Interpretability

Implementation:

- Structured JSON output clearly separates summary, tasks, and reply

- Visual distinction between system-generated content and user-editable areas

- Persistent disclaimer: "Model may make mistakes - please verify"

Principle Alignment: This addresses the "Explain for understanding" principle by making the model's interpretation explicit through clear JSON format that enables unambiguous interpretation.

B. User Supervision and Control

Implementation:

- Draft replies are never sent automatically

- Prominent "Edit" button before any copy action

- "Clear All" function resets the interface completely

Principle Alignment: Embodies the "Let users supervise automation" principle through manual draft editing with Copy button instead of Send. This creates what Horvitz calls "a balance between user control and system initiative."

C. Confidence Communication

Implementation:

- Textual confidence indicators ("High confidence") rather than numeric scores

- Temperature set to 0.2 to reduce hallucinations

- Visual distinction between high-confidence and speculative suggestions

Principle Alignment: Implements model confidence communication through text labels showing "Confidence: High" instead of probability numbers.

D.   Ethical and Privacy Considerations

Implementation:

- No email content stored server-side

- IAM keys secured in environment variables

- Clear disclaimer: "Your text is not saved on the server"

Principle Alignment: Addresses multiple principles:

- Transparency about privacy via explicit data handling statements

- Prevention of potential pitfalls by preventing data leaks

- Safe exploration through demo-friendly design

IV   UI/UX Design Choices

A.   Accessibility Features

- Focus rings for keyboard navigation

- aria-labels for screen readers

- Simple, consistent layout

B.   Interaction Patterns

- Single primary action ("Analyze") per screen

- Progressive disclosure of information

- Immediate visual feedback (spinner during processing)
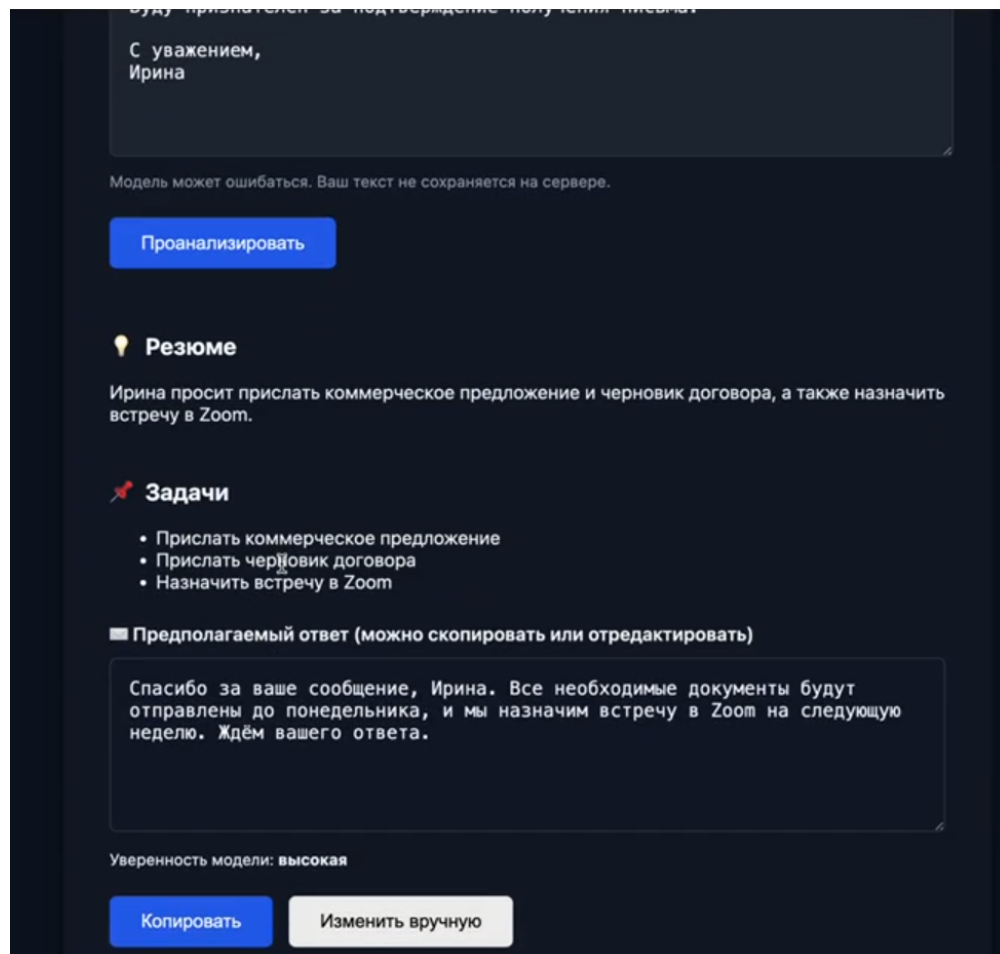
- Undo capability via "Clear All"

Fig. 1. AI Email Assistant interface shows input field, analysis results, and action buttons

V   Stakeholder Considerations

The system serves three key stakeholders:

- **End Users**:

  - Reduced cognitive load for email processing

  - Maintained control over communication

  - Clear expectations about system capabilities

- **Developers**:

  - Easy-to-test API endpoints

  - Clear separation of concerns

  - Maintainable architecture

- **Email Recipients**:

  - Higher quality responses

  - More timely replies

  - Reduced misunderstandings

VI   Lessons Learned and Reflections

Through this project, several key insights emerged about HAIID:

1. **Augmentation Over Automation**: The most successful features were those that augment rather than replace the user, validating the importance of human oversight.

2. **The Value of Constraints**: Limiting the system to specific, well-defined tasks (email interpretation rather than full management) improved both usability and reliability.

3. **Transparency Builds Trust**: Users engaged more willingly when the system's limitations were openly acknowledged ("the model may make mistakes").

4. **Mixed-Initiative Balance**: Finding the right balance between system suggestions and user control required multiple iterations to perfect.

VII   Conclusion

The AI Email Assistant project demonstrates how careful application of HAIID principles can create systems that truly augment human capabilities while respecting user autonomy. By combining Licklider's vision of symbiotic human-computer partnerships with modern interaction design principles, we've created a tool that helps users quickly understand emails without removing them from the decision-making process.

Future improvements could include:

- User-customize template

- Multi-language support

- Integration with actual email clients

This project serves as a practical example of how theoretical principles from HAIID research can be translated into functional, user-centered system that respect both human capabilities and limitations.

References

1. Licklider, J.C.R. (1960). "Man-Computer Symbiosis". IRE Transactions on Human Factors in Electronics.

2. Horvitz, E. (1999). "Principles of Mixed-Initiative User Interfaces". Microsoft Research.

3. Course materials from HAIID.