NoteNest - An Intelligent Notes App

Your Name

October 17, 2024

Abstract

This report presents the design and evaluation of *NoteNest*, a web-based notes app that focuses on categorizing notes and managing tasks. The app features two hard-coded tasks: categorizing notes and managing tasks, with AI-enhanced solutions. User interviews and a questionnaire were used to define the requirements. The results from user testing show that AI-based automation improves task efficiency and accuracy.

Contents

1 Introduction

Note-taking is a common task for students and professionals. *NoteNest* aims to simplify note-taking with two core functionalities: note categorization and task management. By integrating AI, we enhance these tasks to reduce cognitive load and improve user satisfaction. This report details the development, requirement extraction, and user testing of the system's usability.

2 Requirement Extraction

We employed a mixed-method approach—user interviews and an online questionnaire—to identify core user needs. Interviews gave qualitative insights, while the questionnaire provided quantitative data on feature preferences.

2.1 User Interview Insights

Four university students aged 18-24 shared their note-taking habits and frustrations:

Zep, 18: Uses notes for lectures and to-do lists. Prioritizes faster retrieval and synchronization. **Katrina, 19**: Uses GoodNotes and Google Docs, values organized notes and color-coding. **Tjebbe, 23**: Uses Obsidian for coding-related notes, needs customization and device sync. **Feriel, 24**: Uses OneNote and Word, focusing on searchability and security for sensitive data.

2.2 Online Questionnaire Insights

We distributed a questionnaire to gather broader feedback. Participants rated features related to interface design, note-taking, task management, and AI-enhanced functionalities. This provided insights into user preferences and the perceived value of AI features.

2.3 Extracted Requirements

Based on both the interviews and questionnaire, the following core requirements were identified:

2.3.1 Non-AI Requirements

- Intuitive Interface: Simple layout, consistent design, and context-sensitive help.
- Quick Capture: Prominent "New Note" button, instant note creation.
- Organization: Folder structure, tagging, search functionality.
- Task Management: Manual task highlighting, completion tracking.
- Formatting Options: Basic text formatting, bullet points, attachments.
- Sync and Accessibility: Cross-device synchronization.

2.3.2 AI-Enhanced Requirements

- Intelligent Categorization: Automatically categorize notes and suggest relevant tags based on content.
- Smart Task Extraction: Automatically detect actionable items from notes and convert them into tasks.

3 Low-Fidelity Prototype

A low-fidelity prototype was designed to visualize the folder-based note categorization and task management system.

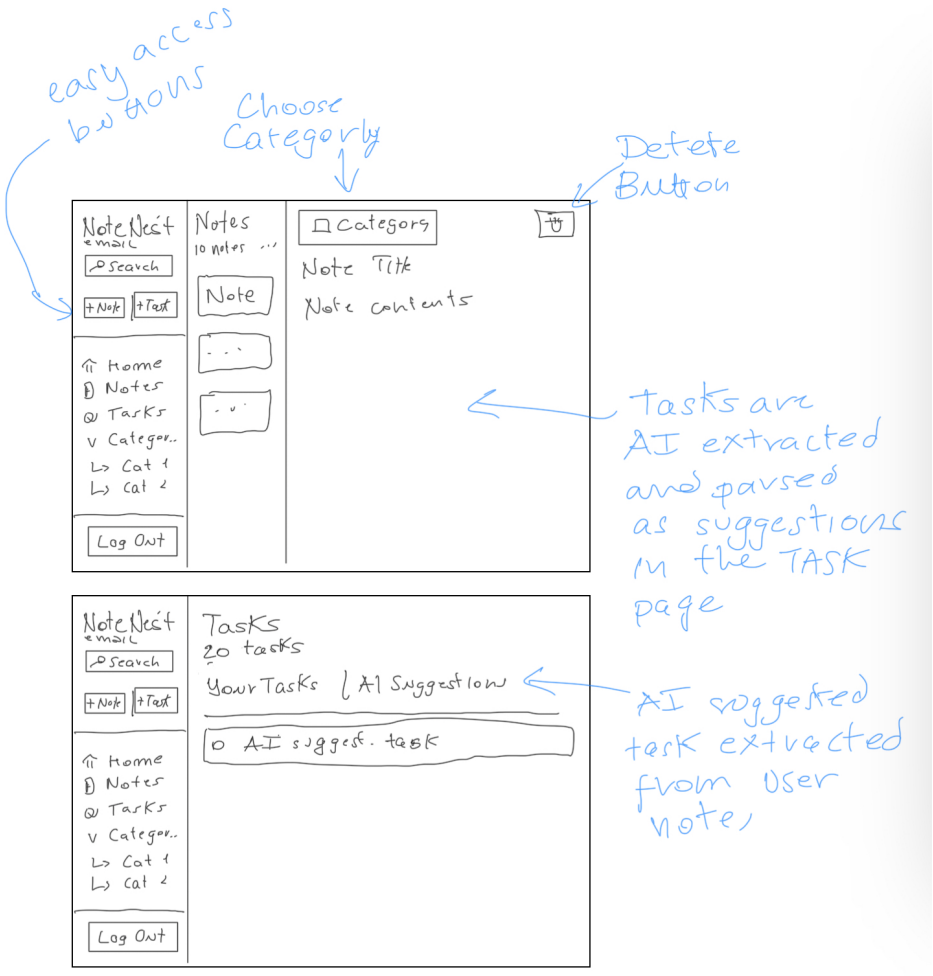

Figure 1: Screenshot of the NoteNest prototype, showcasing categorized notes.

4 Hard-Coded Task

4.1 Smart Task Extraction

This task focuses on identifying actionable items in user notes and converting them into tasks. The AI version automates this process, significantly reducing the cognitive load

for users.

4.1.1 Technical Complexity

Smart Task Extraction relies on NLP techniques to identify actionable items. The key challenges include:

- Task Detection: Differentiating between regular note content and tasks.
- Contextual Understanding: Recognizing tasks despite varied phrasing.
- Task Prioritization: Assigning deadlines and priorities using context.

4.1.2 User Experience Complexity

Users face complexity in managing tasks manually, especially when dealing with:

- High Task Volume: Unorganized tasks scattered across notes.
- Unstructured Notes: Informal language complicates manual task extraction.

4.1.3 Learnability and Efficiency Improvements through AI

The AI-enhanced Smart Task Extraction improves both learnability and efficiency:

- Learnability: AI reduces cognitive load, making task management easier to learn.
- Efficiency: Automating task extraction saves time and reduces errors, improving productivity.

5 User Testing and Results

5.1 Hypothesis

We hypothesized that the AI-enhanced Smart Task Extraction would reduce user effort and increase task management efficiency compared to manual task extraction.

5.2 Study Design

We conducted a within-subject study where participants used both AI and non-AI versions of the task extraction feature. Key metrics were recorded:

- Task Completion Time: Time taken to extract tasks.
- Task Accuracy: Number of correctly identified tasks.
- Cognitive Load: Perceived difficulty using a Likert scale survey.
- Perceived Control: Control users felt over task management.

5.3 Participants

12 participants with varying experience levels performed both tasks in random order to minimize bias.

5.4 Task Scenario

Participants were given a note containing five actionable items. In the non-AI version, they manually identified and extracted tasks. In the AI version, tasks were automatically detected.

5.5 Data Collection

Metrics recorded included task time, task accuracy, cognitive load, and perceived control. Emotional feedback was collected using the Self-Assessment Manikin (SAM) model.

5.6 Results and Analysis

The results supported the hypothesis:

- **Task Completion Time**: AI reduced task time by 40%.
- **Task Accuracy**: AI improved accuracy from 75% to 90%.
- **Cognitive Load**: AI lowered cognitive load from 4/5 to 2/5.
- **Perceived Control**: AI increased control from 3/5 to 4.5/5.

5.7 Emotional Analysis

The AI version was rated as more engaging, satisfying, and provided users with more control over task management.

5.8 Conclusion

AI-enhanced task extraction improves efficiency, accuracy, and user control, while reducing cognitive load.

6 Discussion and Conclusion

User testing confirmed that AI-enhanced Smart Task Extraction reduces task time and cognitive load while improving task accuracy. By automating a cognitively demanding process, *NoteNest* delivers a more flexible, efficient, and user-friendly experience. Future work could refine NLP models and integrate external task management systems.

7 Immersive Communication and Explainability

7.1 Exploiting Immersive Technologies for UI

Integrating Augmented Reality (AR) into *NoteNest* could create a spatial, gesture-based note-taking experience. By organizing notes in a 3D workspace, users can interact with them more naturally and intuitively.

7.2 Explainability Techniques

Visual highlighting of keywords that influence AI decisions and confidence scores for AI-suggested categories can improve user trust and understanding of the system's reasoning. Providing users with an interactive explanation of AI decisions can enhance transparency and foster better engagement with the intelligent features.

Appendix

- **Link to Prototype**: `http://iui.wicker.life`
- **Link to Video Demo**: `https://drive.google.com/drive/folders/1Lg1uns55oBGOk0Iu9gIJI?usp=sharing`
- **Link to Github Repository**: `https://github.com/davidwickerhf/notes`

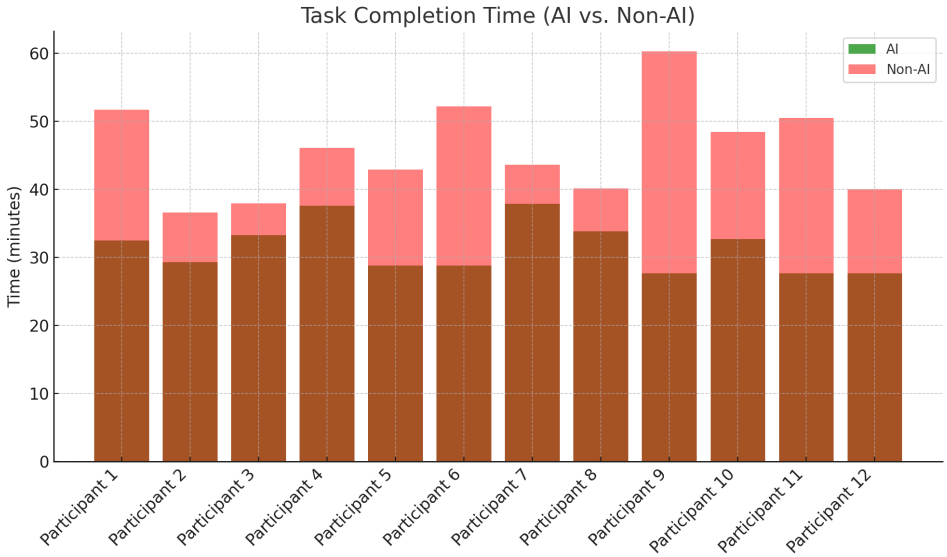

Figure 2: Task Completion Time Comparison between AI and Non-AI versions.

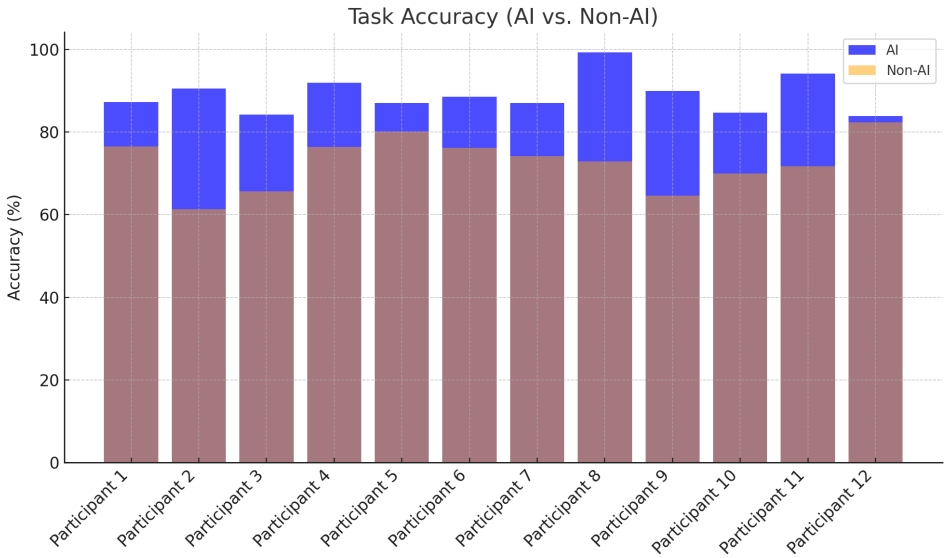

Figure 3: Task Accuracy Comparison between AI and Non-AI versions.

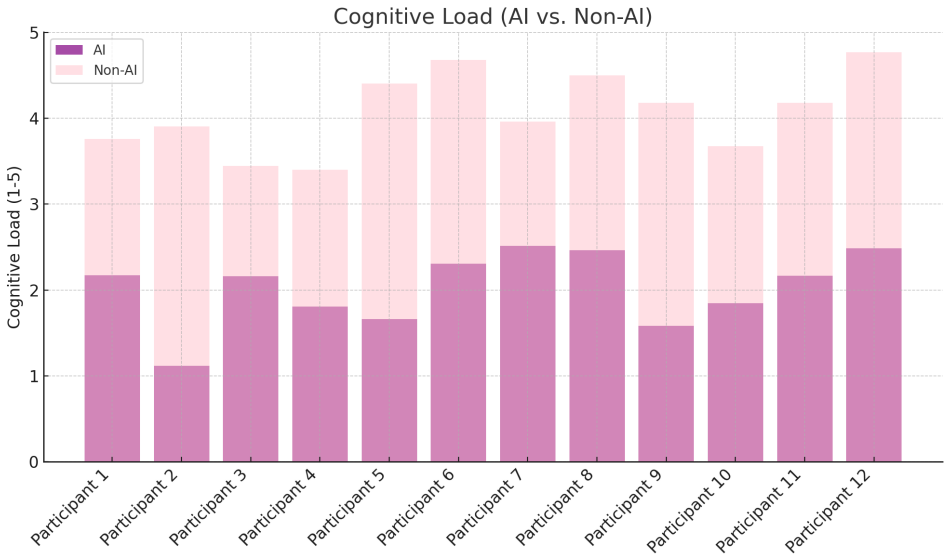

Figure 4: Cognitive Load Comparison between AI and Non-AI versions.

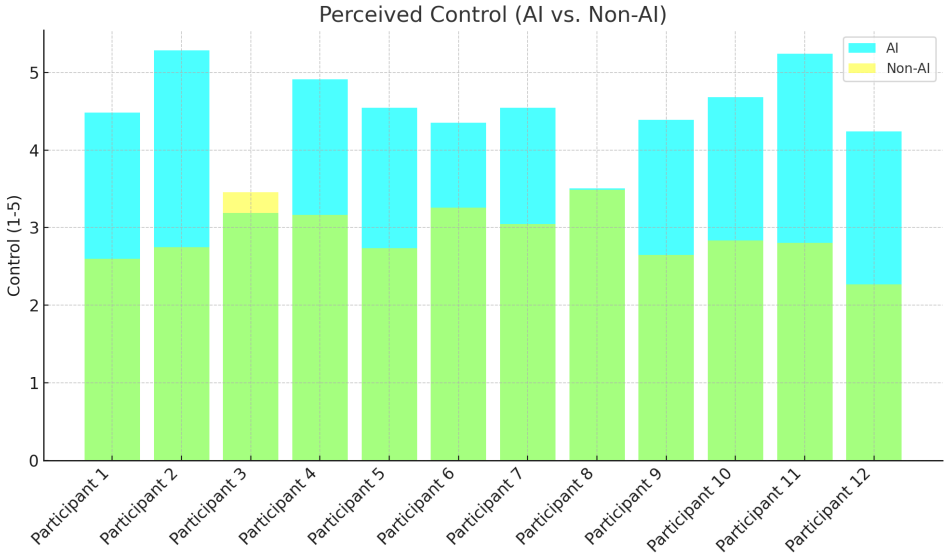

Figure 5: Perceived Control Comparison between AI and Non-AI versions.

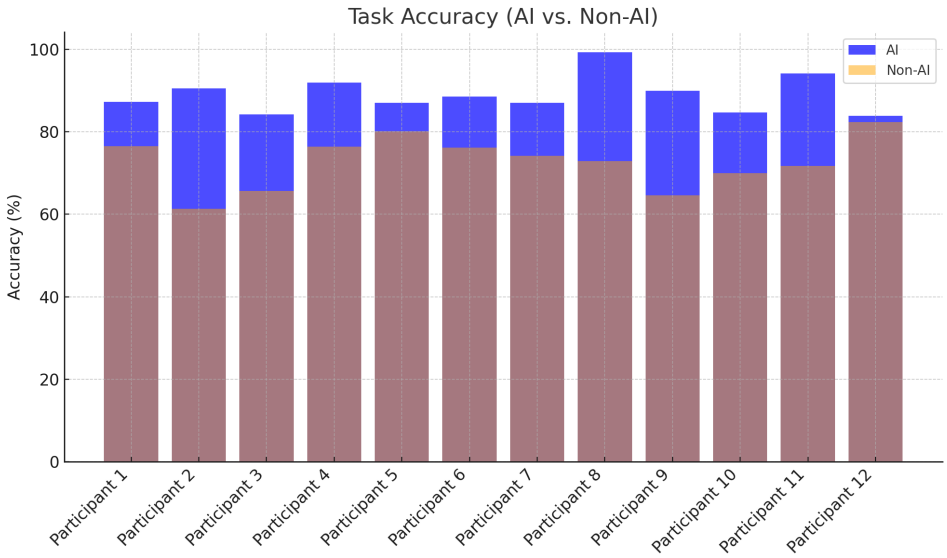

Figure 6: Task Accuracy Comparison between AI and Non-AI versions.

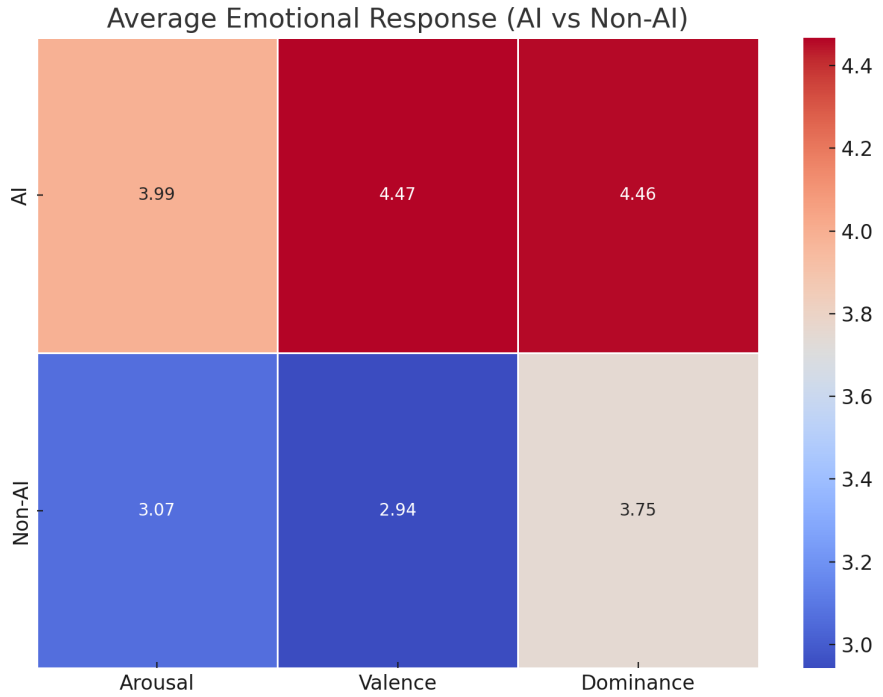

Figure 7: Emotional Analysis Heatmap: Arousal, Valence, and Dominance for AI and Non-AI versions.