Leaf it to AI: A Study in AR and AI in Plant Care

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1 Introduction

This paper presents *Leaf it to AI*, an Augmented Reality (AR) and Artificial Intelligence (AI)-based mobile application designed to support houseplant care through real-time visual feedback. It is difficult to interpret plants' needs, as existing apps provide only text-based or numerical feedback. The aim for this project is to make invisible data visible for the user in a meaningful way.

1.1 Research questions

- **Does *Leaf it to AI* AR application enhance the users' understanding of plant-care compared to a text based app?**

- **Does *Leaf it to AI* AR application help the user make decisions regarding plant-care?**

2 Related Work

In recent years, AI has evolved from being a relatively unknown concept to becoming an integral part of everyday life. From Large Language Models such as ChatGPT to personalized recommendations on streaming platforms, AI has embedded intelligence into our daily lives, representing a major technological shift. This literature review examines existing studies to form the basis for Leaf it to AI, exploring how trust in AI can be established and how everyday objects can be visualized in meaningful ways.

Moon-Hwan Lee (2019) conducted a study on data visualization in everyday contexts through the use of ordinary objects [1]. The goal was to make invisible information visible and meaningful within users' daily environments. The study identified three key design principles: the importance of immediate accessibility of information, adaptive information granularity, and aesthetic integration [1]. These findings emphasize that systems should be both functional and visually harmonious, providing users with quick, accessible feedback that gradually reveals more detailed insights as engagement increases.

Another relevant field of study is Explainable Artificial Intelligence (XAI), which aims to make system decisions explainable and comprehensible to those affected by them. The human-centered XAI approach goes beyond the question of who explanations are for, also addressing why explanations are needed [2]. Both aspects should be considered to make a system understandable to users. In brief, to make an AI system more explainable and trustworthy, it should be transparent, interactive, and informative, among other qualities [3].

Other studies have explored the use of AI in plant-related applications, such as disease recognition [4] and nutrient deficiency detection [5], but these are typically approached from a computer science perspective rather than a design perspective. Building on previous research, we use these findings as the foundation for developing our application.

3 Methodology

3.1 Prototype

Two prototypes were developed for this study:

- a text-based application

- an augmented reality application

The text-based application was designed in Figma and provided plant-care information in a static, structured format. It contained the same categories of information as the AR application, including watering, nutrition, diseases, and sunlight requirements, but without adaptive or context-specific feedback. Users could browse, search, and select plants from a list corresponding to those detectable by the AR application. Each plant had a dedicated information page presenting general care guidelines.
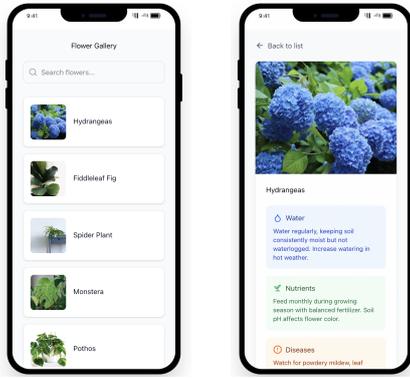
Figure 1: Prototype of the text-based application

The *Leaf it to AI* AR application was developed in Unity to offer an interactive plant-identification experience. It uses image detection to identify plants in real time and overlays information on the plant. The information is more specific than in the text-based app, offering recommendations tailored to each plant and its observed conditions. Users can point their device at a plant to instantly access details about water, nutrition, diseases and sunlight, making plant care simpler and intuitive.
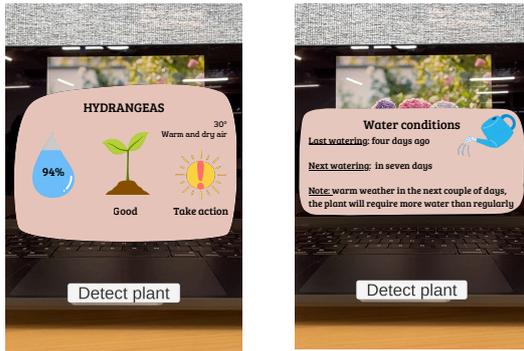

Figure 2: View of the *Leaf it to AI* application

As the goal of this study was to evaluate interaction concepts rather than technical performance, the AR prototype focused on visual representation and interaction flow rather than a fully functional implementation. Artificial Intelligence was only used in the AR condition and was conceptually represented rather than fully implemented. The system was designed to convey the outcome of AI-driven plant health assessment, such as detected leaf issues and corresponding care recommendations, through augmented visual elements, without exposing internal model outputs or confidence values. This approach allowed participants to experience AI-supported decision feedback without requiring a complete AI pipeline.

Inspired by Lee's work on visualization in ev-

eryday contexts [1], the AR prototype emphasized making otherwise invisible plant-related information visible, while supporting details-on-demand to avoid information overload. This design choice allowed users to access additional information selectively when needed.

The AR application allowed users to detect both entire plants and individual leaves. When a leaf showed visible signs of disease, the system presented the identified condition along with recommended actions to address it.

Figure 3: Example of diseased leaf detection and corresponding system feedback

Following principles from Lee et al. [1], the visual design of the AR interface was used to guide user attention and reduce cognitive load. Color contrast and visual hierarchy were used to distinguish between informational elements and alerts, supporting quick recognition of plant conditions while avoiding information overload. This design choice aimed to ensure that augmented information remained readable and actionable within a real-world context.

3.2 Experimental plan

This experiment investigates through a user study whether an AR interface improves users' understanding, decision-making and engagement in plant care compared to a text-based interface. Participants will use two mobile prototypes: *Leaf it to AI*, an AR-application and a text-based Figma app.

Eleven participants with varying plant-care experience, but all with some, will take part. All participants are experienced with different technologies since beforehand. Half of the users are starting on the AR interface and half on the text-based interface to control for order effects. Participants will perform tasks such as identifying the plant, checking health, determining watering and nutrition needs and assessing sun exposure. After each interface, usability and experience are measured using 1–5 scale questions based on the System Usability Scale (SUS). The study is a

within-subjects usability test with counterbalanced order.

For each system, the users got to answer questions from the SUS, which is a quick, standardized questionnaire that measures users' perceived usability of a system on a 0–100 scale [6].

All experimental materials, including the questionnaire, prototypes and collected data, are available online[1].

4 Results & Discussion

4.1 Usability Results (SUS)

The usability of both prototypes was evaluated using the System Usability Scale. The AR-app obtained a mean SUS score of 85.5 (SD = 7.7), suggesting high level of perceived usability and positive reception. Participants reported that the real-time plant detection in *Leaf it to AI* and information overlay made the experience intuitive and entertaining, especially for those with less prior plant-care knowledge.

The text-based app had a mean SUS score of 77.3 (SD = 14.2). While users found it simple and helpful, some reported that navigating static pages required more effort than interacting directly with the AR experience. The higher standard deviation suggests participants' experiences with the text-based interface varied more, most likely due to differences in their experience with plant-care concepts.

Overall, the SUS results show that both apps are practical but the AR-app offers a more smooth user experience, which corresponds to the goal of making plant-care information more accessible and interactive.

Table 1: System Usability Scale Score

No.	Score TB	Score AR
1	72.5	90
2	100	97.5
3	47.5	80
4	90	92.5
5	85	85
6	95	95
7	77.5	87.5
8	75	80
9	75	80
10	67.5	80
11	65	72.5

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[1]Questionnaire, Testing Database, Text-based Prototype, AR-based Prototype

4.2 Task Performance Results

Participants' performance on six plant-care tasks was recorded for both the AR and text-based (TB) apps. Each task was rated as correct (1), partially correct (2), or incorrect (3). Figure 4 shows the distribution of results for all participants and tasks.

Overall, participants scored better when using the AR app on almost all tasks. For the first two tasks, naming the plant and evaluating its current state, all participants got full marks (score = 1) on both interfaces, indicating that both apps allowed basic plant recognition the same way.
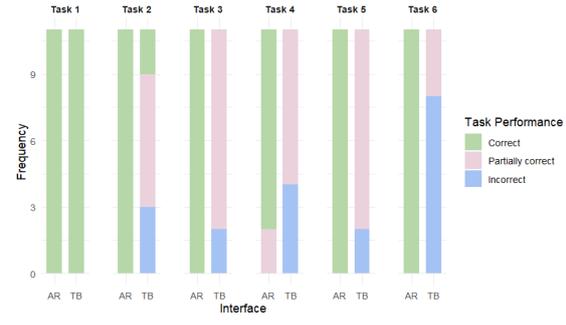

Figure 4: Performance Score Distribution per Task and Interface

Starting with task 3, which included inspecting the leaves and determining plant health, the AR-app performed very well, with the majority of participants scoring correctly (1). However, the text-based app had more variability, with some participants only partially detecting problems (scoring = 2). This pattern continued for tasks 4-6, which required specific actions such as watering, nourishment and light exposure. Participants who used the AR app performed better, with more accurate answers, while text-based users gave more partially correct or incorrect responses.

4.3 Subjective Feedback Results

In addition to quantitative performance measurements, observational notes and participant thoughts during the experiment were used to obtain subjective feedback on their interactions with both interfaces. Although direct quotes were not collected in this study, observational notes captured participants' reactions during task execution. Overall, the AR app was considered interesting, intuitive and useful for understanding plant conditions, while the text-based app was viewed as informative but sometimes difficult to use when answering specific questions.

Five out of eleven participants reported initial hesitation when using the AR application, particularly regarding which augmented elements were interactive. Three out of eleven users were surprised to see that certain AR objects, such as the plant or overlay icons, could be clicked. Once this interaction was discovered, users found the interface to be user-friendly and appreciated the option of getting additional information on demand. This shows that, while the AR interface was enjoyable, clearer visual cues could increase interactive component visibility.

For the text-based app, six out of eleven users complained that they could not always find the answers to specific questions. Although the information was present, users stated that it took more effort to find relevant details, including decision-making tasks such as evaluating if actions were required or if the plant should be moved. This sometimes led to uncertainty or partially correct answers, as shown in the task results.

4.4 Discussion

The results of the usability scores, task performance and subjective feedback show that the AR-based application helps users understand plant conditions and make plant-care decisions better than the text-based interface. The AR-app's high SUS score, together with great task performance, demonstrates that the AR interface was both simple to use and effective at transmitting useful data. Participants described the AR-app as fast because information was immediately accessible, compared to navigating static pages in the text-based interface, by pointing the device at the plant, eliminating the need for searching or interpretation.

Task performance results also demonstrate that the AR-app's benefits were more evident for tasks that required interpretation and decision-making, such as analysing plant health, determining appropriate actions and evaluating environmental conditions. While both interfaces handled basic recognition tasks equally well, the AR-app helped users to give more accurate answers for harder tasks. This is consistent with prior study [1] on visualisation in everyday contexts, which highlighted rapid access to information and details as critical factors for good understanding.

Subjective feedback also showed design considerations. Although the AR app was generally thought to be intuitive, some users were confused that certain AR elements were interactive. This had an impact on accessibility but did not significantly affect overall usability, suggesting that minor design improvements, such as improved features or visual indicators, could improve the experience. Users of the text-based app, on the other hand, found it difficult to identify specific information required to answer task-related questions, even when it was present, resulting in ambiguity and partially correct responses.

An important observation from the experiment was the impact of participants' prior plant-care knowledge. Users with more experience could usually identify plant conditions without relying too much on either interface, while less experienced users benefited more from the AR-app's visual and contextual assistance. This shows that AR-based visualisation may be useful for new users, as it solves the knowledge gaps by making abstract or unseen plant data accessible and understandable.

5 Conclusion

This study explored into whether an AR and AI-powered plant-care app increases user understanding and decision-making compared to a text-based interface. Two prototypes were created and tested using a user study that measured usability and task performance.

The results suggest that the AR-app had higher usability scores and improved performance in activities that required interpretation and decision-making. While both interfaces performed well for basic plant identification, the *Leaf it to AI* AR application provided faster access to information compared to the text-based interface and more accurate care decisions. Participants evaluated the AR interface as entertaining and efficient, while the text-based app users struggled to find relevant information.

The findings also show that prior plant-care knowledge affects performance, with less experienced users benefiting the most from the AR app's contextual and visual instruction. Overall, the study suggests that adding AR and AI into plant-care applications can improve usability and allow for more confident and educated user interactions.

6 Future works

Future work should focus on improving both the experimental design and the evaluation of user trust in AI-powered solutions. The user study showed that a pilot test would have been beneficial before carrying out the full experiment. Testing the prototypes with a small group of users beforehand could have helped detect usability issues, unclear interactions and errors in task design, allowing for changes before the main

study. Due to time constraints, this step was not done, making certain aspects of the experiment more difficult.

Another important area for future research is deciding how trust in AI can be measured more accurately. While this study focused on usability and performance, knowing how users accept AI-generated assessments and recommendations is important in decision-support systems. Future research could include validated trust-in-AI questionnaires, qualitative interviews, or behavioural metrics to understand users' trust in AI-driven plant-care advice.

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