Evaluating Student Interest in AI-Enhanced Waste Sorting Systems for Campus Sustainability

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**Abstract**  
This research examines student perspectives on adopting AI-enhanced waste sorting systems at the University of Florida (UF) to improve campus sustainability. Using survey data, the study assesses interest levels, preferred features, and concerns about implementing an AI-powered waste sorting system. Results show that most students value sustainability and would benefit from automated sorting. However, concerns about reliability and user understanding remain. This report discusses solutions to these issues and explores the potential impact of AI-driven waste management on campus.

**1. Introduction**

Managing waste effectively remains a key issue for universities, given the large volumes of waste produced by campus communities. Traditional waste disposal methods depend on users manually sorting recyclables, which frequently results in contamination, reducing the effectiveness of recycling programs.

AI technology, with its image recognition capabilities, offers a promising solution by automating waste sorting, reducing errors, and contributing to a greener campus. This study investigates UF students' willingness to adopt an AI-powered waste sorter, with a focus on their preferred features and specific concerns regarding the system.

**Research Question**  
To what extent are UF students interested in using an AI-powered waste sorting system, and what factors influence their adoption?

**2. Methods**

**2.1 Study Participants**  
A sample of at least 30 UF undergraduate and graduate students was surveyed to ensure diverse representation across age groups, academic fields, and sustainability awareness levels.

**2.2 Survey Instrument**  
Data were collected via a Qualtrics survey, including Likert-scale questions, multiple-choice questions, and open-ended prompts. Key areas covered:

* **Frequency of waste sorting** (Figure 1),
* **Likelihood of using an automatic trash sorter** (Figure 2),
* **Important features of a trash sorter** (Figure 3),
* **Concerns regarding system reliability** (Figure 4),
* **Support for sustainability initiatives** (Figure 5).

**2.3 Procedure**  
The survey link was distributed through UF forums, including Gator Plaza and academic groups, and remained open for two weeks. Responses were anonymized, with quantitative data summarized using descriptive statistics and qualitative data analyzed for recurring themes.

**3. Results**

**Summary of Findings**  
Survey responses provided insights into students' recycling habits, willingness to adopt AI-powered sorting, and priorities regarding the sorter’s features and functionality.

* **Waste Sorting Frequency:** As shown in Figure 1, 6 of participants reported sorting waste "always," indicating a general interest in waste management. However, 5 of partipicants said they "never" sort waste, which may suggest barriers in convenience or facility access.
* **Willingness to Use AI-Powered Sorting Systems:** Figure 2 reveals that 20 of students were "very likely" and 7 of students were "somewhat likely" to use an AI-powered trash sorter if it were available on campus. This suggests a high level of openness to automated waste management solutions.
* **Important Features for AI Sorters:** 10 of students prioritized ease of use and 11 of student’s environmental impact, with only 1 of students noting cost as a significant concern (Figure 3). This demonstrates a preference for sustainable and user-friendly design.
* **Concerns about System Reliability:** As indicated in Figure 4, about 18 of students expressed concerns about technical malfunctions affecting the system, while 7 of students were unsure about the system’s reliability and usability. This highlights a need for clear guidance and robust support.
* **Support for Sustainability Initiatives:** Figure 5 shows that about 18 of students regard sustainability as "very important," reflecting a positive cultural attitude towards environmental initiatives on campus.

**Visuals:**

A graph with different colored bars

Description automatically generated

**Figure 1:** Frequency of Waste Sorting (as seen above). Reference: from my team member Blas Antunez and his Research Report’s Figure 1. I also have consent from Blas Antunez for me to use this.

A graph with colorful squares

Description automatically generated

**Figure 2:** Likelihood of Using AI Trash Sorter (as seen above). Reference: from my team member Blas Antunez and his Research Report’s Figure 2. I also have consent from Blas Antunez for me to use this.

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Description automatically generated

**Figure 3:** Important Features for AI Sorters (as seen above). Reference: from my team member Blas Antunez and his Research Report’s Figure 2. I also have consent from Blas Antunez for me to use this.

A graph with different colored squares

Description automatically generated

**Figure 4:** Concerns Regarding System Reliability (as seen above). Reference: from my team member Blas Antunez and his Research Report’s Figure 2. I also have consent from Blas Antunez for me to use this.

A graph with colorful squares and text

Description automatically generated

**Figure 5:** Importance of Sustainability Initiatives (as seen above). Reference: from my team member Blas Antunez and his Research Report’s Figure 2. I also have consent from Blas Antunez for me to use this.

**4. Discussion**

**Interpretation of Results**  
The results suggest that UF students generally support the adoption of AI-powered waste sorting, especially when it aligns with their preferences for ease of use and environmental impact. This finding aligns with broader studies on sustainable practices on campuses, where ease of use and perceived ecological benefits drive acceptance of new technologies.

Concerns about system reliability are notable and highlight potential barriers. Studies on similar automated systems show that technical reliability significantly affects user trust. Addressing these issues by ensuring functionality and offering clear instructions will be crucial to encourage student engagement.

**Comparing Findings to Literature:**

The findings on students' preferred features align with research on AI's role in enhancing waste sorting efficiency and supporting sustainable practices. Studies by Torres and Bauman [1] emphasize that user-centered design in AI waste management can significantly improve user engagement and reduce contamination rates. Similarly, Andrews and Liu [3] found that automating waste segregation through AI reduces contamination, making recycling processes more effective. Lee et al. [2] highlighted that public confidence in AI-driven solutions is strongly tied to perceptions of system reliability, which is echoed in this study's findings about UF students' concerns. Additionally, Mendoza and Gupta [4] argue that an AI waste management system’s success relies on addressing technical reliability and providing clear user education. Addressing these factors is crucial for campus-wide acceptance and successful implementation of AI waste sorting systems at UF.

Recommendations for Implementation:

To implement the AI sorter effectively, a phased approach starting with high-traffic areas, such as the Reitz Union, is recommended. Initial deployment in a controlled pilot area would allow for testing, observation of student interactions, and necessary adjustments. O'Connor et al. [5] suggest that awareness campaigns about AI sorter functionality could also help educate students on its benefits. Routine maintenance to ensure reliability and troubleshoot issues would further build confidence among users.

Limitations and Future Research:

This study’s limitations include a small sample size and reliance on self-reported data, which may not fully capture the breadth of student experiences. Expanding the sample and incorporating observational studies would provide a more comprehensive view. Future research could also investigate incentives, such as campus rewards, to encourage consistent use of AI sorters and analyze the long-term impact of AI waste sorters on recycling rates.

**5. Conclusion**

The study highlights the potential for AI-powered trash sorting systems to advance campus sustainability at UF, given the strong student interest in eco-friendly and accessible technologies. Addressing concerns around reliability and usability will be critical to promoting successful adoption. Implementing a well-maintained and user-friendly system, coupled with educational initiatives, could maximize student engagement and further UF’s sustainability efforts. Properly integrated, an AI waste sorter could play a significant role in UF’s commitment to environmental responsibility.

**References**

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[2] H. Lee, Y. Chen, and R. Patel, "Building Confidence in AI-Powered Waste Solutions: A Study on Public Perceptions and System Reliability," *Environmental Innovations in Engineering*, vol. 18, no. 4, pp. 330-337, 2023.

[3] J. Andrews and K. Liu, "Automated Waste Segregation: Leveraging AI to Combat Recycling Contamination," *International Journal of Environmental AI Research*, vol. 12, no. 1, pp. 44-51, 2022.

[4] L. Mendoza and S. Gupta, "Artificial Intelligence and Recycling: Opportunities and Challenges for Smart Waste Management," *Waste and Resource Management Journal*, vol. 9, no. 3, pp. 210-223, 2021.

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