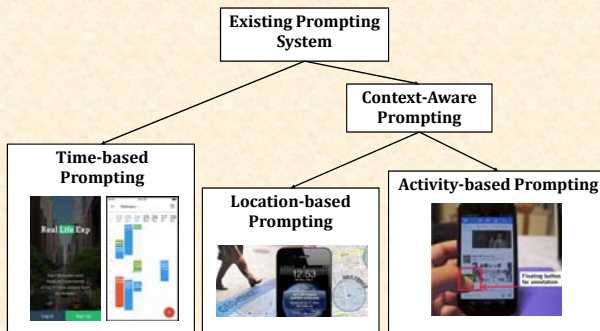


INTRODUCTION

- Individuals with cognitive impairment, such as dementia, experience difficulties in everyday functional independence and activity of daily living.
- Prompting technology may potentially help individuals in dealing with their cognitive impairments and performing their activities. These prompts can be verbal or non-verbal intervention delivered to the user.
- Prompting technology has been shown to increase adherence to instructions, decrease errors on everyday instrumental activities of daily living (IADLs), increase functional independence, and increase activity engagement of individuals with cognitive impairment.
- One key aspect of designing technology in this field is the difficulty of finding the most effective timing for prompt delivery.
- **Objective:** Design and implement a personalized prompting feature in AL app and test its performance using real data.
- **Hypothesis:** The use of personalized intelligent interruption mechanisms will lead to more user higher response rate and shorter response times.

RELATED WORK

- The ultimate goal of a prompting system is to provide prompts at times when it would be most opportune for the user to receive them, and therefore respond to them.



CONTRIBUTION

- We develop a personalized context-aware intervention system for smartphones. We hypothesize that individual's response rate will vary depending on the daily activities they perform and other contextual factors such as day of the week, time, and location.
- To test our hypothesis we have 47 subjects respond to AL app queries about their current activity. We then apply signal processing and machine learning techniques to collected data to develop a personalized prompting system.

METHODOLOGY

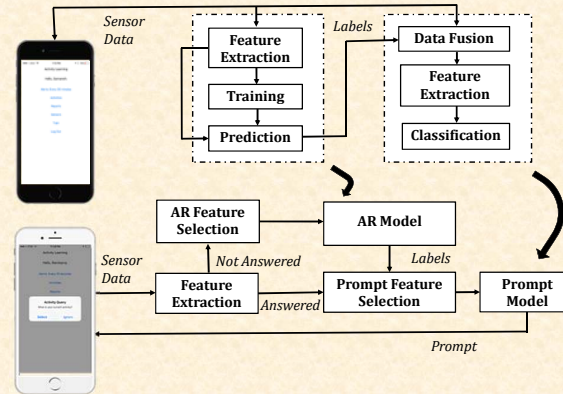


Table 1. AR model features

Feature	Description
Motion	3-axis acceleration, 3-axis rotation, yaw, pitch, roll
Location	GPS coordinates (latitude, longitude, altitude)
Time	Day of week, Hour, Minute

Table 2. Prompting model features

Feature	Description
Daily activity	Activity labels given by activity prediction module
Engagement level	The time taken for the previous prompt to be responded
Location	GPS coordinates (latitude, longitude, altitude)
Time	Day of week, Hour, Minute

EXPERIMENTAL DESIGN

- 47 Participants (31 usable)
- One week of time based data collection
 - Prompt frequency set to send a prompt every 30 minutes.
 - User can choose to select their activities or select ignore.
 - After 7 minutes of awaiting response, prompt will be expired.
- One week of context-aware data collection
 - Users are sent prompts based on their location, current activities, distance from previous answer, time, and date.
 - Phone sensor's data will be checked every 10 minutes.

RESULTS

- We constructed our Activity recognition and prompting models for each subject using Decision Tree machine learning algorithm.



Fig 1. AR Model Performance

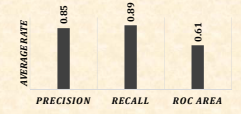


Fig 2. Prompt Model Performance

- Although all features played an important role in our prompt decision making model, "Location" contribution in the model was more significant.

- Using t - test

➤ Null hypothesis: the true mean response rate of the two samples are the same, $H_0: \mu_1 - \mu_2 = 0$

➤ Alternative hypothesis: the true mean response rate of the two samples are different, $H_a: |\mu_2 - \mu_1| > 0$.

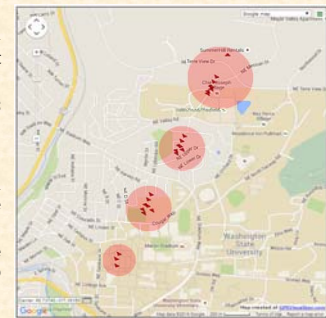


Fig 3. Location of User 84

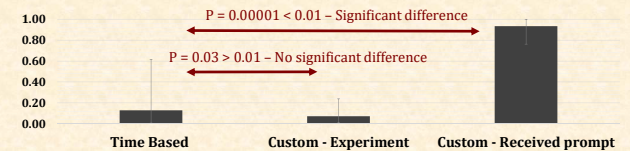


Fig 4. Response Rate

CONCLUSION AND FUTURE WORK

- The preliminary results demonstrate the potentials of proposed personalized context-aware prompting model.
- Due to IOS restrictions on issuing real-time alerts, a significant portion of prompts failed to be properly delivered. As a future work, we intend to further investigate and resolve this issue.
- To further demonstrate the effectiveness of the algorithm, especially, the potential impact of all prompt features, a more extensive experiment is required.

ACKNOWLEDGMENT

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