Active sensing and personalized interventions for pandemic-induced social isolation

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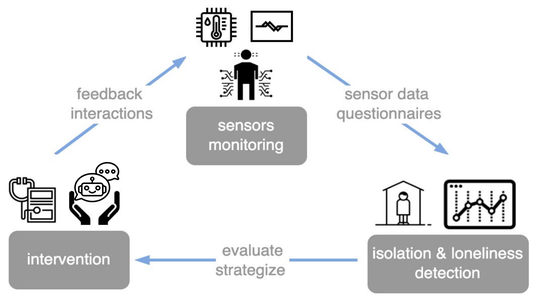
Problem Statement

- Use novel social modalities to predict social isolation and loneliness and identify effective personalized interventions in the elderly community
- Data driven design of interventions
- Deliver interventions and measure their effectiveness



Intellectual Merit

- Within health sciences, the project will develop techniques to identify the onset of social isolation and develop personalized interventions to overcome it
- Within technology, the project:
  - Developed novel sensing modalities, predictive analytics and design a user-friendly platform to integrate these techniques.
  - Building companion chatbot based on Large language models (LLM).

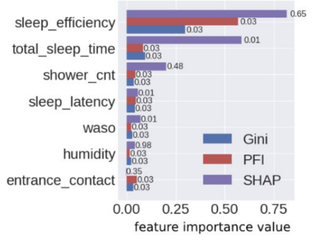
Project Challenge

- Tech-familiarity of the elderly
- Sensor device maintenance
- Skepticism about AI-human interaction
- Privacy concerns

Major Outcomes/Progress

- Sensing system deployment
  - 12 sensors capture indoor mobility, fitness level, sleep, environment.
- Data Collection
  - US side: 18 participants enrolled, collecting 6-month of data by April
  - Japan side: 10 participants enrolled, recruiting more participants
- Data analysis
  - Temperature & humidity sensor and sleep sensors

Model	R^2	MAE	EV	MSE
Linear Model	0.67	5.71	0.73	54.79
Random Forest	**0.86**	3.70	**0.87**	25.22
Elastic Net	0.67	5.76	0.73	54.33
Baseline 1 [6]	0.35	**0.81**	-	**0.91**
Baseline 2 [46]	0.57	4.46	0.57	5.63
Random Forest Reduced	0.78	5.75	0.78	61.74



- Chatbot development
  - 20 Chatbot surveys conducted
  - Three iterations of Llama-based Chatbot App customized to elderly
    - User-friendly UI
    - Multilingual competence

Broader Impact

- Community Engagement
  - Greater Philadelphia area senior apartments
  - Shikano-dai area of Ikoma City: larger mixed community with large number of older adults
- Sustainability
  - Develop a sensor platform and chatbot for gerontology study
  - Application to other age groups for the development of innovative technologies in mental healthcare

Future Goals

- Planned activities
  - Chatbot development
  - Student exchange
  - Japan-side data collection
- Expected outcome
  - Loneliness prediction model using measurements from our sensing platform
  - Sensor-informed Chatbot for loneliness intervention