VOLI

Voice Assistant for Quality of Life and Healthcare Improvement in Aging Populations

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Overview

Technology can play a pivotal role in meeting the needs of older adults in ways that preserve their independence. **Voice** is the most basic and natural interaction method for humans, and we believe it can be a powerful method for aging individuals, particularly those with visual or neuro-musculoskeletal impairment, to optimally interact with computerized digital assistance systems.

We are working on a *personalized* and *context-aware* voice-based digital assistant to improve the quality of life and the healthcare of older adults, and consequently, to reduce caregiving burden and optimize the interactions with healthcare and service providers.

Aims

1. **Technical aim:** investigate how digital assistants, NLP, and machine learning can produce meaningful health-related conversations by leveraging population- and patient-level data from EHRs
2. **Social, behavioral, and cognitive aim**: design services for older adults based on their needs to support independence and investigate the acceptability of digital assistants for the aging population
3. **Clinical aim**: investigate how digital assistants can detect new symptoms and correlate them with medication side effects, medication interactions, worsening of existing conditions, or onset of a new illness or allergy

Architecture

Figure 1 depicts an overview of the system, where participants interact with devices to access services, ask questions, and report health information. Clinicians, researchers, family members, or caregivers can access the information based on preferences and policies. VOLI accesses EHR data, as well as public health knowledge-bases and ontologies.
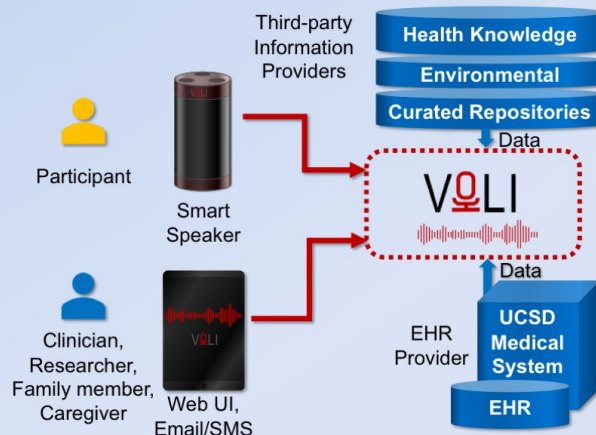

Figure 1. VOLI System Overview

We are developing VOLI using an iterative design process that engages study participants in co-design workshops to inform the features of the voice interface and get early feedback on prototype implementations.
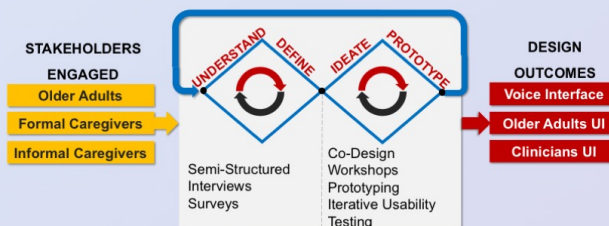

Figure 2. VOLI Iterative Design Process

VOLI's health digital assistant uses deep learning for natural language understanding backed by information from EHR (both structured and unstructured) to personalize the experience and bring in the specific health context of each participant. Conversations can be initiated by the system (e.g., reminders regarding medications or clinical notes) or by the participant to self report symptoms or ask questions.
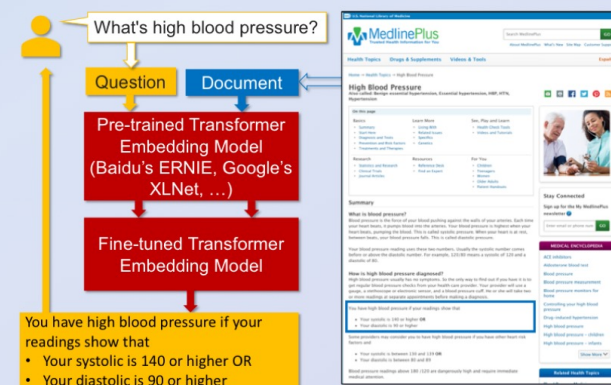

Figure 3. VOLI General Question Answering Process

The EHR integration helps to answer participant-specific questions based on the history of clinical visits and data collected from participants. Patient-level terminologies transpose the health context into familiar terms that participants can better understand.
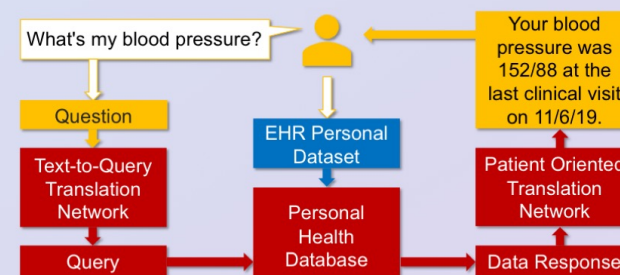

Figure 4. VOLI Personal Context Processing

Impact

VOLI addresses the needs of the aging population to be independent in their homes and to optimize their healthcare based on the context of their symptoms and medications. This research can be further extended to other populations to monitor treatment side effects at home, to monitor recovery after surgery and reduce length of stay in the hospital, to identify onset of new illnesses, or identify the appropriate time to refer a patient to hospice.