Diagnostic Screening of Cognitive Status with Dialogue Agent

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The search for early biomarkers of mild cognitive impairment (MCI) has been central to Alzheimer's Disease (AD) and dementia research community in recent years. To identify MCI status at the earliest possible point, recent studies have shown that linguistic markers such as word choice, utterance and sentence structures can potentially serve as *preclinical markers* (i.e., before the onset of detectable physiologic changes). Here we formulate the search for linguistic markers as a partially observable Markov Decision Process (POMDP) and construct a dialogue system to generate questions that distinguish MCI from normal (NL) cognitive status. Our dialogue agent adapts its questioning strategy based on the user's previous responses to reach an individualized conversational strategy per user. We demonstrate its capacity to deliver efficient conversations that track the cognitive status while minimizing the conversation length. Because the dialogue system is adaptive and scales favorably with additional data, our method provides a potential avenue for large-scale preclinical screening of neurocognitive decline by using dialogue features as digital biomarkers.