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# Including patient context and physicians-in-the-loop to create transparent health conversational systems

## 1. Problem

Imagine there is a virus which has been spreading all over the world, causing millions of people to die. The virus is highly contagious and can be detected through triangulating symptoms, including widened eye pupils, elevated heart rate when standing, and a hoarse voice. All over the world, people started searching through keywords for which other symptoms can be shown, trying to diagnose themselves (i.e., consulting "Dr Google") and thus limiting the richness of possible sensorial contextual inputs (i.e., pupils, heart rate, or tone of voice).

Seeking advice on search engines for health reasons can help understand which health services are available or where they are located. Search engines thus can act as a gateway or platform to guide patient to seek professional advice. However, consulting "Dr Google" for health diagnoses is that it can become difficult for searchers to decide whether the found information is credible, accurate, and relevant to their health issue.

The opportunities to optimise how people search through keywords for health information is plentiful. For example, limited information can be provided for the symptoms through keywords, the context of the patient and expert judgement from health professionals is removed (e.g., health history), and people are searching for highly specialised information (i.e., jargon) which may mislead the patient and cause anxiety.

## 2. Goal

The goal of a conversational system in a health setting is to step away from the keyword-search paradigm and move to a paradigm which includes the human as a holistic "set of data points". The research community can investigate how to (1) include the context in a conversational system such as multimedia and multidevice input, (2) create a physician-in-the-loop system to overcome an evidence-based black-and-white decision-making approach.

## 3. State of the art

Many chatbots have been developed to help automate and self-diagnose patients. Furthermore, more recently, smart devices have been incorporated, such as Amazon Echo to help identify cardiac arrests through background sounds [1]. Other research has suggested that mobile devices' non-intrusive sensors could be utilised to identify illnesses [2-3].

## 4. Steps

Our research community should increasingly work closely with health professionals to navigate and understand evidence-based health decision-making complexity. Our goal should be to make this conversational search method transparent and communicate this process. An example of multi-disciplinary health research can be found here [4].

[1] Chan, J., Rea, T., Gollakota, S. and Sunshine, J.E., 2019. Contactless cardiac arrest detection using smart devices. *NPJ digital medicine*, *2*(1), pp.1-8.
[2] Quatieri, T.F., Talkar, T. and Palmer, J.S., 2020. A framework for biomarkers of COVID-19 based on coordination of speech-production subsystems. *IEEE Open Journal of Engineering in Medicine and Biology*, *1*, pp.203-206.
[3] https://news.mit.edu/2020/signs-covid-19-may-be-hidden-speech-signals-0708
[4] https://www.premier.vic.gov.au/cutting-edge-technology-helping-paramedics-save-lives/